MT

Pt 1

Confidential Filing

Information Technology.
Inadequacy of Interdepartmental Whitehall Machinery.
ACARD Report.

INDUSTRIAL POLICY

Pt 1. JANUARY 1980

PREM 19/489

Referred to	Date	Referred to	Date	Referred to	Date	Referred to	Date
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PART 1 ends:-

IT(81) 39 – 30/3

PART 2 begins:-

MAP to hd 1/4

TO BE RETAINED AS TOP ENCLOSURE

Cabinet / Cabinet Committee Documents

Reference	Date
IT (80) 3	26.9.80
E (80) 147	11.12.80
E (80) 45th Meeting, Minutes	17.12.80
IT (81) 1	5.1.81
IT (81) 1st Meeting, Minutes	8.1.81
IT (81) 3	14.1.81
IT (81) 4	14.1.81
IT (81) 5	14.1.81
IT (81) 7	16.1.81
IT (81) 6	19.1.81
IT (81) 11	28.1.81
IT (81) 10	30.1.81
IT (81) 3rd Meeting, Minutes	5.2.81
IT (81) 13	16.2.81
IT (81) 15	16.2.81
IT (81) 4th Meeting, Minutes	19.2.81
IT (81) 20	2.3.81
IT (81) 21	4.3.81
IT (81) 26	5.3.81
IT (81) 5th Meeting, Minutes	5.3.81
IT (81) 39	30.3.81

The documents listed above, which were enclosed on this file, have been removed and destroyed. Such documents are the responsibility of the Cabinet Office. When released they are available in the appropriate **CAB** (CABINET OFFICE) CLASSES

Signed P Wayland Date 3 May 2011

PREM Records Team

Published Papers

The following published paper(s) enclosed on this file have been removed and destroyed. Copies may be found elsewhere in The National Archives.

Cabinet Office, Advisory Council for Applied Research and Development "Information Technology"
Published by HMSO, September 1980 [ISBN 0 11 6 30818 4]

Signed C Wayland Date 3 May 2011

PREM Records Team

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FROM THE
MINISTER OF STATE
FOR INDUSTRY AND
INFORMATION TECHNOLOGY
Kenneth Baker's Office

Mike Pattison Esq
Private Secretary to
the Prime Minister
10 Downing Street
London
SW1

Prime Minister
Content that attached message and photo should be transmitted from you to Kenneth Baker in Las Vegas on 12 April, to publish British Videotex?
MAP 31/3

30 March 1981

Yes

Dear Mike,

Mr Baker will be attending the National Association of Broadcaster's Show in Las Vegas on 12 April 1981 and, in particular, will open the British Videotex stand. Considerable time, effort and money have been put in to make the UK presence at the Show a success.

The Prime Minister will be aware that Teletext and Videotex are major elements in our efforts to promote information technology and are areas where we lead the world. We need to carry the US with us on standards for these technologies and the NAB Show represents a major opportunity to further this aim. In order to secure the best press coverage possible at what is a very large show, it will be necessary to take all steps possible to stimulate beforehand interest by the local and national press.

Mr Baker feels that it would be of immense benefit to have a personal message from the Prime Minister (on the lines of the attached) that he can call up in Las Vegas from the London-based Prestel computer via the Picture Prestel link. The display will be similar to that in the attached leaflet, using the text and photograph enclosed.

I would be grateful for an early indication as to whether this would be acceptable to the Prime Minister so that the technical arrangement can be made.

Yours sincerely,
Jonathan Hudson

JONATHAN HUDSON
Private Secretary

M10/M10ABJ

PROPOSED TEXT

DEAR KENNETH,

BEST WISHES TO YOU AND ALL AT NAB. I AM SURE THAT, BY WORKING WITH OUR FRIENDS IN THE UNITED STATES, THE MANY ADVANTAGES OF BRITISH VIDEOTEX AND TELETEXT SYSTEMS WILL BE EXPLOITED TO THE FULL.

Margaret Thatcher.

MARGARET THATCHER

MFJ

4 March 1981

I wrote to you yesterday about the Prime Minister's meeting to discuss the paper submitted by the CPRS on 16 February on Information Technology. I should be grateful if you could add the Home Secretary's name to the list of those present.

I am sending copies of this letter to John Halliday (Home Office), Jim Buckley (Lord President's Office), Terry Mathews (Chief Secretary's Office, HM Treasury) and David Wright (Cabinet Office).

TPL

I.K.C. Ellison Esq
Department of Industry

CONFIDENTIAL

SUBJECT.

file NB

cc Mr Hoskyns.

cc. Master set.

10 DOWNING STREET

From the Private Secretary

3 March 1981

The Prime Minister held a meeting this morning to discuss the paper submitted by the CPRS on 16 February on Information Technology. In addition to your Secretary of State, the following were present: the Lord President, the Chief Secretary, Mr. Kenneth Baker, Sir Robert Armstrong, Robin Ibbs and John Hoskyns.

Introducing the CPRS paper, Mr. Ibbs said that the UK's opportunities in IT were enormous. But there was strong international competition, and Governments overseas were playing a major role in support of their industries. Two things were now needed to enable the UK industry to achieve its full potential: a coherent Government action plan and improved Government machinery for dealing with IT. The paper addressed itself to both of these issues. The possible elements of an action plan were described in the annex to the paper. As for improved machinery, it proposed an IT Secretariat within the Cabinet Office reporting to the Minister for Information Technology; an Advisory Group which would be chaired by the Minister and would include 4 or 5 industrialist members as well as key civil servants; and a small Ministerial Committee under the Prime Minister's chairmanship.

In discussion, the following points were made:

(i) There was a danger of overlap between the sponsoring division within the Department of Industry and the proposed IT Secretariat. Against this, it was argued that there were a number of cross-departmental issues which could be best handled centrally, and a small Secretariat located within the Cabinet Office would be in a good position to co-ordinate and help implement the Government's IT plans, and clear obstacles to the development of IT.

(ii) It was important that the proposed Advisory Group and Secretariat should act responsibly and take fully into account the particular concerns of departments; and Ministers must be informed at an early stage of particular proposals affecting their departments.

/(iii)

CONFIDENTIAL

(iii) Rather than set up a new Advisory Group, it would be better to look for outside advice on IT to a sub committee of ACARD. Otherwise, it would look as if the Government were establishing a new quango. It was also suggested that an Advisory Group, however constituted, was unnecessary, since the IT Secretariat would include two outsiders. Against this, it was argued that it was crucial that Ministers should have advice on a continuing and up-to-date basis from industry; a Sub-Committee of ACARD would provide this essential link with industry. If external advice was provided by an ACARD Sub-Committee, there might be a need for a high level official group to co-ordinate advice within Government.

(iv) There were a number of very important initiatives proposed in the annex to the CPRS paper; these would have to be considered further under the new machinery. On the proposal that there should be an IT week in 1982 it was suggested that it might be better to have this in 1983 by when there would be more achievement to show.

Summing up, the Prime Minister said that they were agreed on the recommendations in paragraph 18 of the CPRS paper for new Government machinery to deal with IT issues, except that instead of setting up a new Advisory Group they would prefer to look for external advice to a Sub-Committee of ACARD. The proposed IT Secretariat should be set up within the Cabinet Office, under the direction of an Under Secretary, and should consist of four people, including two seconded from the industry. One of the two seconded people might come from the CPRS; the rest would have to be an addition to Cabinet Office manpower which would have to be offset in other departments or charged to the manpower contingency reserve. She would issue instructions on the setting up of the new machinery. The Secretary of the Cabinet, in consultation with the Minister of State, Department of Industry (Mr. Baker), should consult the Chairman of ACARD about the proposed constitution and membership of a Sub-Committee of ACARD. She would like Mr. Baker to arrange for the proposed action plan to be considered by the Sub-Committee as soon as it was set up with a view to an early report to the Ministerial Committee. She would ask the Secretary of the Cabinet to send a note for information to members of E Committee outlining the conclusions reached and the action now proposed.

I am sending copies of this letter to John Halliday (Home Office), Jim Buckley (Lord President's Office), Terry Mathews (Chief Secretary's Office, H.M. Treasury) and David Wright (Cabinet Office).

J. P. LANKESTER

I. K. C. Ellison, Esq.,
Department of Industry.

PC6

Ref. A04340

PRIME MINISTER

Information Technology

BACKGROUND

FLAG A

On 17th December the Ministerial Committee on Economic Strategy (E(80) 45th Meeting) asked the CPRS (with due consultation) to prepare a paper on information technology, which would describe the measures required and the issues to be resolved, and suggest machinery for handling this subject. The CPRS paper prepared in response to this remit is to be discussed at your meeting on Tuesday, 3rd March.

2. The paper suggests a set of measures to be taken; these are set out in the annex to the paper. It divides the issues raised by these proposals into three sets: those related to the supplying industries; those related to the legal and regulatory environment for information technology; and those related to the user industries - the information industries.

3. The Department of Industry has the main responsibility for the supplying industries: the computer industry, telecommunications, electrical components etc. The legal and regulatory environment - e.g. the regulation of radio frequencies, privacy and data protection, standards and copyright - involves matters of international as well as of national interest, and is the concern primarily of the Home Office, the Department of Industry, the Department of Trade and the Foreign and Commonwealth Office. A number of Departments are involved in the needs and concerns of the users of information technology. Work in Government on all these groups of issues will need an effective input from suitably qualified and experienced people outside the Government, as well as a positive and well co-ordinated contribution from inside the machine.

4. The central machinery proposed by the CPRS for dealing with these issues in Government is described in paragraph 8 of the paper. Perhaps the most significant element in the proposals is the creation of a small "executive secretariat" in the Cabinet Office: this would not just service the proposed

Ministerial Committee, but would act as a positive source of ideas and proposals for action. The CPRS is supported by the Minister for Information Technology in the view that this cannot be left to the Department of Industry alone to handle, and will need to include people from outside as well as from inside Government.

5. It is proposed that there should be a Ministerial Committee under your chairmanship to set policy and give political clout; this will be supported not only by the proposed "executive secretariat" in the Cabinet Office but also by an advisory group of officials and outsiders, appointed by you and chaired by the Minister for Information Technology.

6. The conclusions and recommendations of the paper are summarised in paragraph 18.

HANDLING

7. You might ask the Head of the CPRS to introduce the paper. You will probably want to give the Secretary of State for Industry a chance to comment thereafter, and then to invite the Minister of State, Department of Industry (Mr. Baker), who is the Minister for Information Technology, to comment in more detail.

8. I suggest that you will not want your meeting to discuss the proposed measures in detail: they ought to be considered by the bodies constituting the new machinery, when they are set up. But you may like to make sure that the meeting is content with the general line of what is proposed in the annex to the paper.

9. You may then like to turn the meeting's attention to the machinery proposed. If Ministers are in general content with the lines of action envisaged, do they agree that the machinery provides the best prospect of a positive Government lead? You will wish to make sure that the Secretary of State for Industry is content, since the effect of the proposals would be to put into commission a responsibility which would otherwise fall to his Department; you may also like to make sure that the Home Secretary is content, since the advisory group and the executive secretariat proposed will undoubtedly be making proposals in fields like radio regulation and data protection in which he is the Minister responsible.

CONCLUSIONS

10. If the meeting is content with the proposals, you may like to record conclusions as follows:

(i) endorsing the recommendations in paragraph 18 of the paper;

(ii) taking note that you will set up the proposed machinery, consulting other Ministers as appropriate about the membership of the advisory group;

(iii) inviting the Minister for Information Technology (Mr. Baker) to arrange for the action plan to be considered by the advisory group as soon as it is set up, with a view to an early report to the Ministerial Committee;

(iv) instructing the Secretary of the Cabinet to send a note for information round the Ministerial Committee on Economic Strategy, outlining the conclusions reached and the action now proposed, in response to the Committee's decisions last December.

RCA

ROBERT ARMSTRONG

2nd March, 1981

How Duguid

RESTRICTED

Civil Service Department
Whitehall London SW1A 2AZ
01-273 4400

From the Private Secretary

25 February 1981

Mike Pattison
Private Secretary to the
Prime Minister
10 Downing Street
LONDON SW1

T/L to see

Dear Mike,

INFORMATION TECHNOLOGY

The Prime Minister is holding a meeting on 3 March to discuss the proposals made in the CPRS paper which was circulated by Mr Ibbs on 16 February.

This is just to record, in advance of the meeting, that the Lord President likes the proposals: if colleagues agree it will be necessary to go into the details to see how they would work. The Lord President also thought that he ought to point out that the Advisory Group would be a new quango, although he does not object on that account.

Yours sincerely,
Jim Buckley.

J BUCKLEY

RESTRICTED

Prime Minister

There will be a Cabinet Office brief on this paper on Monday.

Covering CONFIDENTIAL

Qa 05252

cc Mr Hoskyns

To: PRIME MINISTER

From: J R IBBS

27/2

Information Technology

1. I attach a paper on information technology which you commissioned at E(80)45th Meeting on 17 December. see flag A

2. I am sending a copy of this minute, together with the report, to the Home Secretary, the Secretary of State for Industry, the Lord President, the Chief Secretary, Treasury, Minister of State at the Department of Industry (Mr Baker), and to Sir Robert Armstrong and Mr Hoskyns.

JR.

16 February 1981

Att.

DRAFT CPRS PAPER FOR PRIME MINISTER'S AD HOC COMMITTEE ON IT

INTRODUCTION

1. On 17 December E Committee (E(80) 45th meeting) asked the CPRS, after consultation with the Policy Unit and the Advisory Council for Applied Research and Development (ACARD), to prepare a paper on information technology (IT) which would:

a. describe the measures that are required in order for the UK to move purposefully ahead in the manner, for example, of France, and Japan

b. expose the issues that need to be resolved

c. consider the central machinery for formulating and monitoring IT policy

d. find ways of ensuring a greater input by IT professionals from industry.

2. In view of the estimated current world market for IT products (approximately £50,000 million annual sales and growing at 10% per annum in real terms) and the overriding need for UK industry to obtain an appropriate share of this market we have concentrated on those measures which are needed for industrial and financial policy reasons.

3. We have consulted the Policy Unit, those members of ACARD who are especially knowledgeable in this area and the Minister of State for Industry and Information Technology in the Department of Industry, whom we describe from here on as the Minister for IT. However, this paper is the sole responsibility of the CPRS.

(a) Measures to be taken

4. A number of specific steps need to be taken in each of the areas outlined in the Annex but, equally important, the Government needs to organise itself so that it can solve problems and exploit opportunities quickly and effectively in partnership with the private sector. We need an Action Plan. Elements of such a plan are outlined in the Annex. We should be looking for visible results of its implementation within 12-18 months.

5. At present no single department is well placed to take the lead role across the whole range of IT activities. Equally, most departments are becoming aware of their particular needs and some have started to move. These initiatives must be encouraged and those championing them given support from the centre. Without such support discouragement will set in - indeed we find it somewhat surprising that initiatives are still attempted in view of the bureaucratic difficulties that can arise. For example discussions of the desirability of running Operational Research models in the DHSS on a mini computer have been continuing since May 1977. Eight separate agencies with no line management responsibility for the project (2 branches of CCTA; FD; MSC3C, MSC3B, EP4, EP5, divisions of DHSS and the PSA) have been involved so far, at a total estimated cost of £50,000 (based on the 1979 CSD 'ready reckoner' of civil service staff costs). The latest discussions have focussed on a machine costing £56,000 (1979 prices) but the saga is not yet complete - and, of course, bureau fees have had to be paid for the past four years (at a rate of approximately £20,000 pa). We are going to need innovation in bureaucratic practices, as well as in the technology, if the Government is to achieve its objectives.

(b) Issues

6. The IT issues which will be raised by measures of the kind described in the Annex can be classified into three sets:

i. those that directly affect the success of an industrial sector, particularly where this involves the effective use of IT (such as the electrical components industry, the computer industry or the telecommunications industries).

ii. those that affect (or determine) the environment within which an industry operates or, more importantly, determine the nature and size of its market (eg licensing of radio frequency spectrum, Data Protection regimes).

iii. those that affect the information industries themselves (eg publishers, broadcasters, Reuters) who need access to the novel technology and an appropriate environment (eg copyright law) and currently have no informed Whitehall sponsor who is familiar with the technology and the market opportunity.

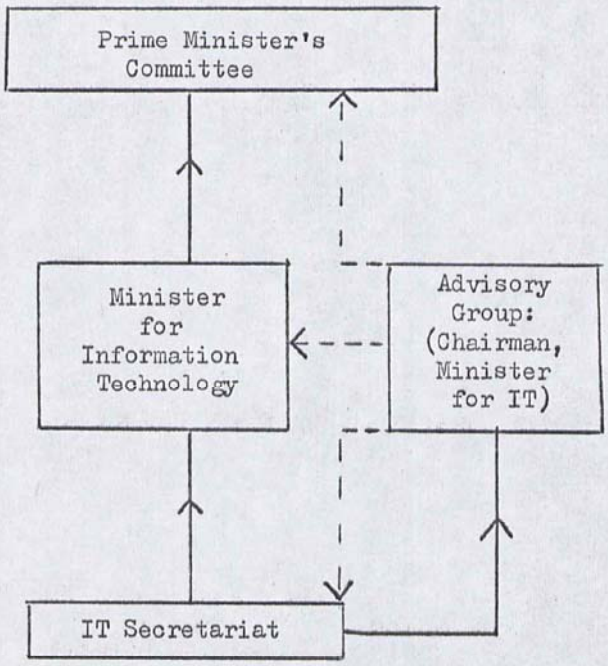
7. Issues of the first kind are, and must remain, the direct responsibility of the appropriate divisions of the Department of Industry. New machinery is, however, required to handle the other two kinds of issue because

- there is need for the civil servants handling these matters to be able to tap a different type of information and expertise than is accessible to, or needed by, those with a sponsorship role (eg CPRS experience that companies will talk more freely to an "independent" body about some sensitive issues than they will to their Whitehall "sponsor").
- they are inherently and inescapably inter-departmental and international.

The existence of these three different sets of issue and the need for a non-civil service input influence the nature of the central machinery for formulating and monitoring IT policy.

(c) Central Machinery

8. We recommend a structure along the following lines



Composition

Prime Minister
Home Secretary
SoS Industry
Lord President
Chief Secretary, Treasury
Minister for IT

4/5 Officials
4/5 Industrialists

2 non-civil servants on secondment
2 civil servants

9. The Prime Minister's Committee would

- set general policy for IT
- resolve departmental conflicts of interest
- give political clout

Prime Minister — Outsiders
Executive team — Action quickly
Committee — Safe middlemen

Advisory for

10. The existing divisions of the DOI would handle industrial policy issues (see paragraph 6) and fulfil the usual sponsorship functions.

11. Issues which affect the industrial environment (see paragraph 6) will need careful handling; speedy, effective action will be called for when they are resolved. Hence the need for an Advisory Group and an executive Secretariat. The key to success will be accurate knowledge of market conditions and opportunities. Hence the need for both the Advisory Group and the Secretariat to include people with practical experience drawn from organisations operating in the IT field.

Advisory Group

12. Apart from the 4 or 5 industrialist members, key civil servants such as the head of the IT division of the DOI, the head of the regulatory departments in the Home Office and the director of the Central Computer and Telecommunications Agency of the CSD will need to be members of the group. People from other departments can be invited to attend as appropriate. This group would be responsible for:

- advising on priorities and objectives
- advising on policy issues prior to Ministerial decision
- advising on the contents of the Action Plan, and keeping it under regular review
- advising the Minister for IT when his intervention was needed.

The group's papers would be widely circulated amongst departments.

13. The terms of reference of this group would need to be drafted with great care to ensure that it functions effectively to expedite decision taking and action. Draft terms of reference are provided in Annex 2. The Prime Minister would appoint the members of the group. There should be a presumption that its papers would remain confidential to Government, but would be open to the group to propose publication, or for the Government with the group's agreement to publish, particular documents, and the group might be associated with public documents such as the Government's response to the ACARD report on IT.

IT Secretariat

14. This would comprise a small mixed team of civil servants and outsiders with the appropriate experience and attitudes seconded to work full time in the Cabinet Office. It would be led by an under-secretary and comprise 3 others at A/S-principal grade (2 on secondment from industry). They would

- have direct access to the Minister for IT
- be responsible for drawing up an Action Plan of the type outlined in the Annex
- be responsible for defining detailed policy issues in a form suitable for consideration by the Advisory Group and for Ministerial decision
- be responsible for monitoring the implementation of decisions by departments
- service and support the Advisory Group described in paragraph 11, and, for as long as it continues, the Official Committee on Information Technology (IT).

15. What is proposed above is largely a formalisation and simplification of what already exists in the CPRS and Cabinet Office (where we had 2 full time A/S-principal equivalents working on these topics for 18 months) and DOI in order to move from an analytical role to an action orientated one. The net increase in staffing in the Cabinet Office would therefore be less than the posts described in paragraph 14. As important as structure, however, is mode of working.

16. The IT secretariat would need to develop and maintain an entrepreneurial spirit and approach untrammelled by institutions of departmental boundaries and responsibilities (hence its location in the Cabinet Office and the inclusion

in its ranks of non-civil servants). The links with the Minister for IT and the Prime Minister's Committee should ensure that sufficient authority for effective action by all departments is forthcoming and for modifying policies if they appear to be failing. In a field where the technology is changing quickly and market opportunities will appear (and disappear) rapidly frequent reviews and speedy adaptation of policies will be vital.

17. It is easy for specialised pieces of organisation to develop a life of their own and survive for too long. The machinery we recommend creating in this paper has a limited, clearly defined and cogent job to do. We would therefore recommend that at the end of two years progress be reviewed on the presumption that the Advisory Group for IT and its secretariat having done the job for which they were created, be disbanded.

Summary and Recommendations

18. The existing activities and organisations which are suitable for analysing policy towards IT issues need to be modified so that effective action may be taken across the spectrum of Government activities. To this end we recommend that

a) the Prime Minister's ad hoc committee on IT be formally constituted to include the Home Secretary, the Secretary of State for Industry, the Lord President, the Chief Secretary, Treasury and the Minister of State for Industry and Information Technology.

b) an Advisory Group be established to advise the Government on all matters affecting IT (and in particular as proposed in paragraph 12 above) under the chairmanship of the Minister for IT and with a mixed composition of 4 or 5 officials and a similar number of non-civil servants drawn from the IT industries.

c) the work of the existing Offical Committee on IT be reviewed in the Autumn of 1981.

d) there be established in the Cabinet Office a small group (the "IT Secretariat") of civil servants and non-civil servants seconded full time from the IT industries under an under-secretary, with duties and functions as proposed in paragraph 14 above.

e) these arrangements be reviewed in January 1983 with the presumption that the IT Secretariat and the Advisory Group be disbanded.

ANNEX

ELEMENTS OF A GOVERNMENT ACTION PLAN FOR IT

1. To respond to the ACARD Report setting out the policy for IT for the 1980s.

2. To develop urgently the physical infrastructure of telecommunications, including satellite systems. We must take advantage of the opportunities arising from the liberalisation of the monopolies. This means the urgent examination of schemes involving the private sector for added value services and alternative networks, particularly for business use in areas like the City of London.

3. To identify specific applications in Government and the public sector for advanced systems and to procure them from the British IT industry. We must get more word processors and teletext/viewdata sets working in Whitehall. DOI hopes to have examples of both the office of the future and a working viewdata system by the summer.

4. To install a micro computer in every secondary school by the end of 1982. This scheme is well advanced. It will include procurement from a British company; training for teachers and specially designed software. Local businessmen will be involved in the programme.

5. To ensure that the whole range of training in computer skills available in schools, CFEs, polytechnics, universities, including the Open University and the Open Tech, and in the MSC, are adequate to meet the growing employment demands of the IT industries.

6. To put ministerial selling effort behind Britain's exports of IT. There is big international business in satellites, telecommunications equipment and communication systems and ministers should be fully briefed to assist these sales which primarily involve overseas governments.

7. To examine urgently the use of IT in the Health Service, the Social Security system, Energy saving programmes and transportation/communication systems like CARFAX.

8. To encourage the setting up of technology agreements so that union opposition does not stifle these developments.

9. To plan an IT week in 1982. This would be a major event to celebrate British achievement in IT and space. It would be on a national basis and launched by the Prime Minister.

10. To ensure that the regulatory and legislative framework for such matters as Data Protection and international standards are responsive to commercial need.

11. To increase the awareness of the opportunities presented by IT by encouraging the siting of showpiece developments in an Enterprise Zone and by supporting applications such as robotic production systems.

12. To support R & D for specific projects which have defined, but not immediately, commercial markets, and which would otherwise limp along.

An early task for the Advisory Group discussed in paragraphs 11-14 of the main paper will be to refine this plan -- drawing on the continuing work of the existing Official Committee for IT as it does so - and turning it into an operational (rather than advisory) document.

ANNEX 2

TERMS OF REFERENCE FOR ADVISORY GROUP ON INFORMATION TECHNOLOGY

To advise the Prime Minister on:

a) opportunities for profitable commercial ventures by the UK in the field of IT

b) means by which the Government can assist in the exploitation of such opportunities

c) the removal of obstacles to the success of such ventures.

Caroline

MS set up
mtg for the

TO: MR T LANKESTER

13 February 1981

FROM: DR ASHWORTH

Washington.
(3/4 hour).

CPRS PAPER ON INFORMATION TECHNOLOGY

With luck you should be getting this paper this afternoon for the Prime Minister's weekend box. The minutes of E(80) 45th meeting suggest that the paper will be discussed by the Prime Minister and a small group of Ministers (Home Secretary, Lord President, SoS Industry). This is just to draw your attention to the need for someone to set up this meeting.

+ Mr K. Baker - London

Lean Britain

Hoskyns

Arranged for 9.45 on Tuesday 3rd March. Please ask T.L. whether anything further required.

c.f. 24/2

CONFIDENTIAL

16 December 1980

Ind Pol

PRIME MINISTER

INFORMATION TECHNOLOGY

We have been in close contact with CPRS throughout the work of the Official Committee on Information Technology. You will have seen Robin Ibbs' excellent note to Tim Lankester. We have the following points to add:

1. The world market in IT has been estimated at £50bn, growing at 10% pa. Our performance in IT affects our competitiveness, entry of our industries into new markets, creation of new products, product processes and services. In terms of money and jobs, IT is the big growth area for Western economies.

2. The paper E(80)147 shows that Government already is and has to be involved in IT, in several different capacities. Lessons of the past show how easy it is for British Governments to get it completely wrong. For example, in nuclear power which has growth potential, high technology and heavy involvement by Government as regulator, customer, operator. UK started with a lead (as it so often does in brains-intensive new industries) and finished up exporting nothing, importing PWRs.

3. We endorse Robin Ibbs' comments on the shortcomings of the conventional Whitehall approach. Government's approach must be intensely market-orientated, flexible and fast-moving. If it isn't, the sort of Government-industry partnership will not emerge and we will be all set for repeats of Trident and Concorde.

4. We would go further than CPRS on the remit and staffing of our IT efforts. The Government needs a dedicated team, not a part-time Committee. I doubt whether Adam Butler has the necessary technical and commercial background to think in the right way. And he certainly has too much on his plate to handle IT which should be a full-time task. The team will in any case need some outside experts on it.

CONFIDENTIAL

5. We suggest that, without in any way trying to criticise DoI or the hard work put into the report by what we understand to be a carefully picked Committee, you ask a few questions, at E, designed to bring out the inadequacy of our approach so far. For example:

- How many people on the Committee have first-hand experience in the computer/electronics/communications industry?

- Have they consulted experts in the industries involved, as CPRS did on Space?

- Do we have, for comparative purposes, any information on the remit, task force, staffing, timescale, expertise brought to bear on IT by, say, the French Government?

6. In summing up, you could comment on past Governments' poor performance in similar cases (eg aerospace and nuclear power); say that you are very concerned that we are about to get off on the wrong foot in a new growth industry which is potentially even more important; and you could then suggest that CPRS, with help from the Policy Unit as required, should prepare a paper answering the questions you have raised, and suggesting how the IT exercise should best proceed. This paper would be considered by E in January.

7. If we want to get UK industry really moving in IT, we need a team with full-time commitment and the right expertise. This is the right time for you to call for a review and a re-think to make sure this one really does go the right way.

8. I am copying this minute to Robin Ibbs.

JOHN HOSKYNS

CONFIDENTIAL

Ref. A03813

PRIME MINISTER

Information Technology

(E(80) 147)

BACKGROUND

Last July, you approved the formation of an Official Committee on Information Technology, chaired by the Department of Industry and with Secretaries from the Cabinet Office, CPRS and DOI. The Committee had during the autumn considered the range of Government interests in information technology (IT) and the need for a national policy on IT. Their initial report (E(80) 147) reviews these interests, discusses a possible Government role in stimulating awareness and application of IT and recommends the development of a coherent Government approach to this new technology. The overall aims of the policy are set out in paragraph 9, with specific elements listed in paragraph 10.

2. The Committee are seeking broad endorsement from Ministers for their views -

(i) that IT is of major significance to future economic success in the United Kingdom; and

(ii) that because of Government's influence on many of the factors that affect the development of IT (the communications system, the legal framework, etc.), Government should recognise its central role in, and have a coherent policy towards, the promotion of IT.

3. They propose a new initiative on IT, including a programme of demonstration projects (unspecified) to raise awareness and show the capabilities of United Kingdom technology. The only decisions of detail sought by the Committee concern approval in principle for such a programme, and its financing, where they suggest (paragraph 6) that additional Government expenditure of up to £10 million annually would be justified.

CONFIDENTIAL

4. The Committee have - understandably - not raised one key aspect of IT which has featured strongly in a number of recent reports on the subject, namely the diffuse nature of Ministerial responsibilities. While lead responsibility for the promotion of IT lies with the Secretary of State for Industry, important legal and regulatory controls come under the Home Secretary and the Secretary of State for Trade, and the Lord President is responsible for advising on Government procurement of much IT equipment. If the Committee are right in their assessment of the importance of IT (and I believe them to be so), the disposition of Ministerial and departmental responsibilities for this subject needs to be considered. This meeting is not the place to deal with those questions, and I will make a separate submission on them; but they include the place and function of the Central Computers and Telecommunications Agency (CCTA), the Home Office's responsibilities for regulation of radio frequencies, and the possibility of assigning to one Minister some general remit for the promotion of information technology within government.

HANDLING

5. You might invite the Secretary of State for Industry to introduce the paper, although he may prefer the Minister of State (Mr. Butler) to make the detailed introduction. You might then turn to paragraph 12 since 12(a) encapsulates the two main themes of the paper - the significance of IT and the central role of Government. You might invite comments on these themes, in particular from the Home Secretary, the Secretary of State for Trade, the Lord President, and the Head of the CPRS.

6. On 12(b), you could remind the Committee that the new sub-committee on public purchasing (E(PP)) is being formed. Presumably this can deal with purchasing issues in IT.

7. On 12(c), you might invite the Lord President to comment on the response to his recent initiative (referred to in paragraph 5) to encourage the greater use of small computer systems by departments. What will be the relationship between that initiative and what is proposed in paragraph 12(c)? What are the

reactions of main user Departments - the Secretaries of State for Social Services, Defence and the Environment might comment (NB. The Secretaries of State for the Environment and Scotland will be late because of PQs).

8. On 12(d), you might invite the Secretary of State for Industry to explain why an IT policy, unlike other policies for new technology, should have this demonstration element. He should also give some examples of the sort of projects that might be included in the programme. The Chief Secretary should comment on the suggestion for additional expenditure in paragraph 6. He will no doubt point out that the November public expenditure review led to extra provision for industrial support of £30 million in 1981-82 and £50 million in each of the later years, and argue that additional provision should be found from this provision or by switching priorities within existing programmes.

9. You might finally seek comments on the Work Programme set out in Annex A.

CONCLUSIONS

10. Subject to the discussion, you might guide the Committee to endorse the statement and proposals in paragraph 12(a) - (e) of the note.

RA

(Robert Armstrong)

16th December, 1980

CONFIDENTIAL

Qa 05027

To: MR LANKESTER
From: J R IBBS

Information Technology: E(80)147

1. The CPRS is directly involved in supporting the Official Committee on Information Technology and has participated in the draft of this paper.

2. The paper sets out the Government's involvement with information technology (IT) in terms of its role as

- guardian, in the National interest, of the regulatory framework within which products dependent on IT operate;
- as major user (and hence purchaser) of IT equipment;
- provider (through British Telecom) of the national telecommunications network.

3. One aspect is of major concern to the CPRS and is not brought out in the paper. Quite simply there is a need for a change of emphasis in the way the Government's role is perceived. If the private sector is to seize the opportunities offered by IT the Government must be seen as a facilitator rather than simply as a regulator. This means changing the way in which Government regulatory powers are deployed so that support of entrepreneurial opportunities becomes a major objective.

4. Within Departments the approach to IT is still governed by distinctions drawn in the past for policy purposes between, for example, telecommunications and broadcasting (Department of Industry and Home Office respectively), or computers and communications networks (Civil Service Department and Department of Industry respectively). Within the new technology these distinctions have largely disappeared and their retention in Whitehall is a serious handicap in responding quickly to rapidly changing technical and commercial situations.

CONFIDENTIAL

5. An immediate way of mitigating this problem lies in the role and remit of Mr Adam Butler in his capacity as Minister for IT, a matter on which the paper is necessarily silent. It is important not only that his role should be prominent and public but also that his remit should specifically include co-ordination of policy issues that go across Whitehall - for example, such matters as the copyright of data in data banks, data protection legislation, effective civil use of MoD technology, and how the radio frequency spectrum should be allocated.

6. Departments will be jealous of their prerogatives and cannot be expected to be eager to give up the position of dominating influence which the historic distinctions provide. Nevertheless, unless Mr Butler can be given the authority to ensure effective action on such issues as the above and others raised in E(80)147, real opportunities for establishing new industries based on IT will be missed and essential improvements in the productivity of our service industries (including the Government's own operations) will be delayed or even lost.

7. The ideal outcome from the meeting of E Committee would be for Mr Butler to emerge with the degree of trans-departmental authority needed to ensure that the historic distinctions are not allowed to impede speedy resolution of the new issues raised by IT.

8. I am sending a copy of this minute to Sir Robert Armstrong.

JF.

15 December 1980

15 December 1980
Policy Unit

PRIME MINISTER

INFORMATION TECHNOLOGY

Norman, David and I have 15 minutes with you on this vital topic tomorrow morning. This is our Agenda:

1. Information Technology is the biggest industrial opportunity to seize (or lose) since the war. Agree?

2. It is a field in which Government has to intervene if anything good is to happen. Agree?

3. Now look at the way we've tackled IT so far; the key people and their credentials; the organisation and its relevance. Do you think it is going to be enough to put UK on equal terms with, say, the Japanese and the French?

4. If you don't, then E on Wednesday is the time to say so, and to ask for something different.

5. We have several ideas on what you should ask for and can put these in writing after we have talked tomorrow.

JOHN HOSKYNS

CABINET OFFICE
70 WHITEHALL
LONDON SW1A 2AS

11 December 1980

To TL

M A Pattison Esq
Private Secretary
10 Downing Street
LONDON SW1

Dear M Pattison

INFORMATION TECHNOLOGY

E Committee is to discuss a note by the Official Committee on Information Technology at its meeting on Wednesday 17 December. This note has been deliberately kept short and contains little in the way of background material. It refers, however, to the ACARD report on information technology published last September. You may think it useful to append a copy of the ACARD report, which discusses information technology more comprehensively, to the E paper. I have a few spare copies here if necessary.

I am copying this letter to the Private Secretaries of members of E Committee, Private Secretaries to the Secretaries of State for Scotland, Wales, Northern Ireland, Social Services, Education and Science, the Attorney General, Paymaster General and the Minister of Transport.

Yours sincerely

R G COURTNEY

M. R.

1. DL to see
2. CS to see re meeting
CP 8/12 MTP 8/XII.

PRIME MINISTER

E Committee is to discuss information technology in about 10 days time. I know that Robin Ibbs and John Ashworth will be asking for an opportunity to talk to you for 10 minutes in advance of the meeting, because they are concerned that there is no effective central grip on this field in Government yet.

Another information technology problem is currently being handled in H Committee. This is the matter of possible legislation on data protection. The forum is an unfortunate one because few of those who attend really understand the implications. I think it would be useful for you to be aware of the issued raised. I attach a note from John Hoskyns describing his researches about the state of the discussion, together with the minutes of the H discussion.

MTP

5 December, 1980.

CABINET OFFICE
Central Policy Review Staff
70 Whitehall, London SW1A 2AS Telephone 01-233 7089

W 02073

15 September 1980

Dear Nick,

ACARD REPORT ON INFORMATION TECHNOLOGY

Your letter of 15 August to Ian Ellison, copied to other Departments, enclosed the ACARD report on Information Technology and invited the Secretary of State for Industry to take the lead in preparing the Government's response.

I now enclose a copy of the printed report, which is to be published on Thursday, 25 September.

I am copying this letter, and the report, to the Private Secretaries to the Home Secretary, the Foreign and Commonwealth Secretary, the Lord Chancellor, the Chancellor of the Exchequer, the Lord President, the Secretaries of State for Defence, Employment, Environment, Scotland, Wales, Northern Ireland, Social Services, Trade, Energy and Education and Science, the Paymaster-General, the Ministers of Agriculture and Transport, and Sir Robert Armstrong.

Yours sincerely

DR J M ASHWORTH

Mr N Sanders
10 Downing Street
SW1

File

DSG

cc: HO
FCO
LD Chanc
Ch Ex
LD Pres
MoD
D/Emp
D/Env.
SO
WO
NIO
DHSS
DTI
DIN
DES
Paymaster-G
MAFF
D/Trans
CO

10 DOWNING STREET

From the Private Secretary

15 August 1980

ACARD REPORT ON INFORMATION TECHNOLOGY

The Prime Minister has approved publication of the enclosed report on Information Technology from the Advisory Council for Applied Research and Development (ACARD). She would be grateful if your Secretary of State would take the lead in dealing with the Report.

I am copying this letter and the report to the Private Secretaries to the Home Secretary, the Foreign and Commonwealth Secretary, the Lord Chancellor, the Chancellor of the Exchequer, the Lord President, the Secretaries of State for Defence, Employment, Environment, Scotland, Wales, Northern Ireland, Social Services, Trade, Energy and Education and Science, the Paymaster-General, the Ministers of Agriculture and Transport, and Sir Robert Armstrong.

N. L. SANDERS

Ian Ellison, Esq.,
Department of Industry.

DSG

MR SANDERS

ACARD Report on Information Technology

Now that the Prime Minister has agreed that the report should be published the Secretary of State for Industry should be asked to take the lead in preparing the Government's response (as indicated in Sir Robert Armstrong's minute to the Prime Minister of 11 August (A02869). I attach a draft minute. I will let you have sufficient copies of the report shortly.

R H ARAM

15 August 1980

DRAFT LETTER FROM PRIVATE SECRETARY, 10 DOWNING STREET

TO THE PRIVATE SECRETARY TO THE SECRETARY OF STATE FOR INDUSTRY

GR for mepl MS

ACARD REPORT ON INFORMATION TECHNOLOGY

The Prime Minister has approved publication of the enclosed report on Information Technology from the Advisory Council for Applied Research and Development (ACARD). She would be grateful if your Secretary of State would take the lead in ~~preparing the Government's response to the Council~~ dealing with the Report.

I am copying this letter, and the report, to the Private Secretaries, to the Home Secretary, the Foreign Secretary, the Lord Chancellor, the Chancellor of the Exchequer, the Lord President, the Secretaries of State for Defence, Employment, Environment, Scotland, Wales, Northern Ireland, Social Services, Trade, Energy and Education and Science, the Paymaster General, the Ministers of Agriculture and Transport and Sir Robert Armstrong.

Mr. Wright

ACARD Report on Information Technology

The Prime Minister has seen Sir Robert Armstrong's minute of 11 August (A02869).

She is content for the Report to be published in the usual way.

N. J. SANDERS

13 August, 1980.

4 – post Switzerland
MJS

Ref: A02869

PRIME MINISTER

PRIME MINISTER

The ACARD report looks to me to be worthy, if not exactly sparkling. Content for it to be published in the usual way?

I will put it in your recess reading – you might like to see the may references to France (eg pp 31-34)

ACARD Report on Information Technology

The text of this latest ACARD Report, to which I have referred in previous minutes, is now available and I enclose a copy.

2. The Council's main conclusion is that a focus is required within government for considering the issues raised by information technology. You have agreed that the Department of Industry should provide such a focus. They regard the Report as a useful document which offers external support for current Government initiatives. For example, ACARD's recommendation on the future of the Post Office's telecommunications monopoly (p 47) has already been fulfilled by Sir Keith Joseph's statement on 21 July. A summary of the Report's conclusions and recommendations is at pages 4 - 7.

MJS 12/8

3. The Council have, as usual, requested permission for the Report to be published. I see no difficulty with this. The Secretary of State for Industry should clearly be in the lead in preparing the Government's response.

RA

(Robert Armstrong)

11th August 1980

ADVISORY COUNCIL FOR APPLIED RESEARCH
AND DEVELOPMENT

INFORMATION TECHNOLOGY

August 1980

ADVISORY COUNCIL FOR APPLIED RESEARCH AND DEVELOPMENT

INFORMATION TECHNOLOGY

Foreword

In its first report "The Applications of Semiconductor Technology", ACARD discussed some of the implications of the rapid developments taking place in micro-electronic technology and put forward proposals to stimulate the use of this technology in United Kingdom industry. Two subsequent reports[1] of the Council have examined specific fields of application. However, the report "Technological Change: Threats and Opportunities for the United Kingdom"[2] identified information technology as possibly the area of application with the greatest potential for creating employment and suggested that the United Kingdom had advantages - for example the international use of the English language - which should enable it to gain a significant share of the world market for information services and associated products.

In the knowledge that some of this country's major competitors had well developed plans for promoting information technology by concerted action from their governments and industrial interests, ACARD decided that a Working Group should examine the subject in order to identify the likely directions of development and the constraints to development and application in the United Kingdom.

The Working Group met six times between January and May 1980. Its terms of reference were -

"To consider whether the development and application of information technology in the United Kingdom should be stimulated;

To consider whether there are constraints to the development of the industries in the United Kingdom which supply and apply information technology equipment, software and systems, compared with our major competitors;

To make recommendations."

[1] Items 2 and 4 in the Bibliography (p 60)

[2] Item 3 in the Bibliography

The members of the Working Group were -

*Sir Robert Clayton CBE F Eng (Chairman)	Technical Director, GEC Ltd
Mr C A P Foxell	Director of Purchasing, the Post Office
Mr D Leighton Davies	Deputy Managing Director, Racal Electronics Ltd
Mr C N Read	Director, Inter-Bank Research Organisation
Mrs V S Shirley OBE	Chairman, F International Ltd
Dr P E Trier CBE F Eng	Director, Philips Industries Ltd
*Mr G H Wright MBE	Regional Secretary for Wales, Transport and General Workers Union

*ACARD member

The Working Group's report was endorsed by the Council at its meeting in June 1980. [It has been submitted to the Government and is now published in order to draw attention to the importance of this area of technology.] The report, like previous ACARD publications, is intended to provide a non-technical guide to the subject and the issues raised; it does not aim to be a comprehensive technical account of information technology.

The Council are grateful to the Working Group for their contribution to ACARD's work and wish to acknowledge also the support provided by the Computer Systems and Electronics Division of the Department of Industry, the Central Policy Review Staff and the ACARD Secretariat in the Cabinet Office.

CONTENTS

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

1. Information Technology - which combines the technologies of computing and telecommunications - will perhaps be the most important area of application of microelectronics. It will eventually affect virtually every household and occupation. It will change patterns of employment and, if the opportunities to supply new goods and services are taken, has the potential to create many jobs.

2. Information technology offers new ways of manipulating and presenting information which are used in, for example, electronic telephone exchanges (which can provide many new services), word processors, electronic mail and viewdata systems. This country's future trading performance will depend greatly on its ability to compete in world markets for products and services based on information technology and on the rapid and effective application of such products and services by industry and commerce generally.

3. Certain of our overseas competitors - notably France - have recognised the importance of this subject and have established national programmes to stimulate its development. Despite some notable achievements there is less awareness in the United Kingdom of its potential impact and we have fallen behind other countries in our appreciation and application of the new developments.

4. Responsibility for the various elements of official policy that bear upon information technology is at present split between a number of Government Departments, the Post Office and other public bodies. A single focus within Government is required in order to ensure that this subject is given adequate attention and that its development is not inhibited through conflicting policies. Such a focus would increase the efficiency of decision making and actions and would reduce the number of bodies with which private sector interests have to deal. Also required is an explicit and publicly stated recognition by Government of the importance of information technology and a programme to increase general awareness amongst both industry and the public. It is important that these measures be introduced rapidly; we will otherwise fall further behind in the development and application of this crucial technology.

5. Our principal recommendations (with relevant paragraph numbers in parentheses) are -

i. One Minister and Government Department should be responsible for co-ordination of government policies and actions on the promotion and development of information technology and its applications through awareness, education and training, sponsorship of industry, provision of risk capital, public purchasing, publicly funded R and D, national and international regulations and standards, legislation, communications and related programmes such as satellite technology. (9.5)

ii. Responsibility for regulation of communications and broadcasting should be exercised by a single Government Department (7.11)

iii. The Government should make it clear that effective exploitation of information technology is essential to the future industrial and commercial success of the United Kingdom. This commitment should be emphasised on all suitable occasions by Ministers and officials.

The Government should support its views with publicity for existing United Kingdom achievements in information technology and imaginative promotion of them.

Innovative applications of information technology by Government Departments, local authorities and public corporations should be encouraged and plans for them should be publicised. (5.9)

iv. The Post Office (or its successor for telecommunications) should have the mandate to provide a world-competitive United Kingdom communications network and should have sufficient finance for procurement and installation, whether from public or private sources. (7.5)

Other recommendations are -

v. Careers services at both school leaver and higher levels should review the guidance given to students about opportunities in information technology, in order to attract entrants from a wide range of disciplines. (6.5)

vi. The Government, its agencies concerned with training, and educational bodies at all levels, should examine the provision of education and training courses in subjects related to information technology and propose measures to stimulate an increase of training in firms. (6.5)

vii. The Government, through Trade Associations and the National Economic Development Council, should improve the links between supplier and user interests in information technology in order that United Kingdom firms may be better able to anticipate future requirements. (6.6)

viii. The Government should recognise the importance, to the information technology supply and application industries, of United Kingdom strength in international discussions on regulations and standards, and staff and financial support must be available for such activities to ensure that our delegations go to them well prepared technically, commercially and politically, and ready to argue strongly for our national interests. Trade Associations must similarly be prepared to play their part on behalf of their industries. (6.14)

ix. The Government should bring forward proposals for data protection legislation, taking into account the views of the Data Protection Committee, without delay. (6.18)

x. The Government should put in hand urgently a review of the legal reforms required to aid and expedite the use of information technology in the United Kingdom and should then legislate to bring about such reforms as fast as possible. (6.20)

xi. The Government should consider legislation to permit the creation of new organisational forms to aid joint information technology projects, taking into account precedents in France and Belgium. (6.23)

xii. The Post Office should be free to supply terminal equipment and information technology services for use with its network but should not have an exclusive right to do so. It should not be the approving authority for terminal equipment and services provided by others. (7.8)

xiii. The Government should employ public purchasing to pull through novel developments in information technology. (8.1)

xiv. The Government should consider the possible role of information technology in promoting national objectives, and give appropriate financial support to relevant projects. (8.2)

xv. The Science Research Council and the Department of Industry should keep their research priorities under review in the light of the needs of information technology. (8.7)

xvi. The Department of Industry, with the Ministry of Defence, the Science Research Council and the Post Office, should increase the present co-ordination of all publicly funded R and D applicable to information technology. It should also make greater effort to ensure both that research which it supports is likely to be applied and that transfer of results to industry takes place. (8.8)

1. INTRODUCTION

1.1 The application of microelectronics technology in the United Kingdom and elsewhere is taking place mainly in two major areas of industry. One is the general field of product manufacture - improving manufacturing processes and the resulting products through automation, instrumentation, control engineering and the replacement of electromechanical devices by electronics. The other area is becoming known as "information technology", which for brevity we shall usually refer to as IT. Information technology is already being applied in many fields of activity, as the following illustrations show.

1.2 Word processors. Reports such as this frequently go through many drafts before the final version is produced. Authors make manuscript amendments, re-write sections and re-order material. Typists then have to re-type either the whole or major parts of the text. This re-typing takes time and carries the risk that new errors will be produced. The use of text processing typewriters (commonly called "word processors"), with storage of text on disc or tape and with visual displays, can now reduce the routine work of both typists (since unaltered sections can be re-typed automatically) and authors (since less checking is required) and enables successive drafts to be produced more rapidly. Word processors offer similar advantages in the preparation of such documents as tenders, contracts, legal papers and specifications.

1.3 Telecommunications. Large organisations, particularly those operating internationally, now find that the most cost effective way of providing internal communications may be via the international telecommunications network, by providing visual display units (VDUs) with keyboards and printers throughout the organisation and computers for routing and storing messages, letters and data. Such systems speed communications and allow records of the

information transferred to be filed automatically for as long as necessary. Once installed for international links, the system may also provide the best way of communicating even within a single building. Where the communication links involve satellites and there is sufficient traffic, the organisation may install its own terminals for direct satellite communications.

1.4 Video discs. When replayed on suitable equipment (which will sell for about the price of a television set) these will provide about an hour's moving pictures and sound for entertainment and education. The discs are expected to sell for about twice the price of a present full-price long-playing gramophone record. The ability to seek and "freeze" an individual picture will extend the use of such discs for information retrieval and educational purposes.

1.5 Telephones. Information technology is also bringing many new services for telephone users with the possibility of, for example, a telephone number for a person rather than a particular instrument. More important than the individual new facilities will be the transformation of the telephone system into a more flexible, personally acceptable service. For example, the ability to"switch off" the telephone but subsequently to identify the originators of any calls received, which is already possible with modern switching systems, will mean that telephone calls need not intrude on other activities.

1.6 These are just a few examples from the increasing range of IT applications. Because of its breadth of application it is possible to define information technology either widely or narrowly. On the one hand, the term may be confined to the actual equipment used to collect, store, process, transmit and display information. On the other, it may encompass not only the equipment

(and the software that controls it) but its interactions with human activities and the management systems necessary if the capabilities of new developments are to be fully exploited. We follow the latter approach in this report, in line with the UNESCO definition of information technology as:

> "The scientific, technological and engineering disciplines and the management techniques used in information handling and processing; their applications; computers and their interaction with men and machines; and associated social, economic and cultural matters."

1.7 We therefore include in information technology important sectors of the electronic components industry (with an emphasis on microelectronics), much electronic equipment (notably computers and their associated terminals, displays, etc) and the whole communications industry, including the broadcasting authorities and the Post Office. We further include the users and suppliers of information - industrial, financial, commercial, administrative, professional and individual - because their activities will be affected by new forms of information handling.

1.8 Governments in a number of countries, including the United States, France and Japan, have identified information technology as possibly their most important industrial growth area. The same view has been expressed in the United Kingdom, for example in several Conservative Party publications and in the ACARD report "Technological Change: Threats and Opportunities for the United Kingdom", while British electronics firms and the Post Office also demonstrate an awareness of the future importance of IT.

1.9 Two principal factors underlie current interest in IT. The first is that accurate and adequate information is a major component of industrial and commercial operations and an increasing proportion of the labour force in any

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1.9 Two principal factors underlie current interest in IT. The first is that accurate and adequate information is a major component of industrial and commercial operations and an increasing proportion of the labour force in any

industrialised country is employed in information handling. The world market for IT products - in banks, shops, business houses, factories, government offices and the home - is vast (approximately £50 billion annual sales) and expanding rapidly (10% per annum in real terms). The second factor is technical - both computing and telecommunications now use microelectronic devices which offer fast data-handling capability at modest cost. This convergence of computing and communications (called 'compunication' in the USA and 'telematique' in France) creates radically new opportunities for data handling and the provision of information.

1.10 As some developing countries have created highly competitive manufacturing capabilities in traditional sectors of industry (steel making, shipbuilding, etc), so industrial nations have seen that future export opportunities will lie in advanced technology. Skills and expertise in IT, based on the design and manufacture of silicon integrated circuits and the writing of computer software, will form the basis for a substantial proportion of such exports. The value of these skills is enhanced considerably, with corresponding gains in employment if they can be incorporated in equipment sold to final consumers. (As an example, British technology lies behind the displays used in many pocket calculators and digital watches. It would have been much better if the United Kingdom had gained the Japanese market position in calculators and watches, rather than in displays alone.) A competitive United Kingdom share in the world IT market could thus be a major factor in our future industrial success; but equally important is an adequate use of IT in this country to improve the efficiency of industry, commerce and public services.

1.11 Information technology is of more than economic and industrial significance; it also has social and political implications. New forms of communication, and easier access to information, raise questions about the relationship of government to the governed, the responsibilities of professions to their clients, and the

privacy of personal data.[1] IT also offers advanced industrial countries a further way in which to promote cultural exchange and to open up new markets in developing countries, many of whom, advised by international bodies such as UNESCO, have identified IT as essential to their economic and social advance and are seeking advice and equipment. Control of information has always been a key factor in the organisation of power structures; new technologies, however, raise old questions in a more acute form. The social and political implications of IT cannot therefore be ignored.

1.12. In the light of the potential for IT outlined above, it is clear that the speedy and effective development and application of IT is of great importance to the future of the United Kingdom. We therefore aim in succeeding chapters -

i. to survey briefly the present position, likely technical developments and potential applications in the next 10 years;

ii. to review activity in other countries;

iii. to consider the degree of awareness of IT in this country and attitudes to its application;

iv. to identify constraints to the rapid and successful application of IT in the United Kingdom;

v. to consider the importance of communications to IT;

vi.. to assess the role of government in the development and application of IT in this country.

[1] These issues are studied in detail in the 'Nora' report (item 6 in the Bibliography)

1.13. Throughout the report, we make recommendations for changes which we believe will help the deployment of IT in the national interest and the creation of a strong United Kingdom presence in world markets. Further technical information, and more detailed discussion of some of the issues raised by IT, may be found in the books and articles listed in the Bibliography.

1.14. We have concentrated on the importance of IT in industry, commerce and government, and on the impact of IT systems on individuals. The basic technologies used in IT will also have wide applications in the domestic consumer and entertainment sectors. Examples are video tape cassette recorders, video discs, audio discs using opto-electronics (which can be smaller and less liable to damage), satellite broadcasting, traffic and route information in cars, and local and remote electronic control of the domestic environment and appliances. These and many other applications of the same technologies that are used in IT will create consumer demands at home and opportunities overseas.

2. TECHNOLOGICAL DEVELOPMENTS

2.1 The principal technological foundation for modern information technology has been the development of microelectronics, which makes possible small, low cost, reliable equipment which can perform complex operations on digitally encoded data. Increasingly, all types of information are being converted to digital form because of the ease with which such data can be handled and transmitted.

2.2 Information handling comprises five stages: input, processing, storage, transmission and output. Some or all of these five stages are built into various systems, which are made up of equipment ("hardware") and, most importantly, logical programs ("software") which control the operation of both individual pieces of equipment and of the system as a whole. Developments in each of these areas are reviewed in the following sections.

Input

2.3 Established input devices for information systems are the telephone microphone and the typewriter and calculator keyboards. Most information is now fed into computers through keyboards but automatic data input, for example by scanning magnetically encoded cards such as cash dispenser cards, is increasing. The telephone dial and keypad can also be used as input devices to an IT system. Microelectronics is making possible "intelligent" input devices, some of which will themselves incorporate information processing and storage. Numbers on cheques are already read automatically but use a special type font. Systems are under development which will enable normal typefaces to be read automatically. Special writing pads are already available which can translate letters and figures in a particular individual's handprinting automatically

into a computer input. The recognition of handwriting is a longer term problem. Voice recognition systems can already respond to a limited vocabulary from a wide range of speakers or a wider vocabulary from a limited number of speakers. Systems which will recognise a wide vocabulary from many speakers will eventually be developed. Systems are also being developed which will extract features from visual images such as photographs and television pictures, e.g. for control of robots, scientific investigations and medical diagnosis.

Processing

2.4 As integrated circuit technology advances, microelectronic devices used for information processing will in coming years have even more transistors per chip, and the cost per function will continue to fall. Annual world production of microcircuits in 1985 has been forecast to be up to the equivalent of 250,000 transistors for every person on earth. This is the equivalent of a present day minicomputer for everyone every year.

2.5 Local processing by a small computer or 'distributed' processing through a network of small computers is possible, and complex operations can be performed by terminals which previously merely acted as input or output devices. Large computers will still have a significant role, for maintaining and manipulating large banks of data (bank accounts, insurance policies, public administration records, scientific measurements, etc.) but will not be the fastest-growing sector of the computer market as they have been in the past. The greater power of small computers will enable text processing to be more readily available. Most information is

presented in the form of words; devices to allow easy manipulation of text (such as word processors) are now available. Their development may well be the most significant aspect of IT. Conversely, as electronic transmission filing and editing all become more widespread, the need for photocopying will decrease.

Storage

2.6 Information in the past has been stored in different forms; eg words, figures, graphs, charts, pictures. All such information can be translated into sequences of binary digits (bits) ie ones and zeros. There are now many ways of storing such digital data, each of which offers a particular combination of capacity, access speed and cost. Developments in electronic memories in the last decade have been particularly important since they have made the microcomputer feasible. The low cost and great data storage facilities of modern devices mean that it is economical to use more complex software than before. This allows the use of a "high level" programming language much more like ordinary English. Memories have grown in capacity and fallen in real cost by about 25 per cent per annum. A continuation of these trends is expected, with a single chip holding a million bits in a few years' time.

2.7 Other storage techniques have similar potential. Magnetic 'bubble' memories, in which tiny portions of material are magnetically polarised in different directions, to represent a one or a zero, allow even greater storage capacity in a small volume. Optical storage techniques are also developing rapidly. The first to be produced on a large scale will be the video disc (which can be read or played many times but, as yet, cannot be re-used to record other material).

Further developments are likely to lead to optical stores in which users can insert ('write') information; such stores will ultimately have erase and 're-write' facilities.

Transmission

2.8 Transmission over optical fibres (tiny flexible glass rods) is opening up the possibility of carrying very large quantities of information for a variety of uses. This technology can not only be used to relieve existing congested cross-city cable routes, it can also provide low cost trunk and local distribution networks for telephony, data transmission, and where required "wide band" services such as television and videophones.

2.9 The continuing reduction in the cost of small ground terminals for receiving signals from satellites has made direct communication between two points via a satellite economical, thus reducing dependence on cable and terrestrial radio systems. For example, a system is being installed for one of the largest American hotel chains, with a receiving aerial about a metre in diameter on each hotel roof, which will make its communications system independent of public communication facilities. The system will offer instant accessibility and is claimed to be cheaper than the use of public links.

2.10 The radio frequency spectrum available for broadcasting, communication, navigation, and other purposes is a limited resource. Digitised speech or video signals are very suitable for processing by microcircuits but by comparison with analogue signals, require a wider band of frequencies. However, micr

electronics technology also makes it possible to reduce the amount of information transmitted to reproduce a voice or picture. These techniques reduce demands on the frequency spectrum; this is important both for the introduction of digital radio transmission and for releasing radio frequencies for new services.

2.11 Microelectronics is making possible faster, smaller, more reliable, more versatile switching of transmission channels and is opening up many new services for users. In voice systems, the user can have many new facilities, for example to receive his calls on any telephone, to call often-used numbers without having to dial the complete number, and to obtain an engaged number as soon as it is free. Similarly, electronic switching will allow enhanced and new data services.

Outputs

2.12 Visual display of information using a cathode ray tube, as in a television set, is fast and versatile; it can use colour and show both text and graphical information. The real cost of such display units is falling. Further improvements in definition and reductions in power consumption may be expected. The major likely development is a flat screen display, based not on a cathode ray tube but on a thin sheet of light emitting material or a fine grid of light emitting devices. Another important output device is the printer; current technical advances offer the prospect of printers that are both faster and quieter. New output devices include voice synthesisers, which are already in evidence. They are likely to be important in personal voice communication systems, including the instruction of users in the use of new facilities.

Combinations of new developments

2.13 The following are examples of developments involving a combination of some of the advances reviewed in the previous sections -

a. telex to desks of individual users

b. cheaper, higher speed facsimile

c portable data terminals

d. communication without use of wire in offices, stores and factories, eg by infra-red radiation

e. 'information mains' analogous to electricity supply mains in offices and factories.

Software

2.14 The component parts of an IT system have to be brought together by systems engineering, and programs have to be developed to enable the parts to work, both individually and together, and the whole system to be operated. Systems engineering and program development can take considerable time and at present are labour intensive.

2.15 The output of systems engineering and programming is generally called 'software' and is essential for most systems and many subsystems. Software developments are making it increasingly possible for people unskilled in data processing to use and interact with systems. Future design and use may be envisaged as three concentric circles -

i. the innermost circle will be those specialists who devise software to program subsystems, for example microprocessors, so that these subsystems can be put together by others to produce information systems;

ii. the middle ring will be the engineers and others who take the subsystems with their programs (without being specialists in their development) and design systems which can be used by unskilled people;

iii. the outer ring will be the final users (with no knowledge of the skills required in the two inner areas) who will be able to use these systems to transmit, process, store or retrieve information.

3. APPLICATIONS

3.1 As a result of developments in information technology, there will be a marked increase in the quantity of rapidly accessible information and in the ability to manipulate it. Access to constantly updated information is already available in offices and homes through teletext and through Prestel and similar viewdata systems. As printing and distribution costs rise and communications and computing costs fall, such systems may come to replace some paper publications. Business viewdata systems, now starting to be installed, will enable information to be disseminated rapidly within a company. Further developments will provide individual users with the ability to interact with the systems for financial, shopping and other purposes. Immediate opinion gathering will be possible and could have major effects on the relations of the individual with commercial, financial and government institutions.

3.2 Financial services may be considerably affected by IT. The time taken for information transmission, at present accepted and sometimes used to advantage in some business operations, can be effectively eliminated. In particular, it will be possible to arrange instantaneous transfer of funds. This will have implications for credit services that depend on payments taking time to be completed. Stock and commodity markets will also find their activities assisted and changed by IT.

3.3 Most office work is directly concerned with information and is susceptible to change because of IT. Within the next ten years, it may be cheaper to capture information and to file, copy and transmit it electronically, than to perform the same functions on paper. Electronic equipment and systems are likely to be introduced because they will be competitive in costs with paper systems, as well as offering enhanced facilities. Electronic mail has already been initiated in West Germany. Office premises and factories may be constructed with information mains, just as they now have telephone lines, so that digital information may be transmitted freely. As with electric mains, a variety of devices could be connected.

3.4 Word processors are already available; intelligent copiers able to reproduce documents from digital signals will be available shortly. The ultimate development of an electronic 'work station', with the desktop including a large flat screen on which images may be viewed, moved and edited, can be foreseen, although development may take some years. However, sufficient new equipment will be introduced to bring about profound changes in office activities, with demands for some skills, eg copy typing and filing, reducing significantly while others, related to the new developments, will be in greater demand.

3.5 IT will affect organisational structures, since the ease with which information can be made available permits either centralisation or decentralisation of control, providing managements with extensive choices for developing the effectiveness of their organisations.

Suitably introduced, IT could also improve work relationships within a firm by enabling everyone to be informed of matters which affect them.

The rest of this chapter deals in more detail with applications in various sections of the economy.

Public Administration

3.6 Central government, through its computer operations, is one of the largest users of information technology in the country, many of its computer systems (eg that for social security records) being very large. Tasks such as payroll calculations, revenue collection, accounting and the planning of major activities (eg defence logistics or motorway maintenance) are already performed with computers. Some tasks would be impossible in their current form without computers; others, because of their size and relatively recent introduction (eg VAT transactions), have been planned with them in mind from the start. Computers have been of significant benefit to government administration. Some applications have resulted in useful staff savings - at least partly taken up by the provision of new or enhanced services - and efficiency has been improved. However, the dependence of administration upon computers can increase its vulnerability to disruption.

3.7 Local government also uses computers extensively. In addition to educational applications, and the technical calculations of architects, engineers and planners which count for a large proportion of local authority work, IT will find application in housing allocation (possibly in the future inter-authority and linked with employment information), housing maintenance, police work and fire services, environmental health and trading standards, as well as in improved management information systems and some strategic studies. Local authorities have in many instances to match people's needs with the services available. IT can assist this greatly. Rapid provision

of housing advice will be possible through the introduction of computerised record systems and the installation of terminals in, for example, public libraries. Social work will also be assisted; many people feel more at ease answering questions posed by a computer than by a professional worker (this is relevant to medical and legal services also).

3.8 There are potentially large applications of IT in the automated transfer of routine information between government offices, between central government and local authorities, and between different parts of national corporations such as the Post Office. This calls for compatibility between systems, and opens up many opportunities for joint working.

3.9 The administrative systems outlined above, and the basic operations of the office discussed earlier in this chapter, will provide the main areas for exploitation of IT. The result should be a more efficient administration, which should be able to manage its major operations more effectively and provide speedier responses to individuals' requests.

Defence

3.10 The armed forces are major users of IT, for communication, command and control and for administration. Naturally, many applications are classified but the potential commercial benefits of techniques, software, devices and equipment developed for defence are likely to be considerable. The pace of advance is such that developments should often be quickly declassified and spin-off from the defence sector would be improved by systematic examination of classifications in the light of advances in technology.

Manufacturing Industry

3.11 The ACARD report "Computer Aided Design and Manufacture" discussed the potential impact of a branch of IT on manufacturing industry and gave examples to illustrate the increases in productivity, the cost reductions, and the quality improvements that could come from the installation of CAD and CAM systems. As equipment costs fall, such systems will become economic for progressively smaller firms.

3.12 There is increasing use of data collection and display devices on the shop floor; these range from simple keypads to visual displays with associated input, processing, and storage capabilities. They assist in inventory control, monitoring the availability of components, scheduling of staff time etc. Systems using intelligent terminals linked to small computers and sometimes to larger machines are becoming widespread in manufacturing industry. The prospect is that such systems will eventually be linked with CAD and CAM systems, providing greater integration of different manufacturing activities.

3.13 Information technology will have an impact on research and development in industry. Experimental work and testing will be helped by automation and data processing; computer simulations may assist or replace experimental investigations; and competitiveness will be increased by the use of IT to transfer information within the organisation and to increase awareness of developments elsewhere through scanning the world's scientific and technical literature.

3.14 Great improvements in productivity have already been achieved in some manufacturing companies through the use of automated production methods and there is currently considerable interest in the wider application of such methods; in particular through the use of robotics. But many firms employ more staff in offices on administrative and sales tasks than on the shop floor. Equal attention will need to be paid to improving productivity in these areas through the use of IT if administration costs are not to dominate total production costs.

Service Industries

3.15 Service industries are an expanding part of the nation's economic activity and provide (in public and private sectors combined) some two-thirds of the employment in the United Kingdom. The service industries can be affected by information technology in two ways. On one hand, the adoption of new technology can reduce the number of people required, but on the other, as pointed out previously by ACARD, the adoption of new technology can lead to expansion both by natural growth and by the creation of new services (see Bibliography, item 3). The extent and skill with which IT is applied will play a major part in this balance.

The following sections consider different sectors of the service industries

3.16 Retailing

Retail stores are already users of "point of sale" equipment (generally electronic cash registers which can transmit sales information to stock control computers), automatic warehousing and conventional computers for management purposes. Bar codes which identify products have been developed and standardised internationally. These codes may be 'read' by low power lasers or magnetic detectors and the information automatically compared with price information held in the terminal's memory or transmitted from the store's central computer. The benefits of bar codes include faster check-out operation, improvement in stock control and more detailed bills for the customer. Retailing will be affected by new plastic card based payment methods now being studied by the banks and credit card companies, whilst "remote shopping" via home terminals is a future possibility. The provision of more complex terminals and systems in retail stores will be a large growth area for the supplying industry.

3.17 Insurance, banking and finance. Rapid communications and computers have already markedly influenced financial transactions. Terminals in branches are already linked with central computers; these terminals will have steadily more powerful data handling capabilities. More services, including self service, will be accessible through plastic cards with magnetic or microprocessor memories or through closer integration of the IT systems

of the financial institutions with those of corporate and private customers. International data links already provide financial and commercial information around the world. Further developments in rapid international data communications will have important implications for London and the world's other major financial centres.

3.18 Transport and communications Computers are already used extensively to schedule and monitor transport services and to maintain seat booking systems. The links between seat reservation systems and hotel and banking systems may be expected to grow. Better systems for traffic management can be foreseen, with more extensive linking of traffic controls. The extent to which improved telecommunication facilities (such as video-phones and conference systems) will reduce the demand for physical travel is unknown. As energy costs rise, a shift to the use of such services will take place, but psychological factors enter and some commentators have probably overstressed the extent to which meetings will be replaced by remote links.

3.19 Printing and publishing. Recent disputes in the newspaper industry have drawn attention to the changes that IT can bring to traditional printing activities. The editing and composing of a newspaper may now be done wholly electronically. In a related field, direct recording of news events on video tape, obviating the need for film, is widely used in many countries although not yet generally employed in the United Kingdom.

Printing and publishing companies will not in future be using IT only in their traditional activities, but will move into the new fields of electronic printing and publishing, becoming providers of information for Prestel and other viewdata services. The market for some publications, particularly reference books with short-lived information (eg stock market information, holiday booking guides, telephone directories, railway timetables) will be most affected by IT, while books and publications of a more permanent character will be less affected. We do not accept a forecast of the disappearance of the printed book by the end of the century.

3.20 Health services Administrative computers are already extensively used in the National Health Service. Small systems for keeping records in doctors' and dentists' practices are already in use and will become widespread. Systems providing improved monitoring in intensive care units are on the way. The wider accessibility of data banks will aid medical diagnosis and epidemiolocical investigations. Interactive terminals in surgeries will enable patients to prepare basic information for the doctor before an appointment. The consequential freeing of professional staff for more direct contsct with patients will be a benefit of IT.

3.21 Legal Services The foundation of case law is precedent, and computerised data banks allowing rapid search for relevant cases will become part of the operation of the legal system. Several such systems have been launched but currently run at high cost. Such legal services share the problem common to many data banks that if charges attempt to cover the heavy initial

costs, there will be little demand for the service. A feasibility study of an economical system for solicitors' offices, where the terminal will also offer other office automation facilities (word processing etc), is in progress. This could also have significance for small professional practices outside the legal field. As we have previously noted, word processors offer a further advantage especially useful in legal work since a document, once typed correctly, can be amended without fear of introducing errors in the unaltered sections.

3.22 Education The introduction of teaching aids using IT is foreseeable. Some schools already have small computers for teaching purposes. These systems familiarise pupils with the concepts of computing. A recent Government programme will provide £9 million mainly for curriculum development and teacher training. But this programme will not provide funds for buying micro-computers. Instruction in many subjects could be provided with interactive learning systems, some of which already exist. The declining cost of IT equipment could lead to a wider equivalent of the language laboratory that is used in many schools and colleges and would enable teaching resources to be better used.

3.23 Throughout the service sector, there will be expanding opportunities, change in institutions and habits, and improved services to the consumer, provided that the new technology is fully exploited.

Personal

3.24 Information technology will give the individual at home a better, wider range of communications and immediate access to a far greater range of information. With developments in Prestel, it will be possible to store and use personal information. Electronic mail may replace some correspondence and telephoning, and electronic means may be used for the payment of bills if ways can be found for establishing personal identity and authority, to eliminate the possibility of fraud. IT will enable more people to work at home, with particular benefit for those who could not otherwise find employment.

3.25 The selection of houses, cars, holidays and even jobs will be assisted by IT. The computer's ability to classify and categorise information and to retrieve it through searching for particular categories means that closer matching of offers and needs can be achieved. Much work will go into the development of software that guides and prompts non-technical users through the system (as, for example, System X will do).

4. OVERSEAS ACTIVITIES

4.1 The governments of France, West Germany and Japan are providing considerable direct financial support for IT developments by assisting R and D, or financing large-scale demonstration projects. They justify this on the following grounds -

a. Economic: if their indigenous firms are competitive in a growing world market for IT products, there are national benefits from enhanced employment and incomes.

b. Technological: IT-related firms are important generators of technology which can be transfered to other industries.

c. Strategic: the growing dependence of national life on computers argues for each country having its own computer industry.

By contrast, Government support in the USA comes mainly from Federal contracts for defence and space programmes. A summary of the main features of official policy in the United Kingdom's principal competitors is below.

France

4.2 The French government have given IT a very high position in national priorities. Public awareness of the importance of "telematique", the new word coined to describe IT, was stimulated by the publication in 1978 of a report (item 6 in the Bibliography) of a Presidential Commission established to study the impact of IT on French society. The report (usually termed the 'Nora' report after one of its authors) discussed the decentralising influence that IT could have on a centralised society and the government organisation required to co-ordinate the use of computers in government and the promotion of industrial IT activities. It stressed the need for France to maintain indigenous computer and telecommunications industries to avoid dominance by American interests. This reflects French concern at the power of IBM. The report also emphasised the importance of software and the key position of data banks

in future industrialised society, again recommending that France had to establish appropriate data banks to avoid dominance from abroad. The consequences of IT for employment and the future importance of service industries were also discussed.

4.3 Since the 1960s, successive French governments have involved themselves closely in industry with the aim of transforming France from an agricultural economy to one based on advanced technology. IT is seen as central to this aim and expenditure on its promotion is currently £270 million annually. This is in addition to the support given to the major French computer manufacturer (£141 million), the development of computer peripherals (£94 million) and the components industry (£70 million).

4.4 Several highly publicised projects have been initiated to stimulate awareness of IT, to provide the incentive (and the funds) for industrial developments and to create the image overseas of French forward-thinking and competence in telecommunications and computing. One project, beginning in 1981, will provide cheap video-terminals in place of telephone directories to 250,000 households in a region, with the eventual intention of eliminating telephone directories throughout France. It is argued that the computer system will be cheaper and that it will have other applications. A second project will link telephone subscribers in Biarritz by optical fibres, enabling video telephones and private TV services to be distributed. Further projects include the French equivalent of Prestel, due to be launched experimentally late this year; a nationwide data network; a telephone handset incorporating a microprocessor; a push-button alarm for the elderly and infirm that automatically sends a distress message via the telephone; a national telecommunications satellite; and an extensive programme of introducing micro-computers into schools in order to teach pupils skills essential for their future work.

West Germany

4.5 West Germany is the largest European market for IT products and services. It has more than twice as many computers as the United Kingdom with a population only 10 per cent greater. Domestic manufacturers have been assisted by successive

government programmes, the last providing about £400 million over four years, one-third of which was for industrial R and D, one-third for the development costs of approved software projects, and the remainder for computer education and for research by the West German equivalent of the National Computing Centre. An information technology programme is awaiting approval. This will concentrate on the links between information technology and society and the impact of IT on individuals.

Japan

4.6 The Japanese government is closely involved with industry in the development of IT, as it is in many other industrial sectors. This involvement stems from a deliberate decision taken some 20 years ago to move Japan away from the more traditional labour-intensive heavy industries into high technology. The government provides financial support for R and D, co-ordinates industrial development and exports, and operates a preferential policy for public procurement. The main government agency involved (apart from the Ministry of Trade and Industry) is the Nippon Telegraph and Telephone Corporation (NTT) which operates Japan's public telecommunications system. However, the government also encourages competition among the major Japanese electronic firms and this provides a major spur to new developments (and to high R and D expenditure by firms). Particular projects under way include the development of a pattern recognition and processing system for coping with Japanese script, a comprehensive medical information system, a viewdata system ("Captain"), and the linking of a community with optical fibres and special terminals.

USA

4.7 In the USA, government involvement in industrial development and the promotion of advanced technology is primarily accomplished through the massive development and purchasing programmes of Federal agencies, notably in connection with defence and the space programme. Expenditure on computers in 1975 for these two purposes alone was thirty times that of the United Kingdom government. Current American dominance of much of microelectronics technology is largely the result of past defence funding for R and D and demonstration projects. There is no explicit government policy for the development of IT but increasing awareness that the very large development costs of advanced data transmission

and processing systems are likely to be beyond the resources of most private enterprises. The American position in IT is one of dominance; the USA accounts for half the world markets for computers, their associated equipment and satellite communications.

4.8 In contrast to most countries, the public telecommunications system in the USA is privately owned, with the Bell system serving 82 per cent of subscribers. Inter-state telecommunication is, however, regulated by the Federal Communications Commission (FCC). In a significant change of policy, the FCC decided early in 1980 that with many new types of electronic equipment being connected to the telephone system, and the increasing use of digital signals for speech transmission, they could no longer reasonably distinguish between data transmission and speech communication. They therefore decided to cease regulating the processing of data by telecommunications companies, and its transmission by data processing companies, thus opening up new markets for both interests.

Others

4.9 Many countries provide government support for advanced technology, particularly through development contracts and subsidies for R and D. Features of IT in other countries include the Canadian equivalent of Prestel ('Telidon'), where the graphics system is capable of much finer detail although needing greater transmission capacity and memory in the terminal, and the Swedish concern for the social implications of IT, in particular in personal privacy and the dependence of society on computers.

4.10 Discussions of an EEC initiative on information technology, aimed at establishing a stronger European share in world markets, have taken place in recent months.[1] Our view, based on previous initiatives, is that such discussions are unlikely to produce significant results in the foreseeable future. We should be concerned if United Kingdom action were to be delayed in the expectation that our competitiveness in world markets might be improved quickly by an EEC plan.

1. See Bibliography, item 13

5. AWARENESS AND ATTITUDES IN THE UNITED KINGDOM

5.1 The concepts of information technology are not radically new; they have been known and used for at least the last fifteen years. We are in an era of evolution rather than revolution; we shall in the future be doing many of the same things (editing texts, preparing reports, seeking access to files etc) more expeditiously or in new ways and doing some new things (rapid preparation of graphs and charts, for example). But the scale and pace of this evolution is unprecedented and we cannot be complacent. If the United Kingdom is to be effective in this field, we shall need the right decisions by industry, regulatory agencies and major purchasers, and acceptance of changes in working practices.

5.2 The current rapid advances in information handling are made possible by developments in electronics, particularly microelectronics, but it is the effects of these developments on individuals and organisations that are particularly arousing the present interest in IT. IT will notably affect methods of operation in offices, libraries and other organisations which primarily handle information. The great potential opportunities for this country in the supply of IT equipment and systems must not be neglected, but the impact of the application of IT on our society and economy is probably more important.

5.3 The techniques that can bring about these changes are already known. Although the time lag between invention and commercial application is decreasing, innovations which will have large scale impact during the next ten years will almost all be based on existing knowledge. The hardware required for most IT requirements is either already available or could be designed with present technology. Less certain is the ability to write the software necessary to use that hardware fully, and to apply the systems to specific industrial, commercial and administrative uses. The benefit that the United Kingdom derives from IT in the coming decade will depend more on education, training, work attitudes, the investment climate and regulatory systems (ie our ability to make successful use of IT) than on advances in technical knowledge. For this reason, many of our conclusions relate to these factors rather than the development of technology.

5.4 Previous ACARD reports have drawn attention to lack of public awareness of the potential of new technologies and the slowness of the United Kingdom in adopting them. The same failings may be discerned with IT. The present attitude in the United Kingdom is not as good as that in France, for example, where the government have publicly supported IT and have publicised the developments, the possibilities, the advantages and the problems to the point where there is public awareness of IT and attitudes have been influenced. Corresponding attitudes in this country are less favourable and include some resistance to change at all levels. We do not believe that there should be anxiety over the intelligent extension of the use of IT, but a sustained campaign to get this over to the public is necessary, since the pace of application of IT will hinge upon willingness everywhere to face the challenges posed by new developments. Firms overseas will be adopting the new developments in IT in order to gain competitive advantage; the United Kingdom must not be behind.

5.5 It is understandable that there is concern on the part of organised labour about the possible threat of IT to employment at a time when alternative employment opportunities do not appear plentiful. However, ACARD has commented before that failure to remain competitive in world markets through the use of new technology is the greatest threat to employment in this country. We hold the view that failure to use IT is a greater threat to employment overall than its adoption; the new services that will be generated will themselves be labour-intensive. They - and present communication services - will require more people to install them; there will be more maintenance to do (even taking into account the enhanced reliability of semiconductor devices) and more staff will be needed to educate and train the whole range of makers, installers and users.

5.6 There will be changes in the requirements for different skills. The demand for jobs which are 'skilled but routine', whether typing or turning out repetitive parts on a lathe, will be most affected by IT. The more basic manual tasks will be little affected, and jobs that require thought will be aided rather than displaced by IT. In introducing proposals for new IT-related equipment and work procedures, full consultation between management and staff - as envisaged in the discussions between the CBI and TUC on new technology - is essential, and provision of adequate training and retraining for those displaced from existing jobs must be a significant part of the arrangements.

5.7 Management attitudes must be positive for the full exploitation of IT. Complacency and ignorance of new possibilities will lead to commercial failure. Managers must be well informed on information technology so that they appreciate its full potential and understand its implications for their business. There is also a need for a better understanding of motivations for and against change. The education of both management and trades unions is an important factor in the application of IT.

5.8 There is more chance of public acceptance of IT and the necessary investment of money and people if it is clear that this is a key point in the future growth of the economy. This requires Government to take a public position in order to create the right climate for the improvement of efficiency and the acceptance of new technology. A clear statement of the importance that Government attaches to this subject is required.

5.9 A statement alone will not be sufficient - welcome though it would be. The French government have been successful in creating - on the basis of projects that are not yet operational - the impression that France is leading the world in IT. A firm Government policy on the importance of IT coupled with adroit publicity for some projects that catch the imagination has produced a situation highly beneficial to French industrial interests. We look for similar top-level support for the projects that show what British IT can do. We look also for the projects that will bring the significance of IT home to the public, like the French electronic telephone directory service.

We recommend that the Government should make it clear that effective exploitation of IT is essential to the future industrial and commercial success of the United Kingdom. This commitment should be emphasised on all suitable occasions by Ministers and officials.

The Government should support its views with publicity for existing United Kingdom achievements in IT and imaginative promotion of them.

Innovative applications of IT by Government Departments, local authorities and public corporations should be encouraged and plans for them should be publicised.

6. OPPORTUNITIES AND CONSTRAINTS IN THE UNITED KINGDOM

Availability of People

6.1 The development, production and application of IT are all constrained by a substantial, or even critical, shortage of people trained in the skills needed for IT. Suppliers and users are experiencing a shortage of people with the ability and training to design systems and write programs. The speed at which technology is advancing makes this problem particularly acute.

6.2 UK software is as good as any in the world and we have the advantage that English is the basic international computer language. It is unfortunate that exploitation of these advantages is constrained by a shortage estimated as between 25,000 and 40,000 trained people. The causes of the shortage include the rapid expansion of the applications, a popular misconception that the field is highly mathematical, inadequate provision for training at all levels and lack of in-career training courses.[1]

6.3 The ability to write programs successfully is logical rather than mathematical. (Recent projects at the National Computing Centre have shown that people of modest educational achievements - say no more than two O levels - can be taught to become competent programmers.) Schools must recognise that pupils with aptitudes other than mathematics could have a satisfactory career in this field, and there is need for guidance to both teachers and pupils on the routes which lead to such careers.

6.4 The movement of trained staff from firms prepared to spend money on training to those prepared only to offer higher wages is an argument often quoted against investment in training. This must not be allowed to undermine training programmes and the extension of the levy/grant system may be necessary to ensure an equitable sharing of the costs.

6.5 The ACARD report on technological change (item 3 in the Bibliography) drew attention to the shortage of skills in microelectronics and related subjects. Schools, polytechnics and universities, the Manpower Services Commission, Industrial Training Boards and the relevant Government Departments should consider urgently

1. See Bibliography, item 19

the ways in which the supply of trained manpower might be stepped up. It is regrettable that none of the £9 million allocated by the Government for microprocessor education will be used for the purchase of equipment for use in schools. IT will itself release resources by enabling many office jobs to be done with fewer staff; one way of smoothing the introduction of new technology could be to train people displaced from current jobs in skills relevant to the development of IT. Government support for such training schemes might be envisaged. However, the longer term shortages at higher levels will not be eased this way; they require immediate measures to indicate to A-level students and new graduates of all disciplines the opportunities available in IT - particularly in software preparation.

We recommend that careers services at both school leaver and higher levels should review the guidance given to students about opportunities in IT, in order to attract entrants from a wide range of disciplines.

We recommend also that Government, its agencies concerned with training, and educational bodies at all levels, should examine the provision of education and training courses in IT-related subjects and propose measures to stimulate an increase of training in firms.

Industrial Activity

6.6 Our study has made us aware of gaps in the range of products in IT available from UK industry. Much of the present equipment for IT, including probably 90 per cent of the peripheral equipment, is coming from overseas. There are opportunities for UK industry, for example in the banks, but apart from a few good examples (such as a new banking terminal), opportunities are being missed. With the present pace of development, a great deal of equipment is being purchased and this provides opportunities, some of which are particularly suited to small specialist firms. In some cases, industry appears to be slow in anticipating future demands. We also believe that UK customers show more antipathy to novel equipment, compared with organisations overseas. There is a need for closer contact between supply and user industries in IT.

We recommend that the Government, through Trade Associations and the National Economic Development Council, should improve the links between supplier and user interests in IT in order that UK firms may be better able to anticipate future requirements.

6.7 There have been major achievements in British IT upon which we should build. Major development programmes in fibre optics have been conducted by both public and private firms and the Post Office recently announced plans for 15 routes comprising 280 miles of optical fibre cables. Britain is unique in having an operational viewdata service - Prestel - accessible by local call from several major cities, and this world lead should be exploited vigorously. Similarly, teletext (ie Ceefax and Oracle) was first developed here and has now been adopted by several other countries. Finally, ICL is one of the few presently viable computer companies outside the USA and Japan.

6.8 However, our supplying industry is stronger in electronics than in the mechanical skills required for peripheral equipment. We are particularly concerned that the UK now appears to lack the capability to design the electromechanical components which are still required in information systems.

6.9 We also note that our R and D effort in this field is now less than that of many of our competitors. Thus our effort on opto-electronics is now only about 10 per cent of that in Japan. We have to be selective and deploy R and D effort where there are the best chances of successful exploitation. We indicate appropriate areas in Chapter 8.

6.10 We have noted that a constraint to development in this field is the lack of transferability and mobility of technical staff between universities, government and industry. This, we believe, results in government funded work not getting developed and applied in industry. Some government research establishments contain "centres of excellence" which it would be wrong to destroy but which are remote from development, manufacturing and marketing. The best solution would be the free movement of people with their ideas.

6.11 We are also concerned that there should be a balance between the production and design of hardware and software. Failure to recognise the importance of software, and of the know-how in applying the technology, could have grave consequences. This importance is recognised in the "Nora" report which urges

the development in France of strategies to enhance competence in software and IT applications for both domestic use and the export of expertise. There is considerable British competence in this area, despite shortages of people. With encouragement and assistance, this could become a major British asset.

Regulation and Standards

6.12 IT by definition involves communication from one location to another. It is essential, therefore, that the equipments making up the communication links are compatible so that information may pass freely. Bodies exist for making both national and international regulations and standards in the field. The present regulatory organisations for communications in the UK, (eg the Post Office and the Home Office) backed up by Trade Associations, are linked with their counterparts in other countries through organisations which have no legal jurisdiction but which enable compatible standards and systems to be developed. Such organisations work well (see Appendix 2 for details). The British Standards Institution is similarly linked with international standards bodies on other aspects of IT.

6.13 Regulations and Standards may promote or inhibit development. In a rapidly changing technology, care is needed to ensure that they do not inhibit progress. Their formulation requires careful, detailed but often tedious and time-consuming drafting and discussion. There is a risk of their importance being under-rated, so that the best people are not sent to standards negotiations. It can be unattractive work with apparently little of commercial value at the end of the day. However, the intelligent preparation, advocacy and, if necessary, defence of positions, in particular in international negotiations, is vital to the UK. Other countries seem more adept at exploiting such negotiations for their own advantage, either by obtaining agreement that their national standards will be adopted internationally, or by frustrating competitors' intentions to capitalise on a technological lead. Extensive negotiations over viewdata standards have so far prevented Prestel from gaining the immediate world acceptance that its technological lead would justify.

6.14 Commercial implications of international standards (not merely European, which are often irrelevant to world markets) can be considerable. But not all the work can be left to our negotiators supported by Trade Associations. It is also up to firms to establish de facto standards by taking up commercial opportunities. If they lose a position, they cannot rely on our representatives in international discussions to restore it.

> We recommend that the Government should recognise the importance, to the IT supply and applications industries, of UK strength in international discussions on regulations and standards, and that staff and financial support must be available for such activities to ensure that our delegations go to them well prepared, technically, commercially and politically, and ready to argue strongly for our national interests. Trade Associations must similarly be prepared to play their part on behalf of their industries.

Legal Constraints on the use of IT from deficiencies in law

6.15 The successful use of IT in the UK is being impeded by the lack of reform to certain aspects of the law which relate to the use of information. Unless such reforms are carried out as a matter of urgency, many future developments will be either prevented or substantially hindered. These are discussed below.

Data Protection Legislation

6.16 Power from the use of information, which can now be provided by IT, is great and there is clearly potential for abuse. Justifiable fears of such abuse are a major contribution to resistance to new ways of collecting and handling data by both Government and the private sector. The legitimate interests of citizens and users of IT must therefore be defined and protected. Laws are needed to prescribe such matters as the information to be handled, the uses to which it may be put, its disclosure to the people covered by the data and to third parties, the assurances to be given on collection, the safeguards for ensuring accuracy, relevance,

timeliness and completeness, the measures for ensuring security and the circumstances in which users must seek the consent of subjects of the data or authorisation from an appropriate authority.

6.17 In the international sphere, the lack of data protection legislation will place the UK increasingly at a disadvantage with other countries who have already legislated; British commercial and industrial interests of many kinds will suffer as a result. Without domestic legislation, the UK will be unable to ratify the international convention on data protection already produced in draft by the OECD.

6.18 Data protection was examined by the Data Protection Committee under Sir Norman Lindop whose report (item 14 in the Bibliography) was submitted to the Government in December 1978. The Committee made many detailed recommendations, including the establishment of an independent Data Protection Authority. The Government has not, however, responded to these.

> We recommend that the Government should bring forward proposals for data protection legislation, taking into account the views of the Data Protection Committee, without delay.

Copyright Laws

6.19 The copyright laws need to be modified to cover information held in forms other than writing on paper. Developments in IT mean that information will in future be held in electronic, magnetic, or optical forms and so the lack of appropriate copyright law will constitute a hazard for the users of IT and could remove incentives to develop innovative concepts in IT itself. The risks to IT users of inadequate copyright protection will be enhanced by the ease with which copies of documents (whether paper or electronic) will be sent to distant locations.

Other Laws

6.20 The admissibility of information held other than on paper as legal evidence is said to be open to doubt. This and any similar uncertainties relating, for example, to the laws of libel and fraud could constitute a further inhibition to users of IT. If the UK is to have a leading position in the supply and use of IT, such inhibitions need to be removed.

> We recommend that the Government should put in hand urgently a review of the legal reforms required to aid and expedite the use of IT in the UK and should then legislate to bring about such reforms as fast as possible.

Present Organisational Problems

6.21 IT brings together computing and telecommunications. This makes possible the interchange of information not only between units of a single organisation, but also between independent organisations - eg between suppliers and their customers, banks and their corporate customers, airline companies, Government Departments, and between Government Departments and private sector organisations. This kind of interchange of information often precipitates a situation in which the costs fall to one party and the benefits to another. The motivation to create system linkages of this kind is hard to promote, unless it is done jointly by all the parties with a clear understanding of how the costs and benefits will be distributed among them.

6.22 This type of joint venture requires new legal forms of organisation which do not affect the separate identity and legal standing of the co-operating parties. Such a legal form has been created in France - known as a Groupement d'Intérêt Economique (GIE), and in Belgium there is a similar corporate entity in the form of a non-profit making co-operative society. Such entities have proved themselves excellent vehicles for joint action to meet a common set of goals, with minimum legal and fiscal difficulties. This has been so even where the joint action is by very disparate organisations with common communication needs, for example telecommunications authorities with banks, or airlines with railway companies.

6.23 We have no such legal structures in the UK and it is difficult to envisage how, for example, the Post Office might undertake a joint venture with other organisations. Already some international organisations utilising IT, such as the banks' SWIFT network, have been established with headquarters in Belgium or France where these legal forms exist, rather than in the UK.

We recommend that the Government should consider legislation to permit the creation of new organisational forms to aid joint IT projects, taking into account the precedents in France and Belgium.

7. THE ROLE OF COMMUNICATIONS

7.1 While some applications of IT will be contained within a single room, office, store or factory, the major applications of the future will be dependent on national and international communications networks. Some transmissions will be via communications owned by the user or provider of the IT system, but most will require the use of existing public communications networks, suitably improved. A first class, modern, economic communications system is therefore essential for effective application of IT.

7.2 IT users' requirements will not, in the main, be for facilities which are technically difficult to provide. They will rather be looking for low transmission costs, speed of installation, reliability, and competitive transmission and switching technology to provide them with modern services. They are much more concerned if, as at present, it can take 9 months to obtain a new connection to the public telephone network.

7.3 Most of the present traffic on the telephone network is voice communication. Even in an era of data transmission, information technology and electronic mail, we expect the majority of the traffic to remain voice telephony. This will only be changed when video telephones are introduced (and widely accepted by the public - which was not the case when an attempt was made by the Bell System to introduce them in Chicago), or television programmes are distributed to homes by the telecommunications network. Even then modern techniques can reduce the data transmission rate required. A network which provides digital voice transmission will also satisfy substantially all other IT requirements (except possibly videophone and television). There is therefore no need for a separate network for IT from that for speech, although some with whom we have had discussions look forward to the development of information ring mains in neighbourhoods. Users would connect to these and specify the amount of information carrying capacity required. There is, however, a case for national standards for data handling via the public network in order to permit data interchange between different organisations, in the same way that speech can now be freely transmitted between individuals.

7.4 We believe that a feature of the development of IT over the next few years will be the replacement of physical movement of some information by 'electronic mail' in which keyed-in information is transmitted over the telecommunications network, stored as necessary, and displayed on a screen at the recipient's address, with printed copies being produced when necessary. There will be scope for different classes of service at different tariffs, eg as soon as connection can be made; when the network is lightly loaded; or overnight. Even in an era of electronic mail, though, there will be cross-coupling between telecommunications and postal services (for those without telephones) and the separation of these services has not had any fundamental effect on our conclusions.

7.5 The provision of a telecommunications network and the transmission and switching of connections between subscribers can be a profitable business at the rates which subscribers will pay. Such a network is at the heart of applications of modern information technology. The relevant technology, however, is changing rapidly and major investment in research, development, procurement and installation is required if the network is to remain competitive in world terms. It is vital that the provider and operator of the network should have adequate funds for this programme, from either public or private sources.

> We recommend that the Post Office (or its successor for telecommunications) should have the mandate to provide a world-competitive United Kingdom communications network and should have sufficient finance for procurement and installation, whether from public or private sources.

7.6 At present the Post Office not only provides the network but has a major influence on the introduction of those aspects of information technology which rely on the network.

> It determines the tariffs charged, the service to be provided and the timing with which they are made available to users.
>
> It controls the equipment which may be connected to the network. It provides some terminal equipment and at one time exercised a virtual monopoly over equipment directly connected to its terminals, although this has now been considerably relaxed.

It provides services such as Prestel, although it no longer monopolises the provision of viewdata services.

It has substantially a monopoly in the provision of point-to-point communication.

7.7 In our discussions, we have encountered a range of views on the future of IT, but nearly everyone would like a 'transparent' communications system with terminals (similar to the outlets for gas, electricity and water) to which they could attach equipment of their choice, provided that it has been approved as not harmful to the network. The role of the Post Office should be to provide the network. Such matters as approval of terminal equipment and approval of independent networks should not be the responsibility of the Post Office.

7.8 Opinions have varied on the future provision of services and equipment. Views include -

a. that the Post Office (or its successor, British Telecommunications) should be only the provider and operator of a transparent communications network (ie a 'bulk data carrier') and should not provide Prestel or similar services, nor should it supply terminal equipment;

b. that the Post Office should supply and operate the network and have the right to supply simple terminal equipment (eg a telephone) which would confirm the satisfactory working of the network;

c. that the Post Office should supply and operate the network and have the right to supply simple terminal equipment but would also be free to supply IT services and other terminal equipment in competition with private interests.

On balance, we support view c.

We recommend that the Post Office should be free to supply terminal equipment and IT services for use with the network but should not have an exclusive right to do so. It should not be the approving authority for terminal equipment and IT services provided by others.[1]

1. A Government statement on 21 July 1980 proposed changes in the Post Office's telecommunications monopoly which follow these principles.

7.9 We recognise that a consequence of the liberalisation of the Post Office's monopoly on terminal equipment could be the loss of this market to foreign competition and an increase in imports of such equipment.
We believe, however, that the rapid application of IT in UK service industries such as banking and insurance (which will lose competitiveness if they do not apply IT effectively) is so important that such liberalisation is necessary. It should, however, be introduced in ways that will give alert British manufacturing industry the opportunity to supply these users' needs.

7.10 The Post Office, together with the Department of Industry and the Home Office, at present have regulatory and supervisory powers for communications. Sound and television broadcasting systems have an increasing role in IT. Examples are the teletext (Ceefax and Oracle) services provided by the BBC and IBA, the use of television receivers for Prestel and other viewdata systems, and the possible use of broadcasting systems for regulating energy demands. Mobile radio (for emergency services, taxis, and industrial use) and point-to-point radio will also be part of IT systems, over which data as well as speech will be transmitted. These broadcasting and radio services (which are at present regulated by the Home Office) are parts of the total communications capability essential for IT. We believe that the supervision of their technology should be brought together with that of other communications, and this task is not appropriate to the Home Office.

7.11 The four principal responsibilities which should be brought together are: approval of equipment for connection to the public communications network; regulation of "value added" services using the network (eg data processing services); regulation of private communications systems; and control of the use of radio frequencies. We believe that, because of their interplay, it would be simpler, more efficient and less restrictive to make these the responsibility of a single organisation. This could also result in some staff savings.

We recommend that responsibility for regulation of communication and broadcasting, including the matters listed above, should be exercised by a single Government Department.

PUBLIC PURCHASING AND SUPPORT FOR R & D

8.1 Government is a major user of IT. It provides funds to support its development and controls the regulatory system in which broadcasting and telecommunications authorities operate. It also has a major influence on the general economic environment, which governs the willingness of firms to invest. As a user, Government can determine the direction and market for major items of computer-based equipment by policies of standardisation and by its willingness to introduce innovative features. Traditionally, Government seeks the lowest cost systems that meet its requirements. In IT (as in other areas of high technology), selection of the lowest cost systems may in the long run weaken United Kingdom industry by not providing the initial market for a new development which bears heavy initial costs. The USA particularly has supported many projects in advanced technology through enlightened and innovative purchasing. Public purchasing in this country needs similarly to provide some of the market pull required to encourage new developments. Cost minimisation is an important criterion for decision, but can stifle advance, whereas imaginative, innovative purchasing can provide great commercial benefits at relatively little extra cost.

> We recommend that the Government should employ public purchasing to pull through novel developments in IT, (and offer examples of possible projects in Appendix 1).

8.2 Government funded applications of IT could also be used to achieve national objectives outside the industrial or IT areas. The following are examples:

a. IT could assist a national campaign for energy economy;

b. the creation of commercial and industrial employment in the regions could be promoted (a distance-independent tariff would help this);

c. technology could be developed to provide assistance to the physically handicapped;

d. a substantial British contribution to the needs of developing countries could be made by study of their environments where the pattern of available industrial and commercial skills is quite unlike our own. The use of IT to overcome deficiencies could speed up such countries' progress. Projects could have political value as well as substantial export value.

We recommend that the Government should consider the possible role of IT in promoting national objectives, and give appropriate financial support to relevant IT projects.

Public Sector Research and Development

8.3 Work on IT supported by government funds is being undertaken in government establishments and in industry and universities. The Ministry of Defence and the Post Office, as customers, are supporting research and development aimed at their own needs, while the Science Research Council and Department of Industry are supporting work in the universities and industry. In addition the Department of Industry is undertaking work in its industrial research establishments.

8.4 We do not advocate an increase in government funded R and D, particularly in government establishments or universities, because we believe that application of the results of R & D, in the form of marketable products which

are put to successful use, does not in general come about unless the R and D is done close to manufacture, marketing and applications. Government R and D establishments cannot be strongly motivated to achieve successful commercial exploitation of research.

8.5 While we do not see a case for expansion of Government-funded R and D, we believe that development of IT and its applications should be emphasised within the existing budgets of the Science Research Council and the Department of Industry and that all possible civil advantages should be taken of related programmes in the Ministry of Defence.

8.6 Areas of importance to IT which should be considered by the Science Research Council and the Department of Industry when deciding their supported programmes include:

a. development of special silicon integrated circuits (microcircuits) for applications in IT;

b. applications of special and standard silicon integrated circuits in IT;

c. opto-electronics;

d. system analysis and design, software systems and programs;

e. displays;

f. pattern recognition;

g. bandwidth compression techniques;

h. new memory technologies;

i. novel sensors and transducers;

j. organisation of large data bases;

k. printed copy generation.

We do not suggest that it is within the United Kingdom's resources to establish a viable world presence in all these areas. A selective approach will be required, based on the availability of first rate ideas and people, and on industry's views on ultimate commercial importance.

8.7 We would draw special attention to two areas. First, satellite communications and broadcasting could be particularly significant in future IT systems and it is important that this is kept in mind in considering priorities in this country's present substantial financial support for satellite science and technology. Second, the technology of opto-electronics (already in use in sensors, displays and transmission) will also be important for many aspects of IT. It may eventually be supplemented by what some term "microphotonics" - the use of quanta of light ("photons") without the intervention of electrons - for information processing, storage and transmission.

> We recommend that the Science Research Council and the Department of Industry should keep their research priorities under review in the light of the needs of IT.

8.8 There is a need for better co-ordination of the R and D on IT undertaken by the Ministry of Defence, Department of Industry, Science Research Council and the Post Office. At present the CSE Division of the Department of Industry and its Computer Systems and Electronics Requirements Board are endeavouring to improve co-ordination, trying to ensure that projects they support are likely to be applied and that they are applied when successfully completed. But there is room for improvement.

> We recommend that the Department of Industry, with the Ministry of Defence, the Science Research Council and the Post Office, should increase the present co-ordination of all publicly funded R and D applicable to IT. It should also make greater effort to ensure both that research which it supports is likely to be applied and that transfer of results to industry takes place.

THE ROLE OF GOVERNMENT

9.1 We have referred in previous chapters to a number of roles for government in the development of IT and its applications, concerning -

a. awareness and attitudes,
b. education and training,
c. sponsorship and support of industry,
d. international regulations and standards,
e. the legal framework for applications of IT,
f. public purchasing
and g. publicly funded R and D.

9.2 Responsibility for these roles is at present split between the Home Office, the Department of Trade, the Department of Industry, the Department of Education and Science, HM Stationery Office and the Central Computer and Telecommunications Agency (but the co-ordinating role of the CCTA in public purchasing does not extend to local authorities, the National Health Service or nationalised industries). In addition, public risk capital for IT ventures is provided by the National Enterprise Board and the National Research Development Corporation.

9.3 This spread of responsibilities for the advancement of developments and applications of IT does not seem to us to provide a coherent framework for policy making for such a nationally important subject. Decisions on one aspect of IT (eg satellite broadcasting) may have repercussions in a very different area (eg standards for data transmission). Responsibility for taking a view of the whole field should rest with one part of Government. We do not suggest the transfer of detailed responsibilities, for example, for education from the Department of Education and Science, but we do believe that it is necessary that all the factors which will influence the development and application of IT in the national interest should be studied together, and that Departments' plans and actions are co-ordinated and monitored.

9.4 There is also the difficulty that costs and benefits from the introduction of IT systems can fall to different Government Departments. Separate financial targets and accounting systems do not easily allow the redistribution of costs and benefits. Projects where the

net national benefit would be substantial may not then come to fruition. There is need for a system of project cost and benefit distribution which can overcome departmentalism.

9.5 We believe that a focal point is necessary, in view of the number of organisations involved, to improve awareness in government, to promote a programme covering both projects and publicity, to improve internal communications and provide necessary couplings, to avoid delays because of the rate of technical change, and to create a positive public consciousness of IT. There is a need to make existing United Kingdom efforts more coherent. The French have managed to achieve coherence in IT and have aroused national consciousness and international interest with a programme which is probably not vastly greater than the sum of United Kingdom efforts. By contrast, British activities, including those of the Department of Industry which already has many of the responsibilities in the IT field, are fragmented and organised in traditional sectors which do not correspond to the new technological possibilities. The creation of a focal point would also assist the private sector, which at present has to deal with many parts of Government on IT matters.

> We recommend that one Minister and government Department should be responsible for co-ordination of government policies and actions on the promotion and development of IT and its applications through awareness, education and training, sponsorship of industry, provision of risk capital, public purchasing, publicly funded R and D, national and international regulations and standards, legislation, communications, and related programmes such as satellite technology.

10. CONCLUDING REMARKS

10.1 Our concluding note, in line with the central theme of this report, is that Government, industry, commerce, trade unions and the professions must take the new developments in information handling very seriously. They will affect working arrangements, management systems and personal life. They offer great commercial opportunities for this country if successfully exploited. It will be necessary to examine the changes in management organisation and techniques which are necessary to make best use of information technology. The Civil Service, local government, and industrial and commercial managements are frequently aware of the systems which are available but are sometimes slow in

adjusting their methods of working to make effective use of them. It is essential to start not from the way that tasks are tackled with present methods but to examine the true tasks to be performed and how they can best be undertaken with the aid of the new technology.

10.2 The successful exploitation of IT is crucial to high employment, a satisfactory balance of trade, competititive industry and an efficient commercial sector. But time is not on our side. If we are to maintain a presence against the present commercial strength of the USA and Japan and the clear intentions of France and West Germany, to name but our major competitors, the message of this report has to be taken up by all sectors in effective action now.

APPENDIX I

DEMONSTRATION PROJECTS WHICH COULD PROVIDE IMPETUS FOR UNITED KINGDOM EFFORTS IN INFORMATION TECHNOLOGY

1. Creation of "centres of excellence" for communications in commercial centres such as the City of London.

2. Installation of an optical fibre cable communication network in an area such as part of a new town, with advanced terminal equipment for speech, text and other information.

3. Use of a United Kingdom satellite for communication and broadcasting.

4. Provision of cheap black and white Prestel-like video terminals for telephone directory information, for use with telephones.

5. Supplementing postal services by telex and facsimile transmission from post offices and other public places.

6. Establishment of a demonstration Government office with the latest, preferably British, electronic communications, word processing, copying, information processing and storage etc.

7. Creation of an effective information retrieval system for the Manpower Services Commission to assist job placement.

8. Provision of microcomputer systems for education, training and applications in schools and colleges.

9. Provision of Prestel receivers in schools and public libraries.

Note: These projects vary greatly in impact and cost. The Working Group would be prepared to provide assessments of impact and cost, if required.

PRINCIPAL REGULATORY BODIES IN TELECOMMUNICATIONS & ALLIED FIELDS

1. THE INTERNATIONAL SCENE

The main body involved in the regulation of international telecommunications is the INTERNATIONAL TELECOMMUNICATIONS UNION (ITU) through its INTERNATIONAL TELEGRAPH AND TELEPHONE CONSULTATIVE COMMITTEE (CCITT). Questions or recommendations raised by member Countries of CCITT at the Plenary Sessions are assigned to study groups and joint working parties (which are made up of experts from both participating PTTs and the private sector) who, in turn, report back to the Plenary Sessions with the results of their investigations.

The Plenary Sessions then decide on appropriate Standards based on the evidence presented. These Standards then become official CCITT Recommendations, the adoption of which is not mandatory but does provide positive benefits to the member Countries. Consequently, CCITT Standards are generally accepted throughout the world and are currently published and implemented covering the transmission of data in various forms over telex networks, telephone networks, and public data networks, including the modern 'packet switching' networks. Standards cover such factors as operating speeds, modulation techniques, interface connections and protocols, etc., etc.

The ITU also controls the allocation and use of radio frequencies throughout the world. The CONSULTATIVE COMMITTEE ON INTERNATIONAL RADIO (CCIR) is a sister organisation of CCITT and works in essentially the same way, i.e. via Plenary Sessions with their Study Groups and Joint Working Parties. The final Recommendations are then submitted to a WORLD ADMINISTRATIVE RADIO CONFERENCE which takes place periodically (the last one was in 1979, and the one before that in 1964). These conferences are attended by representatives of World Governments, e.g. the UK Government is represented by the Home Office, and the U.S. Government by the Federal Communications Commission (FCC). Agreements are reached at these conferences on the international allocation of radio frequencies, and the two main considerations are:

1. To keep the communications concerned with the safety of shipping and aviation clear and open.

and,

2. To avoid interference between one country's internal broadcasting services and those of its neighbours.

/...

Agreements reached at the World Administrative Radio Conference are then controlled and monitored by the INTERNATIONAL FREQUENCY REGISTRATION BOARD (IFRB) which is another ITU organisation. Complaints of interference whether to aviation or maritime communications or domestic broadcasting services are normally referred to the IFRB, the ITU and the country operating the radio station concerned.

Another regulatory mechanism in the international arena and of particular interest to the UK, is the EUROPEAN CONFERENCE OF POSTAL AND TELECOMMUNICATIONS ADMINISTRATIONS (CEPT), which has twenty six member administrations and which aims at 'the harmonising and practical improvement of their administrative and technical services'. Like CCITT, this organisation is essentially consultative and has no legal jurisdiction over its members.

Yet a further international organisation, though not strictly regulatory, is the INTERNATIONAL TELECOMMUNICATIONS SATELLITE ORGANISATION (INTELSAT) which has approximately 100 member nations. The technical and operational management functions of this organisation are supplied by COMSAT (the U.S. Communications Satellite Corporation) but under the overall direction of the Board of Governors which represent the member nations.

Other prominent organisations in the international area - although not strictly concerned with telecommunications per se - are the INTERNATIONAL ORGANISATION FOR STANDARDISATION (ISO) together with the INTERNATIONAL ELECTRO-TECHNICAL COMMISSION (IEC). The IEC, headquartered in Geneva, recommend Standards for electrically operated equipment for international use and, where possible, the BRITISH STANDARDS INSTITUTION (BSI), adopts the same or similar Standards as well as the same form of publication of those Standards. In the special area of radio interference, the IEC has set up an "INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE" (CSIPR), and many UK manufacturers are now designing equipment to meet the Standards defined by that Committee.

2. THE U.K. SCENE

In the field of telecommunications the main regulatory body is the BRITISH POST OFFICE (BPO) with powers vested in it by the Post Office Act - 1969 - which give it a virtual monopoly in the country. There are a number of exceptions to this monopoly, mainly concerned with systems which are installed entirely within a single building or site, or within and for the exclusive use of a single business. Furthermore, the BPO may license other organisations to run systems which it may, itself, from time to time not have either the resources or the desire to offer. In particular, the BPO has issued a general licence covering "Private Attachments to Post Office Telecommunications Installations" dated 1 July 1977. This licence

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has, in turn, resulted in a series of "Technical Guides" which detail various specifications which must be met by any equipment connected to BPO circuits. Such equipment must then be submitted to the BPO for evaluation and test before written permission is given. The requirements for connection to the PUBLIC SWITCHED NETWORK (PSN) are different from those, for example, for connection to BPO supplied private circuits, and separate listings are maintained for equipments for which BPO approval has been given for each type of connection.

Any communication system involving a radio link requires, in addition, the approval of the HOME OFFICE through a "Home Office Wireless Telegraphy Licence".

The BPO monopoly applies not only to the UK and the Isle of Man but also to International Systems in so far as they operate within the UK. A department of the BPO, known as the "External Telecommunications Executive" is involved in evaluating and licensing privately supplied equipment for connection to international circuits.

Although not strictly a regulatory body, the BRITISH STANDARDS INSTITUTION (BSI) publishes various Standards which are relevant to the general information processing industry, most importantly concerned with electrical safety and radio interference. Although these Standards are not mandatory within the UK, similar Standards frequently are in many other countries. However, compliance with the appropriate British Standard is considered by most responsible manufacturers to be of considerable importance and would be normal.

The BSI runs a testing and inspection service to assist manufacturers in ensuring that their equipment does meet the appropriate Standards. They also run an organisation called "Technical Help to Exporters" (THE), which assists manufacturers in respect of overseas technical requirements. The BSI also works closely with many other interested Bodies, e.g. the TELECOMMUNICATIONS INDUSTRY STANDARDS COMMITTEE which, in turn, consists of representatives of various Government Departments and scientific and industrial organisations, such that the resulting BSI Standards are, in fact, a joint recommendation of both Bodies.

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10 DOWNING STREET

From the Private Secretary

MR. WRIGHT
CABINET OFFICE

Information Technology

The Prime Minister has read Sir Robert Armstrong's minute of 7 August, and is content with his revised proposals.

I.P. LANKESTER

8 August 1980

&.

cc Mr Hoskyns

Prime Minister

This looks better. Can they now proceed?

Ref. A02833

PRIME MINISTER

(John Hoskyns is happy with these arrangements. He does not wish to chair the group (which will be taken by a very good dep. sec. in DOI); but he is happy to be a member.) 7/8

Information Technology

When we discussed this question on Tuesday, following my minute of 28th July and Mr. Lankester's reply of 4th August, you said that you wanted the Department of Industry to take the lead in stimulating developments in information technology and in resolving conflicts of priorities and eliminating impediments to maximum exploitation of information technology in the interests of British industry.

2. I have now discussed with the Secretary of State for Industry and his Permanent Secretary how this can best be done.

3. The Secretary of State agrees that he and his Department should take the lead. The need to co-ordinate (and if necessary stimulate) in Whitehall will be met by nominating a Deputy Secretary in his Department to take charge of a group of officials representing the Departments with an interest in the various aspects of information technology, including the CPRS and Mr. Hoskyns from 10 Downing Street. The Secretary of State would like the Secretariat of the group to be provided jointly by his own Department and the Cabinet Office.

4. If you are content, matters will so proceed.

5. I discussed with the Secretary of State whether there should be any announcement of this, in view of the ACARD recommendation summarised in paragraph 4 of my minute of 28th July. We came to the conclusion that we should say no more at this stage than that the Secretary of State should be the Minister responsible for the co-ordination of Government policies and actions on the promotion and development of information technology and its applications, consulting other Ministers concerned as appropriate.

RWA

ROBERT ARMSTRONG

7th August, 1980

PRIME MINISTER

Information Technology

On 25 January 1980 Sir Kenneth Berrill minuted Mr Lankester about the interdepartmental machinery in Whitehall for handling the complex and inter-related issues raised by information technology. I subsequently minuted you on 4 February proposing that the right course was to set up a Steering Group under Cabinet Office chairmanship, with all the Departments concerned represented on it at senior level, and with the CPRS represented to provide a stimulus to a constructive and coherent approach. You accepted this proposal (Mr Lankester's minute of 7 February).

2. I had told you in my minute of 5 February that, if you agreed with my proposal, I proposed to approach the Permanent Secretaries concerned. When I did so, I encountered a certain scepticism about the need for a Steering Group. I agreed that the matter should be further reviewed by an Industrial Policy Group (IPG).

3. The IPG consider that the main responsibility for information technology should remain with the Department of Industry; but they recommend the establishment of a group at senior level in Whitehall to stimulate and keep under review developments in information technology (which is basically the Steering Group which I have already suggested), together with a sub-group to seek to resolve conflicts of priorities, to identify overlaps and to make recommendations.

4. The Advisory Council for Applied Research and Development (ACARD) has also prepared a report on information technology. They, too, see the need for a focal point within Government, in view of the number of Departments and organisations involved, to improve awareness and internal communications, to promote a positive programme and to avoid delays.

Their recommendation is that one Minister and Government department should be responsible for the co-ordination of Government policies and actions on the promotion of development of information technology and its applications.

5. These recommendations reinforce the case for setting up a Steering Group and suggest some refinements in the concept. I have discussed these matters with Mr Ibbs, and what I now propose, with his agreement, is as follows:-

a. The Department of Industry should continue to be the lead Department.

b. In view of the number of Departments involved, there should be a Steering Group of senior officials (about Under-Secretary level), to provide the co-ordinating and focal role which all concerned have identified. I suggest that Mr Ibbs should be asked to take the Chair of this Group: he is content to do so.

c. The Steering Group should be supported by a very small unit, headed by an Under-Secretary with suitable qualifications (probably attached to the CPRS) and including one outsider (who would be a member of the CPRS) and one Civil Servant from the Department of Industry. This unit would, in the first instance, operate from the Cabinet Office; but, once the initial work and stimulus had been achieved, it might be appropriate to transfer it to the Department of Industry.

6. These proposals would mean a net increase of two in the size of the CPRS (one of the three posts would be found from within its existing complement).

7. There is no doubt either of the need to stimulate the use of micro-technology in British industry or of the potential that this technology has for creating new employment in Britain. We have advantages - a well-developed software industry and the international use of the English

language - which should enable us to gain a significant share of the world market for information services and associated products. This is a field of advanced technology in which we should be seeking to develop our opportunities to the greatest possible extent. Our major competitors have well-developed plans for promoting information technology by action concerted between Governments and industrial users. We cannot afford to be left behind by them, or to fail to provide the necessary degree of Government interest, stimulus and co-ordination required to enable us to make the most of our opportunities. Mr Ibbs and I both think that what is now proposed is an adequate and not excessive response to this need. If you are content, I shall proceed accordingly.

RGA

(Robert Armstrong)

28th July 1980

PERSONAL

TIM

Thank you for showing me these papers on the inadequacy of Whitehall machinery for dealing with information technology. Personally I think CPRS were right to press for a central unit. Unless a few people are responsible full-time for battling against inertia, it will be almost impossible to make the sort of progress that is needed. Paragraph 6 of the CPRS note listed many important gaps in present arrangements. I suspect this nut can only be cracked by full-time dedicated work by a group which includes outsiders with some experience of either the production or applications end of the industry - preferably both. It is very hard to imagine that a "steering committee" - simply bringing together the various existing interests within Whitehall - can really change things much.

Another approach would be for one of the Departments involved to take on a more central role - in effect, being the powerhouse instead of a central unit. It could always bring in outsiders. There would be some logic in Department of Industry having this role, though somehow I doubt if they are equipped for the task at present.

I feel this whole area of information technology is far more important than Whitehall has recognised. Although present Ministers might wish it were otherwise, the Government cannot avoid being deeply involved - as a glance at paragraph 6 will confirm. Do you think there is anything further we could usefully do? Perhaps the answer lies in trying to persuade Sir Keith and Peter Carey to increase the DoI role - possibly overseen by a junior Minister with designated responsibility.

Andrew

AD

ANDREW
13 February 1980

(1) I suggest you get yourself onto the Steering Committee, and then make sure that DoI are making a major input.*

(2) I think CPRS are planning to have someone working pretty much PERSONAL full-time on this.

* Privately, you can work on this behind the scenes too - they must have spare people now that DoI assistance is being cut back.

MR. WRIGHT
CABINET OFFICE

Information Technology

The Prime Minister has considered Sir Robert Armstrong's note of 5 February and agrees with his proposals for setting up a Steering Group under Cabinet Office chairmanship.

I am sending a copy of this minute to Sir Kenneth Berrill.

T.P. LANKESTER

7 February 1980

Prime Minister

Content with Robert's proposal for a steering group under Cabinet Office chairmanship?

TL 6/2

Ref: A01317

MR. LANKESTER

Yes and

Information Technology

Your minute of 28th January, conveying the Prime Minister's comments on Sir Kenneth Berrill's minute of 25th January.

Flag A

2. As Sir Kenneth Berrill knows, I share the Prime Minister's and his own lack of enthusiasm for a standing advisory body or a new Ministry for information technology. I can see why he thinks that creating a special Cabinet Committee hardly seems an adequate response to the importance of the subject; but I remain to be convinced that it would be either necessary or justifiable to set up a central unit, presumably in the Cabinet Office, of people whose raison d'etre would be monitoring the work of others. I certainly could not take on such a unit in the Cabinet Office without having to add to our staff.

3. I am sure that we should be considering what more the Government can and should do to stimulate the development of information technology, and how far the Government's regulatory activities - for instance, the allocation of radio frequencies - inhibit that development. I think that the right course is probably to set up a Steering Group under Cabinet Office chairmanship, with all the Departments concerned represented on it at senior level, and with the CPRS represented to provide a stimulus to a constructive and coherent approach. Such a group could take the various aspects of the matter with which Sir Kenneth Berrill deals in paragraph 6 of his minute, and identify what needs to be done. Many of the resulting recommendations could probably be dealt with by departmental Ministers; if collective discussion was needed, papers could come to E(EA) or to H Committee, depending on the subject.

4. For this to be effective, it will need positive chairmanship as well as dynamic impact from the CPRS and the secretariat. We shall have this in mind in setting the Group up.

5. Sir Kenneth Berrill would have preferred a central unit; but he accepts that the proposal in this minute should be tried, subject to review after about a year - say at the end of 1980.

6. If the Prime Minister is content, I shall proceed accordingly - in the first place approaching the Permanent Secretaries concerned.

7. I am sending a copy of this minute to Sir Kenneth Berrill.

RTA

(Robert Armstrong)

5th February 1980

file

ds Ind Pol

B/F 4.2.80.

SIR KENNETH BERRILL

Information Technology

The Prime Minister was grateful for your minute of 25 January and for the enclosed note on information technology. She has read this with interest. As for the possibilities for improved Whitehall machinery mentioned in paragraph 10 of the note, the Prime Minister is not attracted by either option i, ii or iii. She would be grateful for Sir Robert Armstrong's views on the adequacy of present central arrangements and how the question of deciding what changes are needed might best be handled.

The Prime Minister has commented generally that the SRC should know a good deal about information technology.

I am sending a copy of this minute to Sir Robert Armstrong.

T.P. LANKESTER

28 January 1980

OC

The SRC should know a lot about this one

2

CONFIDENTIAL

Prime Minister

Robert Armstrong may have some comments next week.

Qa 04410

To: MR LANKESTER

From: SIR KENNETH BERRILL

Information Technology

25/1

1. The last meeting of the NEDC, which was chaired by the Prime Minister, was largely concerned with the need to speed up the adoption in Britain of the new technologies. There was an impressive (perhaps, indeed, surprising) unanimity of view from all round the table, and at the end of the discussion the Prime Minister pledged that the Government would do all in its power to help.

2. If that undertaking is to be implemented there is, in the view of the CPRS, much to be done. (The Prime Minister picked out one issue at E last Wednesday when she commented on the slow take-up of new technology office equipment by the Civil Service.)

3. The attached note and annex sets out the opportunities in the most important field of the new technology - information technology. It is concerned particularly with the inadequacies, as we see them, of the interdepartmental machinery in Whitehall for handling the complex and inter-related issues. Our main objective is to wave a very large red flag indicating trouble in this area. Whether our particular proposal for improved machinery of government is right is another matter. But we are convinced that the matter needs urgent attention and, if the Prime Minister accepts this, she might ask Sir Robert Armstrong for his views both on the adequacy of present central arrangements and how the question of deciding what changes are needed should best be handled.

4. I am sending a copy of this minute and the attachments to Sir Robert Armstrong.

KB

25 January 1980

Atts

CONFIDENTIAL

INFORMATION TECHNOLOGY

A Note by the Central Policy Review Staff

Introduction

1. Governments in the United Kingdom are always in danger of spending too much time on the problems of the declining sectors of the economy (steel, shipbuilding, motor cars) and not enough on the potential growth sectors. This Government has done its best to keep a balance and to pursue its strategic growth objective of reducing the size of the public sector and, at the same time, creating a better framework within which management in private enterprise can respond dynamically to the growth possibilities as they see them.

2. The CPRS has contributed to this work on trying to improve the framework both at the macro-level (the need for further reductions in public expenditure) and at the micro-level (the detailed 'priorities' work in MISC 14 and MISC 15). But certainly at the micro-level considerably more needs to be done if the economic framework is to be adequately improved. We are particularly concerned that the effort should be adequate in what is now widely accepted as the two main areas for potential development - small firms and information technology. We have expressed elsewhere our fears that the 'small firms package' will prove to be inadequate. In what follows we set out our worries on information technology.

3. It has, suddenly, become received wisdom that small firms and information technology are the most hopeful areas for future growth. The EEC Commission has recognised the crucial importance of information technology and having secured a 'fair wind' from the Dublin European Council is in the process of producing detailed proposals for a Community strategy in this area. The French had a mammoth one week conference in Paris opened by Giscard and concluded by Barre. Each European country is fearful lest it may lose out to the sheer weight of the United States and the skills and drive of the Japanese. All have programmes to improve the prospects for development of information technology.

4. But what have we in the United Kingdom done to improve the framework within which the information technology revolution might hope to progress in

Britain at least as fast as elsewhere? The CPRS believes that so far our response has been worryingly inadequate and that, as so often in the past, we are falling behind and missing the opportunities which our technology offered us (System X and Prestel). In part the problem of improving the framework lies in the complexity of the subject and the very large number of Ministries involved. (To give some idea of the breadth of the subject we attach a brief "Child's Guide" for those who are not completely clear what is meant by 'information technology' and how the range of issues it covers is much wider than that of the more familiar microprocessor or 'chip'.)

The Possibilities

5. The attached brief guide illustrates how several technologies are converging and unlocking many new possibilities. In this revolution the United Kingdom has some advantages (English is the common language of data processing and London is an important centre for commercial services). Against that we are notoriously bad at moving from new invention to production and marketing; we are not at present a major manufacturer of key products such as office equipment and our professions are often disinclined to depart from traditional practices and techniques.

The Role of the Government

6. We do not argue that the Government needs to intervene in the sense of providing industrial support. Equally, however, there is an irreducible minimum of areas where the Government needs to maintain an active interest in order to provide the right framework for the rapid take-up of information technology. In some cases this is a matter of regulation; in others of example. We list them below, commenting in each case on the adequacy of present interdepartmental arrangements for handling.

(a) Manpower - the social and retraining problems caused by changing requirements for skills; making sure that skilled manpower is available on an adequate scale and balancing the military requirements against the civil (this last could be increasingly important).

- E(EA) can handle civilian training issues; no Committee exists to balance civilian and military needs for manpower and contact between MoD and Employment/MSC in this area is, as far as we know, non-existent.

(b) The telecommunications system - the United Kingdom must have a first class telecommunications system. In the past the Post Office has always underprovided and if this occurs again there will be pressure for private satellite based networks provided by the United States or EEC multinational consortia.

- The Official Cabinet Committee, T, has the limited remit of looking at departmental requirements for telecommunications. The Department of Industry is the lead Department but Trade (good telecommunications vital for our trade in services) and Transport (telecommunications can be a substitute for transport) also have an interest.

(c) Transmission frequencies - the frequency spectrum is a vital yet limited resource and the Government must plan and control its use.

- An Official Cabinet Committee, T(F), exists; heavily dominated by the Home Office with limited FCO and no DoI (for equipment manufacturers) representation.

(d) Technical standards - standards are needed to make different systems compatible but standards may also be used by our competitors as a barrier to trade. We need to be alert to this in formulating a United Kingdom response, particularly in the EEC context (see below).

- Existing activity on standards covers an enormous field but there are gaps, e.g. no policy on compatibility of educational computer programmes for use in schools.

(e) Public sector purchasing policy - used strategically by other countries but not so far by the United Kingdom, e.g. the French are launching a cut-price Visual Display Unit (VDU) on the back of a programme to transfer directory enquiries from directories to a computerised system. A co-ordinated approach to the purchasing of word processing systems by Departments would provide a strong lead to the British office equipment industry, as well as laying the foundation for electronic document transfer between Departments.

- Handled by the Central Computing Agency and HMSO for central government with an awkward interface where they meet. Various sponsor Departments also involved. No equivalent for local government, the NHS or nationalised industries - one of the few existing examples of good co-ordination, the University Computer Board being under threat of closure.

(f) Public sector usage - the public sector as demonstrator of how efficiency can be improved by information technology.

- Handled by the CCA and HMSO with wide variations between Department and some practices which would be scarcely credible to the private sector, e.g. the manual handling of prison officers' pay. DoI has an interest as manufacturers' sponsor; CSD because of implications for staffing.

(g) R & D - the need to ensure that the balance of research effort, e.g. between government and industry, civilian and military is right and best possible use is made of foreign as well as United Kingdom results.

- Again civilian research is co-ordinated by the Advisory Board of the Research Councils but no forum exists for assessing the balance between civilian and military research.

(h) Reducing the vulnerability of information flows to strikes, sabotage, or fraud.

- Level of protection decided on a case by case basis by relevant Department and CCA; no forum for ensuring consistency of expenditure or methods.

(i) Privacy - policies on privacy, copyright, defamation (e.g. inaccurate credit rating).

- Home Office in lead on privacy; H Committee a possible interdepartmental forum. No Department appears to claim responsibility for copyright/patenting of intellectual property which has important implications for the level and flow of international trade in information services.

7. A glance at this list shows the large number of Departments involved. Leaving aside the effectiveness with which individual issues have been handled (in our view patchy) there is a major 'machinery of Government' problem of how best to ensure that related issues are considered together. An analogy might be drawn with energy in the early 1970s. Individual Departments (coal, power, etc.) were more or less active in their own sectors but before the creation of the Department of Energy there was no powerful

machinery for developing policies for energy as a whole. With the setting up of the Department it became, in principle at least, possible to bring together the interests of a number of different Departments and develop a coherent Government approach on a number of secondary issues such as energy conservation, We do not recommend the same solution in this case (i.e. a new Ministry) but we do believe that the subject is every bit as important and the arguments for improving on the present machinery similar.

8. Under our present arrangements, many examples can be quoted of inadequate and sluggish response. Prestel, which has been described as the most important British invention since the Hovercraft, is being cold-shouldered by the Department of Industry and the Central Computing Agency at the same time as the CoI is trying to promote its use within Government and in our Embassies abroad. Policies on privacy and data protection are slow to emerge from within the Home Office - at least one major foreign data processing contract has been lost as a result of the absence of United Kingdom legislation in this area. The British Standards Institute is keen to develop badly needed data processing standards which the DoI would be prepared to fund; but the Department of Trade - the sponsor Department - accords this low priority. The involvement of the Foreign Office in briefing for the World Administrative Radio Conference last year was very late and perfunctory. The Department of Education and Science does not advise on the selection of equipment for use in schools. Different education authorities are therefore acquiring different and incompatible brands of microcomputer, and are likely to do the same for video equipment. This inhibits the development of a compatible software library, be it of computer programmes or video-cassettes.

9. There is also the important European dimension. The Council of Ministers has already adopted a four-year data-processing programme which includes work on 6(a), (e) and (h) above (manpower and training problems, technical standards, and privacy). The detailed proposals being formulated following the Dublin European Council will include further work on all these aspects as well as direct encouragement to the development of the basic technology. The United Kingdom approach to discussion of these proposals in the Community will need

careful consideration. On standards the Commission's approach is essentially to complement existing national standards. There may however be a danger that those nations which have already committed large sums of public money to developing their domestic industries will seek to use Community discussion to get their standards imposed on the Community as a whole and to delay the development of potential European competitors while common European standards are agreed. But the United Kingdom industry could benefit from the opening up of European markets if acceptable and compatible European telecommunications and hardware standards could be agreed. There may also be areas, e.g. data banks in which co-operation at European level is necessary to meet American and Japanese competition. What is essential is a clear view of what our attitude to Community policy should be and how best to go about achieving the results we want.

10. As is clear from the above, the CPRS believes that improved machinery is urgently needed in Whitehall to focus attention in the information technology field and to co-ordinate government policy and improve departmental awareness. Four possibilities present themselves immediately (there may be others):

(i) The creation of an advisory body, on the lines of a Standing Royal Commission. This would allow the Government to tap expert advice, at little cost in manpower, money and administrative disruption. Its drawbacks would be that, like many non-departmental public organisations, such a body might produce only occasional Olympian reports, too narrow or too cosmic, and would not exert real, daily authority. Not recommended.

NO

(ii) The establishment of a Ministry of Information Technology. This would have the advantage that a Minister and his officials would embody and constantly demonstrate the Government's commitment in this sector. There would, in principle, be plenty for this Ministry to do but it would have to spend its time pushing every other Ministry to do it. Again not recommended.

NO

(iii) Setting up a new Cabinet Committee. An economical solution and there may indeed be a case for creating a special Cabinet Committee but that, of itself, hardly seems an adequate response, for information technology needs a lot of detailed work and co-ordination as well as broad brush policy discussions.

NO

(iv) Setting up a central unit. The activities of most Departments are affected by information technology policy. There is a case for co-ordination and direction by a central unit - on the lines of the European Unit in the Cabinet Office. To be successful a central unit needs to have a small but good staff, to have plenty to do, and to be seen to be doing it. There is no shortage of issues to consider and decisions to take in this field. The importance of these matters, as well as the character of such a unit's staff, should ensure that its work will not be ignored. It could offer a valuable source of co-ordination and expertise on which all Departments might draw, as well as servicing the relevant Ministerial and Official Committees.

Conclusion

11. In the view of the CPRS, the Whitehall approach to information technology is fragmented and inadequate. Improving the framework in this area is perhaps the most vital issue in positive micro-strategy. The machinery of government to handle it urgently needs reconsideration.

25 January 1980

INFORMATION TECHNOLOGY

A brief description

1. This note by the CPRS describes the principal techniques for handling information and the technical revolution in that handling which will increasingly affect every aspect of life. We begin by defining information and data.

2. From information we acquire knowledge. The raw material of information is data. Information processing assembles and structures data to convey knowledge.

3. We are used to data being encoded in a systematic way (letters, words, numbers, pictures, sounds) which are immediately intelligible to the human observer (the sentences on this page, a road sign, recorded messages or music).

4. With modern information technology, however, the technology itself dictates the use of coding systems which are not directly intelligible. For example, the data may be magnetically encoded, as is the magnetic stripe on a credit card, which contains the account number.

5. Data is generally presented according to a (defined) structure, which gives it a particular significance or information content. For example, we always order the date, 23/1/80, and numbers at the bottom of a cheque are always ordered - cheque number, branch number, account number. The existence and form of such structures are usually obvious to the human observer but a computer has to be programmed to recognise them.

6. In discussing the revolution in information technology, we are chiefly concerned with machine-readable data, encoded magnetically, according to a data structure which is contained in a computer programme. The programme, then, is the key to unlock the information contained in the data.

7. So although in the broadest sense the tools of information technology include everything from pencils to postal services, dictionaries to computers, in this note on the revolution in information technology we are mainly interested in:

- telecommunications, which uses radio waves and cables to extend face-to-face communication, whether broadcast (i.e. spread out) or point-to-point;

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- telecommunications, which uses radio waves and cables to extend face-to-face communication, whether broadcast (i.e. spread out) or point-to-point;

- storage technology, which enables us to store very large quantities of data cheaply and compactly;
- the processing of data by computers, which amplifies and accelerates data processing by people;
- display technology, by which information can be presented on screens instead of on paper.

In all four areas, techniques are advancing rapidly, and unit costs falling - as has been the case for at least fifteen years. A more recent trend is for the encoding systems used in telecommunications to become digital - that is, to break the data down into a succession of discrete 'bits'.

8. Communications engineers are thus able to take advantage of digital techniques which are already commonplace in the computer industry and to implement their ideas quickly in low-cost microelectronic devices. This is bringing about a convergence of communications and computing. The combined subject is known as 'telematique' in France, and as information technology in this paper. The two disciplines are expected to feed on each other and maintain or increase the historical growth rate of over 15 per cent which this sector of the economy has enjoyed (i.e. a 400 per cent growth over the next 15 years). One example is Prestel, bringing together computer, telephone and television to create a new publishing medium. Another is the word processor, which today brings together keyboard, microprocessor, storage technology and visual display and tomorrow will add a communications link, thereby creating the 'electronic office'.

Areas of technical development

9. In each of the four areas, much exciting work is occuring:

A. Telecommunications:

(i) Radio:

Radio communication depends on electromagnetic waves of various frequencies, collectively known as the frequency spectrum. The spectrum is a global resource of fixed size. The available frequencies are in constant and increasing demand for television, telegraph, telephone and telex services, for fixed and mobile point-to-point communication between aircraft, ships, police and emergency services, taxis and other motorised services, for satellite communication. New techniques are enabling us to make more efficient use of the spectrum. These include techniques for putting data into digital form and super-imposing it on a carrier wave, so that the data-carrying capacity is increased; and techniques for squashing frequency bands more closely together, without interference. Such developments do not, however, reduce the need for disciplined use of the spectrum, which it is the task of the International Telecommunications Union to promote.

(ii) Satellites:

As well as being celestial repeater stations, bouncing radio signals from one part of the Earth to another, satellites can be used for 'remote earth sensing', to monitor land, sea and air pollution, inspect agricultural and marine stocks, seek out mineral deposits, and predict the weather. A possible future application is power generation from the sun.

(iii) Cables:

Cable transmission is no more than a way of constraining a radio signal to travel between two points in a closed container. This can be done with a fraction of the power that broadcasting requires, and a reasonable degree of privacy.

Since the information-carrying capacity of an electromagnetic wave increases with its frequency, the demand for increased transmission capacity has driven communications engineers to exploit the higher frequencies in the spectrum.

Thus the twisted pair of copper wires, used in today's low-frequency telephone network, will gradually be displaced by coaxial cables, operating at similar frequencies to the household television; waveguides, using microwave; and, the highest of all, optical fibres, using visible light. Light is an electromagnetic wave like the rest; it just happens to be detectable by the eye.

The light source used is the laser, until recently a laboratory curiosity but now found in computer printers and supermarket cash-tills as well as optical fibre transmission systems. Optical fibre cables can simultaneously carry hundreds of thousands of telephone conversations, or equivalent amounts of data; they will be the motorways of the future telecommunications network. Based on glass rather than copper, optical fibres are manufactured from cheap and plentiful raw materials and are immune to eavesdropping or interference.

Despite these evident advantages, the deployment of these new technologies will be slow because of the enormous capital investment in yesterday's equipment and the cost of re-equipping in bulk.

(iv) Switching:

Traditionally, telephone callers have been connected with one another by telephone exchanges, which step by step make the links through the network. Much of the British telephone system still uses the Strowger automatic

exchange, invented by an American undertaker in 1899, or the electro-magnetic Crossbar system, first installed in Sweden in 1926. Since most calls today require dialling of at least seven digits, and for international calls up to fifteen digits, such exchanges are now very slow and prone to inaccuracy.

The programmable microprocessor is taking over from the Strowger exchange, just as it has from so many other conventional electro-mechanical devices. Not only does it perform the traditional functions faster, and more reliably; it does so at lower cost, in less space, and with less power. It can also do things which were impossible before - store frequently used numbers; re-dial until a wanted number is free, switch a caller to an alternate number, and much more. It gives us the 'intelligent telephone'.

In System X, the Post Office implementation of electronic switching, a family of electronic modules can be arranged in many combinations to make an exchange of the capacity and characteristics desired - like electronic Lego. Separate modules are responsible for call routeing, accounting, overload control, fault diagnosis and the compilation of statistics for system planning.

(v) Packet Switching:

This is a specialised way of running a telephone network, suitable only for computer data, not voice, communications. The aim is to make the best use of all the network resources - lines, switching centres and so on, which should mean lower charges to the customer. The method of operation is analogous to the postal service, in that a data message is broken into packets, which are each given the address of the recipient, and posted into the network. The paths they follow through the network are computer-controlled, and depend on how busy the various parts of the network are. If the direct line is busy, another route is chosen.

In contrast to the postal service, however, delivery of the packets is in the order in which they were sent. Moreover, delivery times have to be kept within a fairly narrow range - up to about a quarter of a second - or the equipment at each end will not work properly.

The Post Office has invested £150m. in this between 1976 and mid-1979; by mid-1980, there will be nine packet-switching centres in Britain.

B. Storage Technology:

Typing words on paper is an everyday example of storage technology. The unit of information is a letter, the storage medium is paper, and the storage device operates by colouring the storage medium according to certain arbitrary but recognisable patterns.

The storage technologies with which we are concerned are in a sense much more primitive than this. Because they rely on physical phenomena such as magnetism, the unit of information with which they deal is the very smallest possible: the bit (binary digit), which can have only two values, 0 or 1. This can be represented by magnetisation: North = 0, South = 1; by voltage: on = 0, off = 1; and so on. More complex units of information, such as decimal numbers and letters of the alphabet, are built up from patterns of binary digits: groups of four, six or eight, depending on the coding system used.

There are many techniques and technologies for storing binary data, from microelectronic circuits and magnetic devices to optical devices now being developed, in which information is stored by burning holes in an opaque film, using a high-powered laser, and retrieved by sensing the pattern of holes with a low-powered laser.

No single storage technology will emerge as dominant, because the designer must select the best compromise between cost and the physical characteristics he wants: storage capacity, time to access a bit, and data transfer rate. Faster devices cost more and have lower capacity. However, in all technologies that are now available the cost per unit of stored information is falling by about 25 per cent per annum. It seems likely to continue to do so for several years to come.

Optical storage devices, just around the corner, offer the possibility for cheap archival storage of reference materials on a vast scale.

C. Data Processing by Computer:

Computers used to be large, centralised, and remote from most of their users. Such central systems will continue to exist and expand, as the guardians of corporate data. In coming years it will be necessary to devote increasing attention to safeguarding the data from unauthorised alteration or disclosure.

Meanwhile, many simple operations (and about 90 per cent of a computer's work-load consists of these) can now be done economically on much smaller, office-based computers, which may refer to the central complex only when they need to. This is known as distributed processing.

Word processing, in which documents can be prepared and revised using a screen and keyboard, is a special case of distributed processing. Its use is growing rapidly, because of the enormous productivity gains which it brings - typically 100 per cent. Not all word processors are connected to a central complex, but in the electronic office of the future, a completed memo will be sent to the central complex for copying, mailing and filing - all done electronically.

D. Visual Display:

Just as the keyboard is the predominant device for putting data into a computer, so the visual display is, and will remain, the predominant device for getting information out. Widespread use of voice input and output, the next major development, is still some years away. Visual displays are fast and versatile; they can use colours and diagrams; and their cost is falling.

These developments do not only benefit professional computer users; they also assist the ordinary user of 'viewdata' services, at home, at school and in the workplace.

We are already familiar with 'teletext' services, allowing subscribers to summon textual messages (like news headlines) on to a television screen. Now a whole range of new information services is being made available to the business and domestic consumer with the introduction of viewdata (notably the British Post Office's 'Prestel' service, now challenged by France's 'Antiope' and Canada's 'Telidon'). Words, figures and pictures are stored in a computer in such a way that they can be displayed on a modified television set. A user of either a private or a public set presses buttons on a key pad (like a pocket calculator) which connects him to the computer, summoning an index page With this, the user is guided through a set of subsidiary index pages to the information he wants (or, using a printed directory, he can obtain the desired page directly). Different organisations (some 150 by the end of 1979) contract with the Post Office to provide several hundred thousand pages of information; the Post Office manages the computer system and acts as the carrier. An information provider may charge the customer for the right to review a page; the Post Office will bill the user and pay the provider.

The potential uses of these services are many: to offer timetables, telephone directories (as France is now planning), stock market prices, classified advertisements and information on library contents and current affairs. As printing and distribution costs rise and communications and computing costs fall, viewdata may in some respects replace the daily newspaper.

As well as a general service, viewdata can offer a system for 'closed groups' of users to store information and transmit it to a limited number of users, who are given an appropriate password. Individuals or different categories of individuals within the group can be barred, if necessary, from receiving certain material.

Further developments, already in an advanced stage, enable users to answer questions from the computer by pressing buttons signifying yes or no (and, eventually, by means of an alphabetic keypad, to answer back); to control a pointer on the screen or to type figures to fill in designated spaces in the frame; and to type in a credit card number. New uses of viewdata will thus include shopping, opinion survey, medical self-diagnosis, and study.

Developments in the four areas we have chosen exemplify the marriage between communications and computing with which information technology is concerned. What will be the effects of the information revolution?

10. Implications of the Communications Revolution

(i) Immediacy/Delay - financial: many businesses exist on the leads and lags which are now an integral and unavoidable part of commercial life (the clearing banks and money markets, for example). Instantaneous fund transfer may eliminate the concept of credit and the services which depend on it.

(ii) National/International: much of our 'invisible' trade is in information; if we grasp this opportunity, it will grow. We will have to prepare to charge others for services hitherto underpriced or free and in turn to be charged ourselves. We must be on the lookout for 'data havens' (on a par with tax havens), where internationally accepted regulations of copyright, privacy, etc. will not apply.

The speed with which information technology is adopted is influenced by the degree of compatibility between devices and systems. International co-operation on 'standards' is important but it must not be taken only at face value, since some of our competitors will seek to take advantage of negotiations and agreements here.

There is already enormous international competition for sales of new telecommunications and information equipment and of the services that go with it. We have a short lead in some areas but we need to press ahead. The Post Office in particular must be encouraged to apply new techniques and the public to use them.

Such competition extends to the medium on which telecommunications depends - the electromagnetic spectrum. Ever increasing demands on the radio frequencies that are available and exploitable make it all the more important that sensible international accommodation is reached in the regular meetings of the International Telecommunications Union and in the constant debate of other international conferences. Less developed countries, moreover, are anxious not to be excluded from the communications revolution; it is essential that they should not be.

What have hitherto been discerned as merely national concerns will be seen more and more as international.

(iii) Central/Local: new communications systems will reduce the necessity for travel to offices, schools, libraries and shops in order to handle paper, to see people or to view goods. Patterns of travel and work will change. Location of housing, shops and office building will be affected. We will change our perception of what is 'central' and what is 'local'.

(iv) Industrial/Professional: jobs now done by people can be increasingly entrusted to self-monitoring machines. These can be tasks of industrial production (e.g. assembly of vehicles; production of glass and sheet-metal; spinning, weaving and stitching) or professional services (e.g. the giving of legal, medical and architectural advice; teaching and other instruction; editing and publishing). We will change our perception of the difference between 'industrial' and 'professional' occupations.

(v) Immediacy/Delay - political: events can be reported in words and pictures as they happen. We are acquiring different notions of what is shocking and what familiar. Public reaction will be easier to sample and analyse; moreover, individuals and groups will in many ways be better able to communicate their views to each other. All this will affect 'accountability', 'representation', the 'doctrine of the mandate', and the operations of pressure groups.

(vi) Access/Privilege: people may be harmed by the disclosure of inaccurate or irrelevant information; on the other hand, much of our activity will depend on the availability and use of timely, relevant and correct information about individuals, families and corporate bodies. We need to develop methods for protecting information systems against intrusion, abuse and theft and to consider to what extent data systems can and should be connected or kept separate. Government and industry, as well as individuals

and other institutions, will find that electronic records are easier and cheaper to use but more vulnerable. We will find ourselves reconsidering rules and conventions regarding secrecy, copyright and privilege.

(vii) Civil/Military: modern systems of record-keeping and transmission, of surveillance and communication give governmental and other authorities efficient means of informing the public, containing crime, fighting terrorism and organising national defence. But such systems are particularly vulnerable to strikes and sabotage. Furthermore, they are vulnerable in new ways: for example, the radiation from a nuclear explosion twenty miles above the Earth would leave human beings and buildings unscathed but would knock out electronic equipment of all sorts. Not only those who design and use military equipment but also representatives of the broadcasting organisations and manufacturing industry are already instructed in techniques of 'nuclear hardening'. We will need to reconsider our distinctions between civil matters and military defence.

(viii) Skilled/Unskilled: Able/Inadequate: the new information technology will have far-reaching effects on employment and on society. Some governments (notably Sweden) are consciously seeking ways in which telematics can help, not hinder, the old, the disabled, the ill, the slow or confused, the innumerate, those who are frightened of technology or who find it baffling. We will need to do the same.

The information revolution is already re-shaping society; this time we can try to anticipate and direct the changes that are upon us.