On September 2, 1966, a body which had sprung into existence as a result of a recommendation of the Flowers’ Report met for the first time. On March 12, 1991, it held its 220th and last meeting before becoming, initially, the Information Systems Committee of the newly formed University Funding Council, and now the Joint Information Systems Committee of the Higher Education Funding Councils for England, Scotland and Wales. What did it do and what did it achieve in those 25 years? This brief review, the precursor to a more detailed study, discusses some of the achievements of the Computer Board for Universities and Research Councils.

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1. INTRODUCTORY NOTE BY AUTHORS
Frank Verdon is a retired Civil Servant who joined the Secretariat of the Computer Board for Universities and Research Councils in 1968, serving there for almost 10 years. Mike Wells, who is Director of the Computing Service at Leeds University, was appointed a Member of the Computer Board in 1972 and served in that capacity for 4 years. Mike and Frank worked together as Chairman and Secretary respectively of two Board Working Parties in 1973 and 1975 which examined the requirements for a coordinated approach to the provision of computer networking, and which led to the creation of the Joint Network Team and of JANET. Their close personal involvement with the activities of the Board led them to undertake the production of a summary of the work and achievements of the Board, and this short paper is the first result of their efforts.

The authors would like to put on record their appreciation of the whole-hearted cooperation which they have received from all six of the Board’s Chairmen, while emphasizing that any views expressed in the paper are those of the authors. The authors are also grateful to the Public Records Office at Hayes and to the Joint Information Systems Committee of the Higher Education Funding Councils for providing access to a complete set of meeting papers for the whole period of the Board’s existence.

2. BACKGROUND: THE FLOWERS REPORT AND THE COMPUTER BOARD
The late 1950s and early 1960s had seen the emergence of the first commercially available computers, many of them from British manufacturers whose names are no longer associated primarily with computing. These included Elliott (503,803), English Electric (Deuce, KDF9), Ferranti (Atlas, Orion, Pegasus, Sirius) and LEO (Lyons Electronic Office) Computers. Throughout the 1960s a sequence of mergers and amalgamations led, via two groupings, EELM (English Electric Leo Marconi) and ICT (International Computers and Tabulators), to ICL (International Computers Limited) emerging as the dominant UK manufacturer of mainframes. Those machines were, by today’s standards, physically large and slow, with thermionic valves or discrete solid state components as their primary electronics. However, for the first time they offered the opportunity to acquire commercially produced machines that could carry out ‘automatic programming’, a capability that had until that time been the preserve of either the military or those organizations engaged in research into the capabilities of such machines. Their introduction as tools in research and education was initially slow and fragmented, being inhibited by the complexities of programming before high level languages had been devised.

In 1963 Harold Wilson, the Leader of the Labour Party, had spoken to the Party Conference of his vision of ‘The Britain that is going to be forged in the white heat of the scientific revolution’. On coming to power in 1964, one of Wilson’s first acts was to set up the Ministry of Technology. In his memoirs [1], he wrote

My frequent meetings with leading scientists, technologists and industrialists in the last two or three years of Opposition had convinced me that, if action was not taken quickly, the British computer industry would rapidly cease to exist, facing, as was the case in other European countries, the most formidable competition from the American giants. When, on the evening we took office, I asked Frank Cousins [the then Secretary of the Transport and General Workers Union] to become the first Minister of Technology, I told him that he had, in my view, about a month to save the British computer industry, and that this must be his first priority.

On March 1, 1965, the Minister informed the House of Commons of four initiatives that the Ministry of Technology was taking. Of these, the one of interest here was the second, a ‘full-scale review of the computer requirements of higher education and the research councils’ [2].

The university community was already aware of deficiencies in its computing provisions, and the University Grants Committee (UGC) had established, in March 1964, an Advisory Panel under the Chairmanship of Sir Willis Jackson (Later Lord Jackson of Burnley, Professor of Electrical Engineering at Imperial College, Vice President of the University of Manchester Institute of Science and Technology, and member of the UGC), with the following terms of reference

To consider and advise in the light of available resources the University Grants Committee and Education Departments (as may be appropriate) on proposals which are referred to them for the provision of computing facilities and related matters in institutions of higher education [3, p. 8].

These two initiatives came together in the formation of the Joint Working Group, whose report in January 1966 became known as the ‘Flowers Report’. Its (commendably brief) terms of reference were

To assess the probable computer needs during the next five years of users in universities and civil research establishments receiving support from Government funds [3, p. v].

Professor (now Lord) Flowers was Langworthy Professor of Physics at the University of Manchester and a member of the Council for Scientific Policy; he subsequently became Chairman of the Science Research Council. When asked to carry out this study of the computing requirements for research, he gathered together a number of individuals known for their familiarity with computing matters and welded them into a committee which worked under considerable pressure (in the Report itself, Flowers noted that the Group met 10 times for 2 day meetings at fortnightly intervals in Manchester, with additional meetings in London). Professor Bob Churchhouse, a member of that Committee (and later a Chairman of the Computer Board) recalls that after an initial meeting or two, the members were individually asked to spend a weekend on one each of the various topics to be covered and return with essentially the first draft of a chapter.

Flowers was charged with suggesting a 5 year provision programme costing around £2m (at 1966 prices) per year. The proposed programme also included provision for additional recurrent costs, i.e. maintenance of new equipment and staff to run it, and Table 1 shows the actual expenditure by the Board year-by-year on both capital and recurrent items. The reported figures have been revalued to approximate 1995 values by use of Retail Prices Index (RPI). The revaluation process is justifiable for the Board’s contribution to recurrent expenditure, since much of this was for costs which moved broadly in line with the RPI.

Flowers had to posit a phased programme which attempted to balance the needs of universities of different sizes within the necessarily limited financial framework. This he did, but he also proposed in a postscript to his report that his group ‘should be succeeded by a suitably constituted permanent body responsible to the Department of Education and Science, with a continuing responsibility for co-ordinating the provision of computers to universities and research councils on a rolling five-year basis, and for the continuing reformulation of policy in a field in which technological change is very rapid’ [3, p. 80].


This body became the Computer Board for Universities and Research Councils. The Board’s terms of reference, as set out in its constitution and first report [4, p. 4], were as shown in Appendix 1. The terms of reference showed clearly that Board was to serve as a funding agency to the universities, while it was purely an advisory body to the research councils. There was an inherent tension between the Board’s need to track the UGC approach, of providing funds which levelled out differences of provision in universities, and the research council approach, of identifying and enhancing centres of excellence.

That first report was concerned, in terms of hardware provision, with implementing the recommendations of the Flowers Report within the financial constraints set by the Government, which had decreed that the 5 year programme set out in that report should be implemented over 6 years. It made a number of interesting observations, all referring to provision within the universities: firstly, that ‘multiple-access (or on-line) use of computers is clearly an area of major importance and interest to the universities’, but the Board had ‘felt obliged to concentrate its resources on what were seen as the basic computing needs of the universities’ [4, pp. 18–19]; secondly, that the Board was ‘well-placed to take a co-ordinating role in university computing matters’ [4, p. 27] and in this context it reported a submission from the institutions in the South West of a proposal for an integrated solution to their requirements; and finally, that there continued to be a ‘deficiency’ in projected computing power available mainly because of the lack of ‘very powerful computers’ at the universities of London and Manchester [4, p. 27].

Throughout these first years, the Board was required to take account of Government procurement policy—the so-called ‘Buy British’ approach. As so demurely spelt out in the Board’s report, this policy ‘places an onus upon the Board to ensure that computers made in Britain, whether by British firms or subsidiaries of foreign firms, are used wherever this is reasonably possible’ [4, p. 16]. In practice the policy was applied only to those procurements which were funded by the Board, i.e. to the universities; the research councils, who were advised by the Board, were frequently able to purchase foreign (i.e. American) equipment. Although the report noted that this policy ‘commands wide acceptance in the universities’, its full ramifications were never spelt out and were only tested to the ultimate limit in the case of the University of Glasgow, which will be referred to later. In its second report [5] the Board linked the problems of the powerful machines and the procurement
policy, noting [5, p. 16] that

the Board has been very much concerned with ICL plans for large machine development. The cancellation by ICL of developments of the 1908A created considerable difficulties for the Board, necessitating a fresh review of its large machine programme especially for the regional centres. Indeed, this review has still to be completed in the light of ICL’s plans for Project 52 [which later became ‘New Range’, with the largest system produced being designated 2980].

In a report which had as its main theme one of consolidation, there were two developments which, with hindsight, can be seen as signposts for future developments. The first was that, following a study jointly with the UGC [6], the Board’s remit was extended to include provision of computers for teaching. The second was that the Post Office (as it then was) provided free of charge for a development period 48 kbit/s lines between the five institutions in the South West (the universities of Bath, Bristol and Exeter, and in Cardiff, the University College and the University of Wales Institute of Science and Technology). These links were the first to be installed with such high transmission capability, the norm at the time being either 2400 or 4800 b.p.s.

In its third report [7] the Board drew attention to the impact of Procurement Policy on its decisions. Its Annual Report for April 1970–March 1971 had been deferred because a proposal by the University of Glasgow to replace its KDF9 with an American system had been referred to ministers and a decision had taken some time. The University had submitted a substantial case, based on technical and financial grounds, for its selection of an American system rather than one from ICL, but after prolonged consideration the case had been over-ruled by Government and ‘the Board was requested to provide ICL machines at Glasgow and Strathclyde’ [7, p. 6]. This was the only case for which the Board’s recommendation was overturned on policy grounds.

The twin themes of consolidation and procurement policy found their echo in the conclusions of the third report, where the Board noted

The period was mainly significant as one of evolving thinking on questions of regional development and the role of the major centres. . . For the three regional centres (at Edinburgh, London and Manchester) and for Cambridge, the Board saw the provision of large American machines as the only effective means of early establishment of the requisite facilities; its recommendations were

### TABLE 1. Computer Board expenditure

<table>
<thead>
<tr>
<th>Year</th>
<th>Capital (£m) (includes buildings)</th>
<th>Capital (£m) (revalued to 1995)</th>
<th>Recurrent (£m)</th>
<th>Recurrent (revalued to 1995)</th>
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</thead>
<tbody>
<tr>
<td>1966/67</td>
<td>2.58</td>
<td>24.05</td>
<td>0.19</td>
<td>1.77</td>
</tr>
<tr>
<td>1967/68</td>
<td>2.91</td>
<td>26.45</td>
<td>0.19</td>
<td>1.73</td>
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<tr>
<td>1968/69</td>
<td>3.24</td>
<td>27.73</td>
<td>0.48</td>
<td>4.11</td>
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<tr>
<td>1969/70</td>
<td>4.17</td>
<td>33.99</td>
<td>1.03</td>
<td>8.39</td>
</tr>
<tr>
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<td>5.42</td>
<td>40.76</td>
<td>1.92</td>
<td>14.44</td>
</tr>
<tr>
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<td>6.61</td>
<td>45.94</td>
<td>2.69</td>
<td>18.14</td>
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<tr>
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<td>8.60</td>
<td>55.47</td>
<td>2.39</td>
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</tr>
<tr>
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<td>9.64</td>
<td>55.53</td>
<td>2.57</td>
<td>14.80</td>
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<tr>
<td>1974/75</td>
<td>9.23</td>
<td>44.30</td>
<td>3.65</td>
<td>17.52</td>
</tr>
<tr>
<td>1975/76</td>
<td>9.31</td>
<td>36.22</td>
<td>6.24</td>
<td>24.27</td>
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<td>7.08</td>
<td>21.52</td>
<td>9.11</td>
<td>27.69</td>
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<td>12.71</td>
<td>29.87</td>
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<td>14.38</td>
<td>26.60</td>
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<td>21.91</td>
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<td>24.36</td>
<td>17.98</td>
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<td>1990/91</td>
<td>19.59</td>
<td>21.94</td>
<td>24.79</td>
<td>27.76</td>
</tr>
<tr>
<td>Totals</td>
<td>266.89</td>
<td>754.36</td>
<td>279.99</td>
<td>560.87</td>
</tr>
</tbody>
</table>

There are serious problems associated with the interpretation of the figures for capital expenditure, the bulk of which was for the provision of computing equipment. In 1965 one of the more powerful systems available in the UK was the ICL KDF9, installed in a number of universities, at a cost of the order of £500k per system. Expressed in today’s jargon, the machine had an 0.4 MHz processor, 192kbytes RAM and 8 Mbytes hard disk: a machine that small today might cost about £50 and would almost certainly have higher performance. An improvement in price-performance of a factor of (say) 10000 in a period of 30 years, an annual rate of about 35%, cannot easily be accommodated on the same basis as the increase of a factor of about 10 in the more conventional RPI. However, what the revaluation does show is that annual expenditure remained sensibly constant in real terms.
accepted, except for the projected installation at Glasgow. During the same period, however, the first four or five ICL 1906A computers have been installed [7, p. 12]. This pre-occupation with installed ‘power’ concluded the report, where the Board noted that, by end-1974 (i.e. approximately a decade after the concerns about the inadequacy of university computing were first voiced) the power available would have increased by a factor of 25, principally due to the provision of large machines.


By the time of its fourth report [8, p. 15], the emphasis was beginning to shift from sheer computing power, towards ‘quality and range of computing. . . A significant trend can be discerned from the considerable number of Remote Job Entry (RJE) terminals (basically a card reader for input and a line-printer for output) which have been installed or are on order. At the time of the report (end-1974), such terminals were seen as allowing ‘local’ installations some relief from large jobs which could be exported to remote centres. This did not necessarily imply the ‘regional centres’ (as large jobs which could be exported to remote centres. These included ‘local’ terminals as well) as the Board welcomed evidence of ‘increasing collaboration . . . between universities in geographical groupings, universities which are sharing resources, and universities with similar development interests’. Lord Flowers cited this encouragement to cooperate in the development of computing facilities as one of the more significant achievements of the Computer Board. The report formally marks this trend, being the first to record provision in terms of geographic groups of universities rather than, as previously, in terms of universities having particular types of hardware.

This cooperation was further emphasized by a number of software projects reported in 1974. These included one jointly with ICL to develop facilities within the company’s operating systems for the large 1900s, another with Computer Technology Limited (CTL) to ‘establish a comprehensive library of software’ for the firm’s equipment. One development that was reported in 1974, and has subsequently gone from strength to strength, was the establishment of the Numerical Algorithms Group (NAG) at Oxford. Originally set up at the University of Nottingham as the Nottingham Algorithms Group to ease the transition from the KDF9 to the large 1900s, NAG developed an extensive library of machine-independent algorithms—in 1974 the Mark 4 version contained ‘504 primary routines coded in ALGOL 60 and ANSI FORTRAN’. Today’s library is far more extensive.

The Board sought reassurance on future trends in university computing in two ways at this time. The first was from a consultancy study ‘of how the complex problems of anticipating and satisfying universities’ computing requirements for research and teaching could best be solved’. In the event, the pilot study (by Logica) seemed ‘unlikely to lead to the development of a method of forecasting future demand that was appropriate to the Board’ [8, pp. 3–4] and the study was shelved. The second study was by a small group under the Chairmanship of Professor Mike Wells, a Board member (with Frank Verdon as secretary), ‘to consider the feasibility of setting up a British universities computer network’ [8, p. 4]. This study was prompted by a visit by a small group from the Board to America to probe the development of ARPaNet and has to be set in the context of a comment elsewhere in the report that ‘consideration must soon be given to the case for increasing the speed of line connections to London for some universities; currently it is 2400 b.p.s. for all’ [8, p. 5]. By the following year [9] (incidentally, the first occasion on which the Board managed to fulfil its obligation to produce an ‘Annual Report’ covering a 1-year period), the Board’s principal concern seemed to be with reconciling its commitments to equipment purchases with the Government’s financial constraints, introduced in 1973, when the Chancellor of the Exchequer wielded what became known as ‘The Barber Axe’ because of the impact of rapidly rising oil prices. The Board foresaw two possible means of addressing this problem at source—the first was by the formation of a network, the second by introducing a form of charging. The first of these was to assume increasing significance in the development of university computing for the remainder of the Board’s existence and indeed the Board reported its intention to support the participation of a number of universities in the evaluation of the Post Office’s ‘Experimental Packet Switched Service’ (EPSS). Charging for computer time was an albatross that had been placed on the Board’s shoulders by Flowers and of which it was never rid.

The Board’s relationship with the UK computer industry was highlighted in this fifth report by the note that its order for three of ICL’s ‘New Range’ systems, to a total value of £5m, had been included in that Company’s product launch announcement. This cooperation was further illustrated by the fact that ‘the Board, together with the Vice-Chancellors and Principals of the universities concerned, accepted . . . a delay of 6 months in the delivery of the two larger systems in order that ICL could fulfill a prestigious order from the European Space Research Organisation’ [9, p. 6]. This apparent cosiness hid considerable tensions between the universities and ICL, who were accused at the time of taking a ‘nanny knows best’ attitude to the development of the operating systems for the New Range. ‘Coded evidence’ (to use the current terminology) of these tensions appears in the Board’s report for the following year [10] where it is noted that the Directors of sites receiving 2900 (New Range) systems met with ICL ‘to instigate and control cooperative projects . . . for the development of software for the range’.

A novel feature of the 1974/75 report is the inclusion for the first, and only, time of figures showing the ‘serviceability’ of all university computers. The Board’s terms of reference required it to ‘satisfy itself that computers and equipment provided . . . are effectively commissioned, adequately used and efficiently managed’. The Board therefore decided to gather statistics on serviceability and
publish them as a spur to both computer managers and service organizations: in fact, it did so only for a single year.

There is a certain blandness about this fifth report, a lack of the direction obvious in earlier versions. Whether this lacuna was caused by the constraints of finance or because for the first time the Board had no representation from its original membership, or both, is difficult to determine. Dr (now Lord) Henry Chilver had become Chairman in January 1975 and Dr (now Professor) Henry Norton had taken over as Secretary in November 1974. Because of the change in both executive officers, it was decided to hold a 'policy review' meeting in November 1975, whose outcome was a forecast for the next decade [11].

The review is interesting, not so much for its penetrating insight into the future as for its recounting of the most fundamental developments in computing over the preceding decade. Converting its figures to bytes, rather than bits, it states that in 1966 a 'large university' installation had 128 kbytes of core and about 500 kbytes of drum store; by 1976 these figures had increased to 1 and 1000 Mbytes respectively. The review does not then attempt to forecast what these figures would be a decade later, but posits levels of expenditure on calculating power (replacement of 'mainframes' every 10 years), and provision of 125 Mbytes of 'database storage' and 20 interactive terminals per 1000 students.

Two proposals for investment, rather than simply statements of policy, are of historical interest. The first follows immediately from the comments above about developments in personal computing. The Board foresaw the development of microprocessors as likely to 'reinforce the trend' towards the distribution of computing power, leading 'to some processing power being associated with individual teletype and visual display terminals'.

The second, and essentially central, statement in the report related to networking. Based on a second study undertaken by Professor Wells (again with support from Frank Verdon), the report noted 'There are no technical obstacles to the development of a national network'. Presciently it added that 'the area that will require the greatest attention in the development of a network will be the management' [11, p. 12]. This would be needed to reconcile local and national requirements, and the interests of universities and research councils. To effect the planning and implementation of networking, the Board announced that it was setting up a small full-time unit in collaboration with the research councils, the Post Office, and the Department of Trade and Industry. It was this body which, in the fullness of time, grew and developed into the present Joint Network Team.

By 1977 [12], the Board’s report was even shorter. Its principal point was a cut of some £4m in its allocation for 1977/78 (in total, from an estimate of around £20–16m), a reduction which seriously impacted the Board’s plans to replace and improve provision on a 10 year cycle. Initially, the Board had predicated a 7 year replacement cycle, but financial pressures from the early 1970s had forced this to be extended to a 10 year periodicity, which became formalized in ‘Computers in Higher Education and Research: The Next Decade’ and it was this longer period which was now under threat of further extension. The principal cause of the financial problem at this time (1976) was pressure from the International Monetary Fund on the Government to rein back public expenditure. However, by the time of its 1979 report [13] the Board was still postulating a 10 year mainframe replacement and enhancement cycle ‘...as every university is expected to have a mainframe replacement in that timescale... (although) the university will still have to justify the need for replacement and also the type and scale of facilities requested’ [13, p. 10]. This 10 year cycle was modified in 1981, when the Board decided to ‘...review each computing centre every 5 years; mainframe replacement will still take place, in general, every 10 years and there will be a mid-term review to determine if a significant enhancement is justified’ [14, p. 10]. With this new *modus operandi* a new ‘Minor Facilities Grant’ was also introduced, an annual grant which each university could use at its own discretion to purchase whatever minor equipment or services it felt necessary.

Also in 1979, the Board supported a recommendation from one of its Working Parties that there should continue to be two major centres, one each at London and Manchester, and that the relationship and balance between these and the SRC Atlas Laboratory facility needed review. Although the primary role of these centres was to provide the gross computing power essential to address problems of increasing mathematical complexity, the Board identified ‘a number of problems that can be tackled more expeditiously on a computer with some form of parallel processing’ [13, p. 5]. Accordingly it negotiated with ICL the installation of a Distributed Array Processor (DAP) with an array of 64 × 64 processing elements to be attached to the ICL system at Queen Mary College in London.

The Board also looked at the impact of micro-processors and other micro-technology on the provision of central computer services. The Working Party that carried out this study made 11 recommendations, which need not be reproduced in full here. However, one very forward-looking theme linking a number of the recommendations was that the Board should stimulate and guide the implementation of a standard campus networking system with connection to the nationwide network. These two developments became known with time as the LAN and WAN (Local and Wide Area Networks), and, it is claimed, gave the UK a significant lead in the evolution of network standards which are now commonplace.

In the concluding paragraph of its eighth report, the Board writes...
Following the period covered by the report noted above (and the election of the 1979 Conservative Government) a study of ‘Quangoes’ was set up by the Prime Minister—the Plätzky study. This study concluded that there was a need for a ‘permanent and independent central body to assess universities’ requirements for computing, establish a hierarchy of facilities, ensure cooperation, compatibility and rights of access, and undertake the continuing reformulation of policy in a field in which technological change is very rapid’ [15]. Interviewed by the writers early in 1995, Lord Chilver, who as Dr A. H. Chilver had been Chairman of the Board at the time, said that he felt that the Board’s conviction that it still had a role to fulfil was shared by the study group, whereas 10 years later the Board and the Department’s perception was that the time was ripe for the Board’s functions to be absorbed by the wider funding organizations. Other (unpublished) papers reveal that the Board was able to demonstrate that the ‘savings’ that would be effected by merging its functions with those of the UGC would be less than the Board saved each year in ‘bulk’ discounts from suppliers.

This report dwelt on the ‘rising cost of software and the prospect of software costs becoming a more major (sic) element of expenditure on computing provision as new technology was reducing the cost of hardware’ [15, p. 8]. It identified five categories of software, of which the Board undertook to provide the two ‘kernel’ sets automatically. Of these the foremost was the NAG Library, referred to earlier in this article, and the Board noted, with obvious delight doubtless tinged with relief, that in 1980/81 NAG Limited reached an historic landmark by becoming financially independent.

This report also finally laid to rest the spectre of ‘real money’ charging for computer time, which had been recommended by Flowers. The Working Party that had been set up to study the subject concluded that the existing procedures, whereby funds for central computing are allocated within the Department of Education and Science in competition with funds for other university expenditure, provided sufficient control of expenditure on computing services and that any benefits from extending the present arrangements would be outweighed by the extra costs and administrative effort incurred in charging [15, p. 9].

However, it added a rider that ‘universities should continuously keep under review the methods used for the control and monitoring of allocation and usage of computing facilities’. There is as yet insufficient evidence to determine the relationship between the presence or absence of a charging scheme and the excellence of a university computing service.

Networking also bulked large in the Board’s work for this period. It note that the Joint Network Team (JNT) which it had set up in association with the research councils and the Department of Trade and Industry had produced three reports, and was being encouraged to produce interim UK standards that moved the community towards Open System

Interconnection (OSI) standards that were being developed by the international community (acronymically led by the International Standards Organization, or ISO). The set of standards developed by the JNT became known as the ‘Rainbow Books’ because each (FTP, JTP, etc.) was contained in a book having a distinctively coloured cover. The Board quotes from an American report [16], issued in December 1982, which referred to UK network developments as ‘an aggressive foreign national initiative providing a striking contrast to the current state of planning in the US’.

5. FROM FUNDING AGENCY TO CATALOGUE: 1982–1991

At this time, also, the Board began its move from being essentially a provider of hardware and a catalyst for cooperation in software towards a role of positive stimulus for new developments. It announced that it was setting up a Microprocessor Support Unit at the South West Universities Regional Computer Centre to provide a number of support facilities for micro-processor units within the UK university community at large. We shall see this change in emphasis, from funding agent to promoter of initiatives, continue and expand over the remainder of the Board’s existence.

An example is immediately found in the Board’s report in 1985 [17, p. 3], where the first points noted in the introductory remarks were the extension of ‘computing and communications facilities throughout the academic community’. The report continued by noting that the Board ‘has sought to ensure that its [information technology] development in both teaching and research is stimulated and co-ordinated’. It then congratulated itself by noting that it ‘has continued its pioneering work in this [networking] area by the development of a wide area network—the Joint Academic NETwork (JANET)—to connect all universities and research council sites together with some polytechnics’. This emphasis on the evolution and positive development of networking as an essential infrastructure is continued in the body of the report, where the topic occupies almost one-sixth of the text.

Some of the reasons for this network development are pointed up by the announcements of provision at the Universities of London and Manchester of major facilities for the whole community. These included a Cray system at London and a Control Data Corporation Cyber 205 at Manchester. The report noted the problems encountered setting up these services, the way they were overcome and the rapid build-up of usage leading to the need for early enhancement to eliminate bottlenecks.

6. END OF THE COMPUTER BOARD: AN EVALUATION

In the 1985 report [17], some 19 years after the Board had been set up, the signs of change began to appear, whether within the DES or the UGC it is difficult to say even with hindsight. In comments on its own future, the Board noted
that its traditional role in the provision of large mainframes [is changing] to the support of distributed facilities. Many departmental computers are now funded by the UGC and the research councils, but the central role of the Board in supporting standardised networking arrangements is becoming increasingly more important [17, p. 15].

In conjunction with this role, the Board was also taking a more pro-active function by providing funds for a ‘Teaching Initiative’ because of the positive response to its report on Computers for Teaching [14]. This trend was, perhaps, only an extension of its long-held view that proper support of computing, e.g. in terms of appropriate maintenance and staffing levels, was as important to a successful service as the provision of hardware.

When the Board reported to the Secretary of State at the Department of Education and Science in 1988 [18], its terms of reference had expanded radically and had become those shown at Appendix 2. In other words, after approximately 20 years in being, the Board required 510 words to define its remit, rather than the 135 with which it had started. The realities and complexities of university computing had changed since the Flowers Report, but the terms of reference provided in 1966 could have been interpreted to cover the Board’s ongoing programme; the change was initiated by the Board itself because ‘the original terms of reference had become outdated due to technological developments’. In this expansion of verbiage it is possible to detect the beginning of the end—an organization seeking to justify its existence by spelling out the minutiae of its remit.

Whilst this penultimate report continued to emphasize the centrality of communications facilities in the evolution of university computing, it drew attention also to the need for ‘supercomputing’ facilities for the community served by the universities and the research councils. The report of a Working Party was obviously well received and some £18m was provided as a result by the various funding bodies, of which £5m was for the development of JANET over a 3 year period.

The final report [19] begins with the comment that ‘significant developments in computing and communications technology have made the concept of the electronic campus an increasingly realistic one’. This, perhaps, illustrates better than anything the changes over the 25 years of the Board’s existence. Whilst its first report was concerned exclusively with the provision of a basic level of computer (batch-orientated) service to meet the research needs of each of the universities, this last listed Board initiatives in the support of equipment donations, knowledge-based systems, training, use of computers in teaching and benchmarking in a complex environment.

The last public statement by the Board was this:

The Computer Board was in existence for 25 years, during which time the use of computers in universities spread from being the preserve of a few specialists to the point where computers are used extensively in all subject areas. By helping universities to develop strategic proposals which take account of the rapid pace of technological change, by initiating developments, and by promoting sound procurement procedures, the Board played a vital part in this process [19, p. 11].

It might reasonably be thought that these words are too self-congratulatory, and an objective view of the Board’s achievements might paint a different picture. The problem is in deciding on objective measures to apply. The crudest of these—the financial impact of the Board—is, nevertheless quite impressive. In actual cash terms, i.e. using the reported expenditure uncorrected for current values, the Board spent £267m on capital equipment and £280m on recurrent support in its 25 years. By any measure, this investment is non-trivial, and the fact that inherently some of it was ‘directed’ at the infrastructure of academic computing, in terms of networking, the provision of major (national) facilities, software coordination and support, and latterly the teaching and knowledge-based initiatives has to weigh very heavily in the Board’s favour.

Putting a quantitative measure to the improvement in facilities available to the universities is not so straightforward. In 1965, the Flowers report included a graph showing the projected increase in computing ‘power’ that would result from implementing the programme he had recommended. This was in terms of ‘7090 units’, and showed the installed capacity increasing by a factor of 10 (from 14 to 140) between 1965 and 1970. In fact, subsequent Board reports indicated that the higher figure was not attained until about 1972, by which time the development of multi-access and the mini-computer was beginning to make crude assessments of power less valid. Today, with the system sitting on the desk having a computing capability at least as great as the 7090 and with the number of such systems in the universities measured in thousands, it would be a very brave (or very foolish) person who attempted to reconcile Flowers’ projections with installed power.

Was the Board a success? Like many questions which are easy to ask, this one is less easy to answer and perhaps impossible to answer in absolute terms. In such cases one must resort to comparisons and we propose two of these—one internal to the UK and one international. Both are subjective, but we believe valid.

Within the UK, there can be no doubt that throughout the period of the Board’s existence the overall standard of provision for computing within the university sector was on average consistently higher than in other parts of the Tertiary Education sector. Some of the credit for this must rest with the Board, which was able both to argue the case for funding and to ensure that those funds were spent in an economic and effective way.

If one seeks an international comparison, there is a tendency to compare the average within the UK with the best in other countries. The obvious targets for comparison are North America, Western Europe and, in later years, Japan. The best-equipped universities in North America were (and are) better equipped than any within the UK. Within Western
Europe the best equipped sites have been effectively identical with those in the UK. In Japan, willingness of manufacturers to make equipment available at effectively zero cost provided at least more prestigious establishments with very powerful systems. However, throughout its existence, the work of the Board and its openly stated support ensured a high average level of provision within the UK. Of equal importance, the Board made it financially feasible for workers in any university to gain access to the most powerful facilities on a shared basis, provided the networking to facilitate this access and guaranteed local support to foster it. It is in this that the Board’s real success was to be found.

REFERENCES


(a) To carry forward on the basis of planned development, allowing for modular growth and compatibility, the proposals for providing computers for research in universities and research councils announced by the Secretary of State for Education and Science in the House of Commons on 21st December 1965 in the light of the report of the Joint Working Group on Computers for Research.

(b) On the basis of a continuing review of needs, to make recommendations to the Secretary of State in respect of provision of computers to universities and to advise Research Councils on their computer proposals (including significant peripheral equipment, but excluding computers provided solely and essentially for the purpose of specific research projects).

(c) To satisfy itself that computers and equipment provided under the programme are effectively commissioned, adequately used and efficiently managed.

APPENDIX 2: TERMS OF REFERENCE OF THE COMPUTER BOARD (1988) [18]

(a) To advise the Secretary of State on the needs of the United Kingdom universities in receipt of grant on the recommendation of the University Grants Committee, hereafter referred to as ‘the universities’, for computing and communications facilities for research and teaching and on the allocation of such funds as may be voted by Parliament for the provision and development of such facilities.

(b) To promote the development of cooperation between the universities and other academic bodies including the research councils, in the use of computing facilities, with the aim of achieving the most effective use of resources.

(c) To advise the Secretary of State on the development and running of the Joint Academic Network (JANET) and to promote the development of networks based on common standards for data communications.

(d) To make recommendations to the Secretary of State concerning the payment of grants to such institutions or persons and for such purposes as the Board considered necessary to secure the development and provision of effective, efficient and economic computing services for the universities and the sharing of such services between the universities, research councils and other bodies. Such grants may include, inter alia:

1. grants to universities for the purchase, leasing, installation and maintenance of computing equipment, software and data communications facilities;
2. grants to universities and to other bodies for the establishment, equipment accommodation, operation and maintenance of national centres providing...
computing facilities for use by agreed users (the universities, research councils, polytechnics, Cranfield Institute of Technology, the Royal College of Art, the Open University and such other institutes as the Secretary of State may from time to time agree) and for the development and provision of communications facilities for such use; and

(3) grants to universities, research councils or other bodies.

(e) To advise the Secretary of State on the conditions to be attached to any grants that he may make on the Board’s recommendations, in particular whether the use of facilities provided through such grants should be subject to the application of a peer review mechanism or the payment of any charges.

(f) To advise the Secretary of State on the computing needs of the Open University, the Cranfield Institute of Technology and the Royal College of Art.

(g) To advise the research councils on their provision of computing and related communications facilities (excluding facilities provided exclusively for the purpose of specific research projects).

(h) To publish information on the Board’s activities and plans and to collect and publish information on the computing practice and facilities of the universities and other bodies on whose needs the Board advises the Secretary of State.

(i) To provide such advice on the computing and communications needs of other bodies or institutions as the Secretary of State may from time to time request.

(j) To satisfy itself that computing and communications facilities provided pursuant to its grant recommendations are effectively commissioned, adequately used and efficiently managed.

(k) To study, consult and organize such other activities in pursuit of or incidental to the Board’s terms of reference as the Board considers appropriate.