New Office Technology

1986
NEW OFFICE TECHNOLOGY

A REPORT TO THE PRIME MINISTER
BY THE
AUSTRALIAN SCIENCE AND TECHNOLOGY COUNCIL
(ASTEC)
PREPARED BY THE
TECHNOLOGICAL CHANGE COMMITTEE

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My dear Prime Minister

We have the honour to present to you a report on new office technology. This has been prepared by the Technological Change Committee, a standing committee of ASTEC.

In this report we describe developments in Australia and overseas in this rapidly changing area of technology. We consider the effects which the adoption of the technology is likely to have on firms and public organisations, in terms of the way in which business is conducted and the productivity of offices. We also look at the effects of technological change on office employment.

The report contains recommendations for actions by the Government which we believe will assist Australian companies to take advantage of the opportunities the technology offers, and also ensure an equitable distribution of the costs and benefits of its introduction.

Yours sincerely

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For and on behalf of:

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The Honourable R J L Hawke AC MP  
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1. The ASTEC Technological Change Committee is to maintain a continuing review of the processes and trends in technological change in Australia and elsewhere, and evaluate and report on the direct and indirect effects at the national level including social, economic and technological effects.

2. The Committee is to identify and evaluate new and changing technologies of importance to Australia, and factors favouring, or restraints impeding, the introduction or diffusion within Australia of new or existing technologies.

3. The Committee is to consider community attitudes recognising the need to increase the national community awareness and understanding of issues arising as the result of technological change.

4. The Committee is to carry out studies of technological change as required above and also in response to requests from ASTEC, noting that ASTEC may receive requests from the Commonwealth Government.

5. The Committee is to report to ASTEC making recommendations, where appropriate, aimed at deriving maximum benefit to Australia from technological change.
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1 SUMMARY AND RECOMMENDATIONS

1.1 New office technologies are developments which enhance the capacity of the office to perform its functions and have significant effects on people working in offices. They do this by increasing the speed, improving the quality and reducing the cost of existing office activities, and by providing entirely new means to achieve the goals of the office. The new technologies centre on computers, computer software and communications networks.

1.2 The capabilities of the emerging technologies permit radical departures from existing methods of performing office functions. Many forms of new office technology are already being widely adopted and the pace of development remains rapid. The new technologies are likely not only to transform the office, in a way which dramatically increases productivity, but also to alter the ways in which organisations and industries are structured. The division of functions between those which are performed within the organisation and those which are purchased from outside suppliers will change. So too will the most efficient size of organisation. An important development is likely to be the emergence of international trade in office services. These technologies can remove the existing natural protection from international competition traditionally enjoyed by office activities, especially in computer services and banking.

1.3 In multi-unit organisations the technologies can be and have been used to centralise control functions in head office or to decentralise control and other functions to the unit level. The centralisation of management functions can provide better overall control and assist with the development and implementation of strategic planning. Decentralisation can make more efficient use of resources and can improve morale and commitment by involving lower-level managers in corporate decision-making. Factors other than the technologies will determine which outcomes predominate.

1.4 Part of the data on which this report draws come from a survey conducted by ASTEC for the purpose. While we cannot be confident that the respondents accurately represent all Australian firms, we can draw a number of valuable inferences from the data.

1.5 The survey results, together with other sources of information, indicate that the overall rate of diffusion of new office technology in Australia is satisfactory. There are no grounds for government action to attempt to accelerate the rate of diffusion, except amongst small businesses. Even there, it is not acquisition which should be promoted, but awareness of optimum use and the ability to assess the alternatives.

1.6 The successful introduction of the more sophisticated technologies is not easy. It requires that the purposes of the office and the ways of achieving them be thoroughly thought through (a process which can enhance productivity on its own). Work processes generally have to be restructured to take advantage of the new capacities. Since each office has some characteristics peculiar to itself, much of this process cannot be learned, except by experience and the mistakes that go with it. Organisations will be more likely to accept this uncomfortable challenge if they are pressed by competitive pressures to do so. Office technology,
unlike some other advanced technologies (in manufacturing, for example) is widely
promoted through advertising and other marketing means. Users of the technology
face a significant challenge in making appropriate choices.

1.7 Many of these developments will proceed as a result of the commercial
judgements of producers and users of the new technologies. In our view, the
principal role of government should be to create an economic environment
conducive to growth. Decisions about the types of technologies to be developed
and adopted are best left to the private sector. There are, however, some
facilitating actions which government can take, and it is also necessary that
government intervene to ensure that appropriate measures to protect the health
and safety of workers are devised and adopted. The recommendations which
follow are consistent with this view of an important but limited role for
government in promoting the development and adoption of new office technology.

1.8 Australia is largely dependent upon the diffusion of overseas develop-
ments and thus major research and development programs in office technology
undertaken by other countries need to be monitored and assessed. Although some
companies already obtain information of this sort, having made the effort to
obtain it, they do not generally make it available to others. There is, therefore, a
case for government action to provide a continuous, broadly-based assessment of
overseas work, in order to reduce the costs and improve access to this infor-
mation. The scientific councillor network of the Department of Science, which
also provides information on technology for the Department of Industry,
Technology and Commerce, can make an important contribution to this assessment,
as could the industry-based information gathering network proposed in our recent
report on technology transfer. The information obtained through the science
councillor network is available to any company seeking it. It may also be
necessary for government-funded studies of specific aspects of computer and
information technology to be conducted from time to time.

1.9 As a result of a rapid expansion of international communications, the
flow of data across national boundaries has become a common and important
phenomenon. Office functions may now be performed at any location, in real time
or at any time. This development alone permits a rethinking of the way office
functions are organised, with implications for trade in office services, and the
contracting-out of functions at present performed in-house. ASTEC believes that it
would be neither practical nor desirable to restrict this flow of data, but rather
that Australia should seek the positive benefits which may result. However, the
privacy of some data, including personal data, needs to be protected in accordance
with the OECD guidelines. We believe a desirable outcome is the exploitation of
export markets by the office services industry in Australia. Before specific policy
can be formulated, it is necessary to study existing restrictions and trade
promotion measures in information services. The contracting-out of office
functions may have serious strategic and employment effects on Australian
companies, as well as providing a possible new industry. Overseas firms are also
aware of the possibilities; for example, in the United States the General Motors
Corporation spent over $4 500 million in one year on international computer
capacity to perform office services.
ASTEC recommends:
That the Minister for Industry, Technology and Commerce and the Minister for Trade, together with the Board of Austrade, as appropriate, examine and report on:

(i) the value of imports and exports in office and professional services (data goods and data services);
(ii) how the Australian Trade Commission could be used to promote these exports;
(iii) any existing non-tariff barriers to trade in this area;

with a view to encouraging the establishment of an export industry in office services.  

(R1: 4.32)

1.10 New office technology can automate specific tasks and this is at present the main motivation for its introduction. However, we believe that office technology should be directed primarily to achieving the overall goals and objectives of an organisation. The significance of organisational effects is not in general appreciated by management. There is a role for government assistance in the dissemination of information on the importance of organisational effects on productivity, organisational issues in implementation, and the management of information as a single resource. Evaluation of competing products might also be undertaken by a body without vendor-bias. A demand for services of this type has been demonstrated by the activities of demonstration centres in Melbourne and Adelaide.

ASTEC recommends:
That the Government provide seed funds to establish additional co-operative ventures between State Governments, tertiary education institutions and business groups, such as the Australian Microcomputer Demonstration Centre in Adelaide and the Australian Microcomputer Industry Clearinghouse in Melbourne, to provide information, training and advice on the choice of systems in new office technology.  

(R2: 4.36)

1.11 A useful program of activities is currently being carried out by the National Information Technology Council (NITC). The NITC is playing a role in generating awareness about the benefits of information technology. Its work is seen to be at arm's length from government bodies, and it supplements existing government programs in industry awareness. The NITC's activities could usefully be extended to include publicly-funded pilot consultancies in the application of new office technology for representative industrial groups. This role is not at present carried out by any other business advisory group.
ASTEC recommends:
That the Minister for Industry, Technology and Commerce provide additional resources to the National Information Technology Council to enable it:

(i) to carry out its information dissemination programs to benefit more managers of small businesses in particular and the community in general;

(ii) to let contracts for pilot consultancies, initially for five representative industry groups in the office sector in the first year, in order to identify the kinds of technology available and their specific benefits for the particular group;

(iii) to review these pilot consultancies after one year; if the consultancies are judged beneficial by the relevant industry groups, consultancies could be undertaken for other industry groups in the office sector. (R3: 4.38)

1.12 A large proportion of the labour force is employed in office work and that proportion is still growing, but at a slower rate than was once the case and with some replacement of full-time work by part-time work, coupled with a substantial growth in part-time work. It is an especially important source of employment for women and for new entrants to the workforce. The future effects of new office technology on the numbers of office jobs cannot at this stage be forecast. It will depend, among other things, on the rate of growth in the demand for such services, as they become cheaper and of better quality, and the ability of Australian firms to compete successfully in international trade in this area. On the assumption that economic growth continues at present rates, we judge it to be most probable that in the longer term there will cease to be growth in the employment of office workers, especially in the more routine jobs.

1.13 We believe it is a proper role of government to buffer some of the negative effects of the technology on the workforce and society at large. It is essential that jobs in this sector are closely monitored and that contingency plans in anticipation of negative effects are formulated.

ASTEC recommends:
That the Minister for Employment and Industrial Relations ensure that changes in the number and types of office jobs in Australia are monitored and evaluated in order that appropriate employment and training responses can be made. (R4: 5.10)

1.14 New office technology will undoubtedly change the nature of jobs. There is likely to be a shift away from routine data and word entry towards the use of office systems to manipulate, transfer and analyse data and other forms of information. This will require different skills from those currently used in the majority of offices. Middle management jobs are also likely to be affected. Many jobs which exist primarily to channel information up and down the company hierarchy are likely to disappear. Remaining managers will have more direct access to primary information and the mechanisms for manipulating it. They will need to become familiar, in a practical way, with much of the new technology. As middle management begins to enter data directly, there will be less need for
the traditional skills of the typist. As these trends accelerate, it is important that young people and the educational institutions receive early advice of changes in the requirements for vocational courses.

1.15 The use of keyboards will remain part of the office for some time yet and the new keyboard equipment has seriously exacerbated the risks of operators suffering repetition strain injury (RSI). This appears to be the major occupational health and safety problem associated with new office technologies, although stress problems may also arise if the technologies are used to monitor and pace employees in a coercive way. Although the precise causes of repetition strain injury remain a puzzle, there is some agreement on steps which may be taken to prevent it occurring. We believe that research, objective diagnosis and prevention measures are urgently required. The National Occupational Health and Safety Commission has produced a report containing suggestions for applying existing knowledge through preventative strategies and a model code of practice, together with proposals for research priorities to expand this knowledge. We support the continuation of this work.

1.16 The impact of the new technologies on job skills, the nature of work and work relationships is not determined by the technology itself. The way in which the office and its jobs are structured to utilise the capacities of the technologies is also very important and there is considerable scope for managers to choose the outcomes. The technologies may be introduced in a way which enhances job satisfaction, individual productivity and autonomy, or in a way which provides jobs which are routine and controlled. The design of job-enhancing change requires awareness and competence in both management and the relevant technical experts. Both require some insight into workplace human relations. Regrettably, this insight is often lacking. Sensitivity to the needs of the workforce is not only socially desirable, it is also enlightened self-interest. It is likely to result in a more willing acceptance of the changes and a keenness to make them work.

1.17 Technology agreements in the form of contracts specifying the way in which new technology will be introduced have been adopted in the public sector, but they are comparatively rare in the private sector. We believe that they offer an effective means of ensuring the efficient and equitable introduction of new office technology.

**ASTEC recommends:**

That the Minister for Employment and Industrial Relations ask the National Labour Consultative Council to promote technology agreements between employers and employees in the private sector as a mechanism for distributing the benefits and minimising the social costs of technological change in the office. Agreements should be consistent with established wage fixing principles. (R5: 5.19)

1.18 The retention and growth of an office service industry in Australia is essential considering the office sector's increasing contribution to the gross national product in recent years and its role in reducing costs in all sectors of the economy. Improved access to investment capital, for example, through the Australian Industry Development Corporation, would assist the industry. We make no recommendation on this, but draw the Corporation's attention to the importance for the future strength of the Australian economy of such investment.
1.19 A significant feature of new office technologies is their potential to integrate office and production activities in an organisation engaged in manufacture. This potential for integration has consequences for the way in which government support for manufacturers is provided. Thus, it might be argued that assistance to industry by way of tax concessions or subsidies for computers and related equipment should not distinguish between computers used in the office and computers used on the factory floor, because productivity increases in the office may lead to overall productivity increases. We do not recommend an across-the-board exemption of sales tax on computers, but note as an emerging issue the increasing difficulty of separating production activities from other functions.

1.20 The productivity potential of new office technologies will only be realised once their various components have been integrated into a common network. This integration is in its early stages at present. Among other things, its full development requires a new communications infrastructure which enables offices to communicate with each other and with the sources and destinations of information. To enable office systems throughout the country and overseas to be integrated, capital investment in a high capacity, flexible infrastructure network is, in our view, essential and ought to be a public function.

1.21 A necessary requirement to accommodate incremental improvements in quality of the products is flexibility. Maximum benefits will not accrue if incompatible systems are installed. Lack of standards precludes free competition as users have no option but to go back to the same supplier if they wish to extend their office systems. The rationale for the choice of standards is thus based on economic and not on technological grounds. We welcome efforts by Telecom Australia, other telecommunications service providers and government agencies to adopt the Open Systems Interconnection series of reference standards currently being developed by the International Consultative Committee on Telegraphy and Telephony and the International Standards Organisation as the standards for communications networks in Australia. We also welcome recent efforts by Telecom to provide users of its services with information on the nature and timing of the introduction of new communications technology.

1.22 New office technologies appear to be widespread in Australian firms. We do not consider financial incentives for diffusion either necessary or desirable in view of the marketing strategies of overseas supplier companies. We believe that the appropriateness of the technologies adopted is an issue. Domestic production capabilities particularly of the software industry help to make technology more relevant to Australian industries and business methods.

1.23 The domestic software industry is internationally competitive and is in a stronger position than the local hardware industry. It may be disadvantaged, however, by the way in which the computer market has developed, with the principal emphasis being placed on the selection of a machine and with the choice of software being a secondary consideration. The Australian industry needs large contracts to give it experience. The Government has a role in assisting in this through its purchasing policy.
ASTEC recommends:
That the Minister for Local Government and Administrative Services assist the Australian hardware and software industries to tender for government contracts by:

(i) encouraging all government departments and agencies to give careful consideration to the purchase of Australian goods and services, especially when drafting specifications;

(ii) enabling the software supplier to be the chief contractor;

(iii) ensuring that specifications encourage joint tenders by Australian manufacturers or by an Australian manufacturer in collaboration with an overseas supplier;

(iv) ensuring that the methods used to evaluate tenders do not place joint tenderers in an unfavourable position. (R6: 6.24)

1.24 Government statistics should not continue to reflect past assumptions relating to an 'industrial age' economy. The post-industrial transition in the economy is characteristic of all OECD countries and the statistics collected on the information sector of these countries ought to be directly comparable.

ASTEC recommends:
That the Australian Bureau of Statistics collect and present statistics to enable:

(i) output and employment in the information sector to be determined;

(ii) production and trade in computer hardware to be distinguished from production and trade in computer software;

and that these statistics be comparable with classifications and definitions being developed by the Committee for Information Computer and Communications Policy of the OECD. (R7: 6.25)
INTRODUCTION

2.1 This report is intended to serve three purposes. It has been prepared in order to provide information for government and for the community on changes which are taking place in office technology. It describes the issues relating to these changes which are likely to be of concern in the next few years. It recommends certain actions by government which will facilitate the development and adoption of new office technology and provide protection against its adverse effects.

2.2 The report is based on two principal activities. Firstly, an Australia-wide survey of 4000 firms, which attracted 745 replies, was conducted between September 1984 and March 1985 to determine the productivity and other effects of new office technology, as perceived by management, and the extent of its diffusion. The survey was supplemented by detailed case studies of public sector organisations. This work was undertaken jointly by the Technological Change Committee and the Information Research Unit of the University of Queensland. Secondly, a review and analysis of the literature was undertaken to provide information on developments and changes taking place overseas, and to assess the effects of the technology on organisations and on the labour force. The complete results of these activities are contained in a companion volume to this report [1]. This volume contains summaries of the main findings and discussions of the Council's conclusions, together with recommendations to government.

2.3 New office technology is defined as any recent or prospective technology used to carry out office functions. It includes a wide range of systems which are all combinations of computers and their peripheral equipment, computer software and communications networks. This technology is appearing in offices side by side with, and to some extent replacing, traditional office technology such as manual and electric typewriters, dictating machines and telegraphic and paper-based communications. The scope of this study excludes broadcasting as a means of information transmission, videotex and teletext, and electronic funds transfers. Videotex and electronic funds transfers have been considered in previous ASTEC reports prepared by the Technological Change Committee [2][3].

2.4 With the growing complexity of government, industry and commerce, the term 'office' is taking on an expanded meaning. An office may exist to purchase or sell goods, manage human resources, provide services, or transact accounts. It may support production activities in any sector of the economy or may itself produce information goods and services. Office activities constitute the bulk of the work done in the service or tertiary sector of the economy, but are also important in other sectors. In the course of carrying out office functions, letters may be written, information processed, records maintained, files kept, discussions entered into and so on. These activities, often confused with the goals of the office itself, are merely the means by which office goals are realised; they may be dispensed with if better means of carrying out office functions are found, and this indeed is happening with the introduction of new office technology [4].

2.5 Many office activities involve the handling of information. This activity has assumed such importance in recent years that it is sometimes treated as a separate sector of the economy, distinguished from the primary (agriculture and mining), secondary (manufacturing) and tertiary (service) sectors. A further
distinction is sometimes made between the information-related activities of the service sector, which are referred to as the primary information sector, and those associated with the primary and secondary sectors, which are referred to as the secondary information sector.

2.6 Further distinctions are made in the literature between the information sector, the office sector and the office-based sector. The office sector comprises the office activities of all firms and public sector organisations. The office-based sector comprises those firms and public sector organisations which have office activities as their major function. These latter are engaged principally in the provision of financial, business, administrative and management services. There is a close correspondence between the office-based sector and the primary information sector, and also between the office sector and the whole information sector. This complicated set of definitions creates difficulties in obtaining and interpreting statistics. In this report from time to time we use data from the information sector, because that is all that is available, as a proxy for what is happening in the office sector.

References


3 DEVELOPMENTS IN NEW OFFICE TECHNOLOGY

3.1 New office technology provides the mechanisms for automating office work as well as for enhancing in other ways the effectiveness of the office in meeting its objectives. Highly structured repetitive tasks are the most easily automated, although increasingly complex tasks are being tackled as more capable computer programs are developed. New office technology has the potential to affect virtually all office functions. The significance of new office technology is not merely its ability to automate specific functions but also to bring together and rationalise office functions within an integrated system. Hence document production, database management, routine word processing and internal and external communications can be achieved by the same computer-communications network [1]. Perhaps more significant is the potential of office technology to integrate all the activities of an organisation, for example, the production activities of a manufacturing company with its office functions.

Developments in the technology

3.2 The fundamental technological developments which have made new office technology possible are increasingly complex integrated circuits, including microprocessors, which have led to the present generation of computers, digital switching devices in telecommunications, and high capacity communications networks. Because the fundamental technologies are still being developed and are capable of further evolution, office technology is evolving together with them. It is clear that, for a given cost and size of machine, greater computing and data storage capacity will continue to become available [2].

3.3 Although the power of computers and the ratio of price to performance for computer hardware have improved dramatically over the last twenty years, the overall costs of office systems have not fallen correspondingly. Productivity in the development and maintenance of software has at best only doubled and software costs are rising. The high labour input of software production is the main contributor to its cost. Software costs are already exceeding hardware costs in some applications [3].

3.4 Considerable expenditure on research and development in information technologies is being undertaken by some countries. In particular, Japan's 'fifth generation computer' project has attracted considerable attention. If some of the putative goals of 'fifth generation' developments are achieved, (i.e. voice recognition, computer vision, artificial intelligence) there will be substantial improvements in succeeding generations of office technologies. The other national strategies of significance - the 'Alvey' program in the United Kingdom, the 'Esprit' program in the European Economic Community and similar work in the United States - appear to have been inspired by it, as a response to a perceived threat of Japanese domination in information technology. These information technology programs are important to Australia because we rely to a large extent on the diffusion of overseas developments for our own new technology.

3.5 Communications networks can be established between computer systems, usually microcomputers or terminals, linking them together. Two technologies for communications networks are local area networks (LANs) [4] and private automatic branch exchanges (PABXs) [5].
3.6 The diverse capabilities of new office technology include data analysis, word and data processing, a range of management systems, word, text, voice and graphics conferencing, and electronic mail. There are a few examples of different technologies which can be used for the same purpose, for example, the photocopier and facsimile machine, telex and electronic mail, local area networks and private automatic branch exchanges, automatic data processing and distributed data processing. Several of these compete with traditional services, such as the physical delivery of mail.

3.7 Changes in office technology are sequential and incremental in nature, especially when viewed in an historical context. Word processors, for example, are an improvement upon electric typewriters with limited memory capacity. Complementation of existing technology and the substitution of new equipment for existing items are key elements in the process of change. Hence a lack of co-ordination in the diffusion of sequential technologies can create unnecessary costs, as can incompatibilities between succeeding technologies.

3.8 Some technologies are still in an early stage of development, although their potential impact is great. Among these is a means of conversion between text and voice. The synthesis of artificial speech is provided by some computer systems currently in use, but the recognition of continuous speech - particularly from an unfamiliar speaker - requires a large computational capacity and is restricted in its availability. Should it eventuate, the large scale use of direct voice-to-text conversion could have a major impact on the office.

Overseas developments

3.9 Some trends emerging overseas in the effects of new office technology are as follows.

- Centralisation of decision-making by multinational firms is increasing, and there is an acceleration of specialisation of office functions both between firms and within firms [6]. However, decentralisation of decision-making is also facilitated by the new technologies; the choice depends in part on management philosophy.

- Labour productivity is expected to increase in the near future and total factor productivity to grow in the longer term [7-8].

- The rate of growth of employment in the office sector is declining. This is most marked in the routine information-handling occupations, in which women as a group predominate [9][10].

- Within the countries of the OECD there has been a considerable increase in the proportion of gross national product derived from information goods and services transacted on established markets. This trend has been evident for two decades, although the rate of growth is now declining. Throughout the OECD nearly forty per cent of gross domestic product now comes from this source [11].

3.10 In the major OECD countries (France, Japan, West Germany, the United Kingdom and the United States), investment in computers and associated peripheral equipment, measured at current prices, has been growing at between fifteen and twenty per cent per annum, and has been accounting for an increasing share of
total investment in information technology products. Within these countries, there is a variation in the rate of diffusion of computer systems among different sectors of the economy, with the financial and associated business sectors having the fastest rate of diffusion [12].

3.11 In the economies of developed countries, the proportion of the national income contributed by services, excluding wholesale and retail trade, communications and transport, was above thirty per cent in 1983. With these exclusions, the service sector approximates closely to the office-based sector. For the last three decades, insurance, banking, finance and business services have consistently been the fastest growing sectors of the economy in terms of output, overseas as well as in Australia [13][14].

3.12 The sectoral effects of new office technology include the emergence of financial conglomerates in the business and financial sectors. The scale economies offered by integrated office systems enhance the efficiency of large organisations, especially by means of decentralised information-handling, in contrast to the centralisation of decision-making. This results in the intensification of oligopolistic competition among them, leading to mergers and the emergence of firms offering a wide range of customised and packaged services covering banking, home loans, insurance and accountancy [15].

3.13 The trend towards the establishment of such conglomerates or 'financial supermarkets' is already well established in the United States, and it is now beginning to spread to Europe. The next stage of the development will be to link customers' computer systems directly to the financial network. Overall the growth of international computer communications will accelerate the process of international specialisation. Rather than occurring only between firms, this process may increasingly occur within firms [16]. Major multinational enterprises are making very substantial investments in international computer capacity to provide office services. It is reported that General Motors spent over $US2 000 million in 1984 on internal data processing and office automation and a further $US2 550 million on the purchase of a data processing company, with the aim of integrating all its computer and communications systems throughout the world [17].

Developments in Australia

3.14 The ASTEC survey provided up-to-date information on the extent to which new office technology is being used in this country. It was designed assuming a forty per cent response rate, which would have allowed the data to be projected to all Australian firms with five or more employees, with standard errors of a workable size. Smaller firms would have been somewhat under-represented. The actual response rate was only nineteen per cent and this prevented such projections being made. There may also have been some response bias towards firms most advanced in their use of new office technology and against those that have experienced major problems with computer installations. Nevertheless, the distribution by size and industrial type and across States of firms which did respond was close to the original sample. We therefore have reasonable confidence in the results.

3.15 Fifty-eight per cent of respondents to the survey had adopted new office technology: of these it was, in general, the larger firms that were making most use of the technology. Within the group of large firms, the most intensive
use was in the mining, finance and business service sectors, probably because these are the expanding sectors of the economy. In these sectors, seventy to eighty per cent of firms reported using new technology. Firms in these sectors operating overseas as well as in Australia were even larger users, eighty to eighty-eight per cent reporting the adoption of new technology. Non-users of new office technology were predominantly small firms operating at a single location.

3.16 A study conducted in August 1984 provided market forecasts for Australian hardware and software products which are similar to trends overseas i.e. about six per cent growth in expenditure on hardware and twenty per cent growth for software [18]. There are a growing number of small Australian companies in this field, as well as some large multinational enterprises, such as IBM and Sperry, which are producing equipment here. Complementing this are a number of Australian companies which see the office automation field as a segment of the information technology market in which Australia can become a world leader.

3.17 The contribution made to the economy by the office activities of firms in the manufacturing, resource and agricultural sectors (the secondary information sector) is difficult to estimate from available statistics, as these activities are generally costed as overheads of production. It is probable, however, that in 1981 this sector provided about twenty per cent of all employment [19]. If so, it was comparable to the size of the primary information sector for the same year.

3.18 Australia, as a small country, is mainly a user rather than a producer of new developments in computers and information technology. Although it should be an objective of Australian companies to compete internationally in the development and marketing of high-technology products and services, it must be recognised that this can be done only in selected areas. It is vital for Australia to monitor the progress of the major overseas research and development programs in order that both industry and government are made aware of new developments in information technology. This will facilitate the rapid adoption of new technologies where appropriate, and could also facilitate collaboration between Australian researchers and their overseas counterparts. It must be noted that such monitoring cannot be conducted without a level of complementary domestic research and development to maintain technological capability and competence within Australia. Identification of Australian industry's capabilities and strengths in areas of research and development in which Australia might collaborate in these programs could be undertaken by the relevant government departments in consultation with industry.

3.19 Some companies and industry groups already obtain information on developments in computers and information technology from journals and databases, from overseas visits and attendance at conferences and from overseas agents. Such information is generally retained for its own use by the company that has made the effort to obtain it and is not widely disseminated. There is a case for government action to provide a broadly-based assessment of overseas work. The assessment should be continuous, so that new developments are reported on as they occur. The scientific councellor network of the Department of Science, which also provides information on technology for the Department of Industry, Technology and Commerce, can make an important contribution to this assessment, as could the industry-based information gathering service proposed in our recent report on technology transfer [20]. The information obtained through the science councellor network is available to any company seeking it. It may also be necessary for government-funded studies of specific aspects of computer
and information technology to be conducted from time to time. The Technological Change Committee of ASTEC is launching a new study of advanced computer technology, however, this will be confined to certain aspects of artificial intelligence and will give prominence to social effects.

References


11. Op cit ref [9].


4.1 The introduction of new office technology may lead to major changes in the ways in which organisations operate and are structured. These changes may prove to be the most important effects of the technologies described in this report. In this chapter we describe some of the changes which are occurring.

The control of office functions

4.2 It has been suggested that the traditional office might be eliminated from production activities since office functions can be contracted-out to specialist firms. We do not consider this to be a likely development in the short term. Some office functions such as strategic planning and market forecasting are vital to a firm's survival and must be kept secure from competitors. The contracting-out of some less sensitive functions, however, is an option made possible by new office technology. As firms gain confidence in the security of activities carried out by service bureaux, the trend to contracting-out a wide range of office functions may develop.

4.3 Both centralisation and decentralisation of functions are possible with new office technology. Both may occur simultaneously within one organisation, if management perceives that there are reasons for treating different functions in different ways. Decentralisation may be costly because of the loss of economies of scale. On the other hand, decentralisation may offer such benefits as local control, closeness to users' needs, greater user access to information, the opportunity for the user to become more familiar with and capable in the use of technology, and the entrepreneurial spirit it develops among employees. Centralisation may also consolidate control, facilitate concerted and co-ordinated action in creating organisation-wide policy, and improve the co-ordination of interdependent activities.

4.4 New office technology can provide a parent company or a central office with up-to-date information on all aspects of the running of a subsidiary. This is the case, not only with a company and a subsidiary operating in the same country, but also with multinational enterprises. The opportunities provided by the technology might lead a parent company to take over some of the more important office functions of a subsidiary. This development, if widespread in a country which is dependent upon multinational enterprises for a significant contribution to its economy, could mean a loss of control within that country and an acquisition of greater control by outsiders.

4.5 An OECD study of multinational enterprises supports this view and suggests that the main effects introduced by new office technology are the following.

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1 The word organisation is used to signify any enterprise, public or private, in which a group of people work together. The term firm is used to signify a private sector organisation.
The flow of data for control functions tends to increase the degree of centralisation of multinational enterprises, thus reducing the autonomy of local affiliates. Affiliates become responsible for a progressively narrower range of functions.

The increasing specialisation of affiliates is associated with the creation, within the group, of new functional firms. Trading and co-ordinating companies, which are the most conspicuous examples of this trend, specialise in providing services to the group as a whole.

The demand for these internal co-ordination functions increases with specialisation within the groups, both in terms of the distribution of production and in terms of the range of functions affiliates can carry out.

Finally, the overall structure of multinational enterprises becomes increasingly complex, with a juxtaposition of global product divisions, domestic product affiliates and global functional management centres.

4.6 It is not clear to what extent, if at all, centralisation of control is occurring in subsidiaries of multinational enterprises located in Australia. Our impression is that the reverse might be occurring in specific instances. The ASTEC survey showed a few instances of major changes in the degree of centralisation, or in organisational control, as a result of the implementation of new technology, but there was no information on the overall direction of change. In the case of Australian firms with branches in other States, control may be becoming increasingly centralised in Sydney and Melbourne.

4.7 Although there is a lack of clear information on the subject, we are concerned that the office functions of Australian subsidiaries or branches of foreign multinational enterprises, especially those concerned with strategic planning, might be transferred to the headquarters of the parent company. We make no judgement about the effect that this might have on Australia's interests, but note that the technology makes it possible. Australia has associated itself with the OECD declaration on international investment and multinational enterprises (the OECD Guidelines) [5], which includes a statement that multinational enterprises should allow their component entities freedom to develop their activities and to exploit their competitive advantage in domestic and foreign markets, consistent with the need for specialisation and sound commercial practice.

We believe that the Government should give careful consideration to the effects of technological change in this area of business activity.

Productivity

4.8 New office technology can aid the transformation of a society into one in which information work is the chief economic activity, although it must be remembered that an 'information society' must be built upon a sound foundation of production activities - i.e. a productive primary and secondary sector.
4.9 The productivity benefits of new office technology include:

- economies of scale as well as reduced media transformation (for example, from voice to print);
- increased automation of labour-intensive tasks;
- time savings brought about by a reduced number of unproductive and unsuccessful tasks;
- more rapid availability of information to management, leading to improved quality of management through increased control and better strategic planning;
- new functions and unexpected organisational benefits;

4.10 New office technology can achieve these benefits by:

- decreasing the delay and uncertainty in receiving information and allowing easier access to information;
- eliminating redundant work and unnecessary tasks such as retyping drafts, thereby improving the utilisation of human resources for tasks that require judgement and initiative;
- providing for more rapid communication, making possible faster, better decision-making that takes into account multiple, complex factors;
- allowing office functions to be carried out at any location and at any time.

Components of a function such as data and text entry can be separated from its manipulation and processing in space and time. Hence functions can be carried out in real time or at a later time and at any location.

4.11 Although benefits from new office technology can be obtained from individual technologies, we believe the attainment of maximum benefits of office automation depends upon the following.

- Linkage of office technology with organisational goals.
- Integration of all office functions, and office and non-office functions, into a single system, so that data are entered only once. Once in the system they can be manipulated, transmitted or stored, either in-house or at any other location.
- The presence of a minimum 'critical mass' of connected work stations, not only within organisations but also between organisations. Productivity gains from multiplier effects can be achieved when all the firms and people dealt with - customers or clients and service companies used by the organisation - become 'on line'.
- Proper implementation of office automation including a careful consideration of design and organisational and human resources.
4.12 A further constraint arises from the need to adapt technology to meet local conditions. No two organisations are exactly alike. Even within one country and one trade or profession there will be differences in goals, ways of doing business, management styles and values, and the social and personal characteristics of the staff [6]. Generally these differences are not so great as to prevent broadly the same systems and methods being used for the same purposes. Problems are more likely to arise when systems designed for use in one country are transferred to another. With the increasing use of computers there is a tendency for software packages designed for use in one social and economic environment to be marketed in situations for which they are not suited. These problems may be avoided to some extent if there is a well-developed local industry producing the technology.

4.13 Automation of a manual process can result in reduced employment. Besides decreasing labour costs by substituting for labour, office technology may improve the quality with which some jobs can be carried out; error rates can be reduced, flexibility in reporting and data manipulation can be enhanced, the range of analyses available can be increased. An example is the airline reservation systems that provide unprecedented flexibility and efficiency in matching capacity to demand, as well as greatly improved convenience in making reliable travel plans for passengers. It has been suggested that the ultimate judge of the quality effect is the recipient of the end product, whose satisfaction will be reflected in increased revenue for the firm [7]. Other unquantifiables which have some effect on productivity include personnel morale and improved client relations.

4.14 New office technology can bring entirely new capabilities which would not otherwise be possible. There are applications which require so much computation as to be impossible without a computer. Balances in bank accounts and parameters such as criteria for assessing loan applications, interest rates and foreign exchange rates, some of which change by the minute, can all be manipulated in a variety of ways. Some examples of new functions performed with specific technologies include an editing capacity in word processing not present in typewriters, and asynchronous conferences which can be held with new teleconferencing technology.

4.15 Another benefit of office technology is that it can greatly reduce the need for 'production-line' office jobs. In what has been called the 'industrial' office, work moves from desk to desk, being processed in an incremental fashion, resulting in simple, repetitive, unsatisfying jobs [8]. A worker may do no more than staple and file a copy, or check and correct dates. This type of organisation has been considered particularly efficient for office activities such as the handling of a large volume of customer transactions, for example, sending out bills and processing insurance claims. With new office technology, one individual can handle all customer-related activities for a number of accounts instead of executing a small number of tasks repetitively. Such a transformation of organisational structure can enhance labour productivity, achieve organisational goals more effectively and improve quality of work and job satisfaction.

4.16 Office productivity has two elements. One is the internal efficiency with which a standard office task is carried out. The other, which is no less important, is the performance, quality, responsiveness and scope of the output. This latter, often referred to as effectiveness, is difficult to quantify by conventional productivity measurement of inputs divided by outputs.
4.17 The ASTEC survey showed that managers do not see benefits accruing from all applications of new office technology. Benefits from those applications that assist in conducting routine, well-understood tasks are clearly perceived. The most clear-cut productivity effects, as expressed in conventional terms, came from data and word processing. Data processing productivity effects may be separated into 'office' as opposed to 'organisational' effects. There was a dichotomy between effects that were clearly 'discernible and measurable as opposed to organisation-wide effects that were not measurable. 'Office' effects such as accuracy and timeliness of accounting, office employment levels, processing speed, all of which could be measured by precise but narrow indicators of office productivity, for example, labour time per letter, were judged beneficial by fifty-eight per cent of firms responding to the survey. 'Organisational' effects on sales or inventories, control of resources, product range and quality, management ability, market share and turnover, were, in contrast, judged beneficial by thirty-one per cent of firms. The productivity effects of word processing were similar to those for data processing though less marked. The literature cites a twenty-six to fifty-three per cent productivity increase for word processing after a few months of familiarity with the technology [9].

4.18 The ASTEC survey also showed that the individual effects of office automation systems were not clearly perceived by managers, even though they expressed a strong belief that productivity benefits occurred. This contrasts with the finding that the benefits of word and data processing were well recognised. Office automation systems were defined as systems permitting the communication of text, voice, data or images between computers and terminals.

4.19 The productivity of managers is difficult to define, because of the high proportion of discretionary activities in their work. It is also frequently difficult to measure their output. The application of new office technology to management functions is discussed below, however it is doubtful whether significant productivity gains are being realised at present from applications of technology such as management databases, which are designed to support complex and uncertain managerial tasks, and which can be expensive to develop and maintain.

Information

4.20 Information is a vital input in the development, production and marketing of all goods and services, using up more than half the resources in the largest firms [10]. It is clear that both the amount of information and the distribution of information will increase in the future. Ultimately, this information must be scanned and used selectively by firms. At least two factors make it important for firms to handle information efficiently:

- the need to give Australia a relative advantage over its competitors in trade in the service sector, so as not to lose business overseas;
- the increasing size of the labour force classed as office workers.

Office technology can provide an integrated system for handling information as a single resource within the firm. It can also deliver more timely information faster and in greater volume.
Ideally, information flows within an organisation should determine its organisational structure. Specialisation of information-gathering is thought to be an important economic benefit of combining activities within one organisation [11]. Offsetting this benefit are the costs of forming and maintaining the organisation [12]. The optimum design and use of organisational resources as well as information must be taken into account in order to obtain the maximum benefits from new office technology. A possible consequence of the widespread use of computer networks could be an increase in the size of those firms engaged primarily in information activities. The cost of generating information is largely independent of the scale on which it is used. There are, therefore, considerable economies available to larger firms, which may lead to changes in the structure of the information sector.

Management functions

The full effect of new office technology on the organisation is yet to be determined, since even the most successful applications at present do not aid the full range of tasks performed by managers, executives and professionals. Nevertheless the management functions of decision-making, control, supervision and communications can be enhanced by use of appropriate technology. Tools to aid every professional group are being developed. Even a small increase in the labour productivity of management can have a substantial overall leverage effect on the productivity of the organisation as a whole. As well, the automation of routine functions has the potential to enlarge the scope of managerial jobs and make them more interesting. In order to obtain the maximum benefits from these tools, management must have a good understanding of office systems.

Sound decisions require adequate, timely and reliable information. New office technology can increase the quantity of information available to the decision-maker. Appropriate programs and good editing of input data can also improve the quality of information. The computer can be used to compress information, reducing the amount of data managers are required to handle. Decision-making can be fully or partly automated with the aid of spreadsheets, financial packages and decision support systems. Routine problem-solving is most amenable to automation and software packages have been developed for this purpose. Automating routine decision-making gives managers more time to carry out other functions more efficiently and effectively. It needs to be pointed out, however, that decision-making is not always orderly and rational. There is also a danger that formalising the procedures for decision-making may create undesirable constraints and rigidities.

New office technology brings with it some new management functions. In addition to current job requirements, managers will be required to understand office systems and to take decisions on their use and development. Data administration is emerging as a new office function: it comprises the setting and monitoring of uniform procedures for the acquisition, validation, editing, indexing, classification and preservation and discarding of computerised information.

Security

New office technology creates its own problems because of the vulnerability of office systems to disruption by human and mechanical faults and by deliberate interference. The new risks arise from:
the integration of separate data collections into a single database;

centralised access and processing at several remote, non-specialised sites;

the physical location and distribution of hardware;

the difficulty of controlling access to large numbers of keyboards;

the destruction of traditional supervisory responsibilities;

difficulties in tracing user inputs;

the general increase in computer literacy within firms and in the community at large.

Technological, operational and management procedures exist which minimise these risks. For example, passwords can be used to ensure that only authorised users can gain access to a system and these can be changed frequently, data can be encrypted and there are safeguards to prevent the alteration of certain data. At the level of individual firms, fraud and irregularities might be detected more readily by continuous auditing procedures, which the technology now makes possible, rather than by annual auditing.

4.26 Australia has no legislation on computer-related crime as such. We believe that general legislation or guidelines by the Commonwealth Government covering all computer communications, including electronic funds transfer, would be valuable. A small list of general rules for all computer-based technology may be more easily understood than separate statutes enacted in different States and dealing with particular problems of various industries, such as banking. In some countries in Western Europe general data protection agencies have been created.

4.27 The problems of developing safeguards cannot be solved exclusively at the national level. It has been proposed that the OECD's Ad Hoc Group on Computer-related Criminality be given the task of compiling a list of acts considered reprehensible by member countries, based on commonly identified problems [13]. Agreement has yet to be reached on the terms of this study, but it could be useful in formulating national policies. The increase in the flow of data across national borders and the creation of international data banks have highlighted the need for concerted national action to detect and punish abuses, while allowing the free flow of information for purposes of trade.

4.28 The important question of the protection of individual privacy is dealt with in our study on electronic funds transfers [14]. With new office technology, information relating to individuals can be matched, aggregated and transmitted. In at least some computer applications in the office, standards for privacy are needed. There may also be a need for some mechanism for ensuring conciliation and negotiation between a plaintiff and an organisation which allegedly fails to protect privacy. Ombudsmen perform this role so far as privacy invasions by public sector organisations are concerned. In the private sector, citizens rely upon the integrity of firms for privacy protection. We note that in 1983 the Australian Law Reform Commission published a report on privacy [15]. The recommendations made by the Commission are being considered by federal agencies and interested groups. A task force has been established within the Attorney-General's Department to co-ordinate consideration of the recommendations.
4.29 Australia acceded to the OECD Guidelines on the Protection of Privacy and Transborder Data Flows of Personal Data in December 1984 [18]. The accession entails national implementation, including the adoption of appropriate domestic legislation and the provision of sanctions and remedies. The guidelines help harmonise national privacy legislation. They uphold relevant human rights, while preventing interruptions in the international flows of data. They represent a consensus on basic principles which can be built into existing national legislation, or serve as a basis for legislation in those countries which do not yet have it. It will be necessary to take the guidelines into account when considering the recommendations of the Law Reform Commission's report. We believe such consideration should be expedited.

Transborder data flows and trade

4.30 The transfer of data as digital signals between countries can improve a firm's performance by the co-ordination of design, research, production, marketing, distribution, customer services, inventory control and by financial and management consolidation [17][18]. Firms in the primary information sector, in addition, can offer new products based on the movement of data. Trade in information services can improve the balance of trade in service activities, hence sectoral trends leading to specialisation of office functions might be exploited.

4.31 New information technologies, including office technologies, provide the means for international trade in information services by making feasible the performance of a function at a remote location. Trade in information services makes the relative efficiencies of countries in the performance of office functions explicit, rather than being concealed in the prices of the final products. The availability of internationally traded information goods and services might influence firms to contract-out office functions. The cost of contracting-out office functions compared with performing them in-house depends upon the costs of information processing, transmission and control. Australia may not be in a favourable position in terms of transmission costs since it is not on routes with heavy information flow. Traditionally, much of the service sector of the economy has not had to face any substantial international competition on the domestic market, because services, by their nature, could not be separated from the thing or person being serviced, and could not be stored and transported. In areas of office services, these natural barriers to trade are likely to disappear as the new technologies are introduced. We note that Australia is one of a small number of developed countries which imports a greater value of services than it exports [19]. We think it important that Australian firms take up the new opportunities for trade which these developments will present. The Department of Trade and, since its formation in 1985, the Australian Trade Commission, Austrade, prepare reports on the export capabilities of sectors of Australian industry. Recent reports deal with computer software [20] and telecommunications equipment [21]. We see a need for a similar study of offices services. Because both exports and imports are involved, the responsibility for action lies with both the Minister for Trade and the Minister for Industry, Technology and Commerce.

4.32 Restrictions on trade in information services exist, but, unlike the tariffs on commodities, they rely predominantly on regulations imposed by governments and professional associations (for example, only appropriately accredited practitioners are allowed to provide legal and accounting services) and on quantitative limits on capacity, prices and the nature of services. Services with export possibilities include accounting, design, medical and legal services,
software provision, financial services and training. The quality of professional expertise could create a comparative advantage for Australia and it is in Australia’s interests to maintain high standards and skills in information services.

**ASTEC recommends:**
That the Minister for Industry, Technology and Commerce and the Minister for Trade, together with the Board of Austrade, as appropriate, examine and report on:

(i) the value of imports and exports in office and professional services (data goods and data services);

(ii) how the Australian Trade Commission could be used to promote these exports;

(iii) any existing non-tariff barriers to trade in this area;

with a view to encouraging the establishment of an export industry in office services. (R1)

**Implementation**

4.33 The way in which new office technology is implemented can make the difference between success and failure in achieving productivity gains. Factors necessary for success include:

- top management involvement;
- identification of the goals of the organisation so that criteria for productivity improvement can be established;
- analysis of the type, frequency and nature of work;
- consultation with all users;
- systems designs which enhance user creativity, learning and imagination;
- changes in the organisational structure to rationalise functions;
- taking into account all costs including security costs and maintenance costs;
- experience and adequate training; and, most importantly,
- choice of appropriate technology and the replacement of unsuitable equipment [22][23].

4.34 We believe the main issue in the adoption of new office technology is its appropriateness. The appropriateness of a particular technology depends upon the nature, objectives and methods of operation of the organisation in which it is used. It is not clear from our survey if the technology adopted is always appropriate in the organisational context in which it is used. Even after a thorough analysis of office work, the adoption of the technology is complicated by
the choice of equipment for a particular application, and the choice of software available for any particular system. Both hardware and software are largely manufactured overseas. We believe market forces will ultimately sort out the less useful products for the Australian context, and firms need to 'learn by doing', because the process of adaptation may be more or less specific to the organisation involved.

4.35 The value of information to an organisation depends in part upon the organisation's state of readiness to receive and make use of that information. It might be argued, therefore, that there is a useful role for government in improving the ability of firms to understand and make use of new office technology. Limited government intervention to disseminate this sort of information, and to train staff responsible for implementing new office technology, might be justified. A wide range of products is on offer and these have different capabilities and features. This is particularly true of software. The comparison of similar products offered by different vendors is at present difficult, particularly for small firms. There is a need, therefore, for advice based on an independent assessment and evaluation of competing products.

4.36 A service is needed to help those in business decide what sort of system will be most useful to their own firm. It should be able to provide a single source of information and hands-on experience, together with expert, unbiased advice on the range of equipment and software available. Services of this sort are already provided by the Australian Microcomputer Industry Clearinghouse Centre in Melbourne and the Microcomputer Demonstration Centre in Adelaide and we are aware of plans by the Department of Industry, Technology and Commerce to extend similar services to other cities. The success of the existing centres suggests that there may be a demand for more such centres, operating on a larger scale and with increased publicity, at least in all State capital cities. We believe that, if there is a continuing demand for these centres, as seems likely, it should soon be possible for them to become self-supporting.

ASTEC recommends:

That the Government provide seed funds to establish additional co-operative ventures between State Governments, tertiary education institutions and business groups, such as the Australian Microcomputer Demonstration Centre in Adelaide and the Australian Microcomputer Industry Clearinghouse in Melbourne, to provide information, training and advice on the choice of systems in new office technology. (R2)

4.37 Another useful program of activities is currently being carried out by the National Information Technology Council (NITC). The Council, which is made up of representatives from each State and the Northern Territory, is sponsored and partly supported by the Commonwealth Government. It stages exhibitions, discussions and workshops in capital cities and regional centres, which focus attention on the present and future uses of information technology. The NITC is playing a role in generating awareness about the benefits of information technology. Its work is seen to be at arm's length from government bodies and it supplements existing government programs intended to promote industry awareness of developments and applications of information technology.

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4.38 A large number of small firms can ill afford consultancies and yet would benefit from specific office technology systems if they were tailored for their particular needs. There is, therefore, a need for publicly funded pilot consultancies for representative industrial groups. This role is at present not carried out by any other business advisory group.

**ASTEC recommends:**

*That the Minister for Industry, Technology and Commerce provide additional resources to the National Information Technology Council to enable it:*

(i) to carry out its information dissemination programs to benefit more managers of small businesses in particular and the community in general;

(ii) to let contracts for pilot consultancies, initially for five representative industry groups in the office sector in the first year, in order to identify the kinds of technology available and their specific benefits for the particular group;

(iii) to review these pilot consultancies after one year; if the consultancies are judged beneficial by the relevant industry groups, consultancies could be undertaken for other industry groups in the office sector.

4.39 The introduction of new office technology should cause organisational change. It is essential for organisations to realise that it is neither practical nor efficient to automate a whole job as it is performed before automation. Organisational structure, as well as technological capability, must be taken into account in order to obtain the maximum benefits for the organisation. A precondition for an organisation to have the ability to take advantage of the integration of tasks possible with new technology, and to handle information as a single resource, is an analysis of the nature and frequency of the work performed and of the existing organisational structure. Rationalisation of office tasks can by itself bring productivity gains. The respondents to the ASTEC survey did not in general appreciate the importance of this precondition. The 432 firms using new office technology were asked whether they considered certain aspects of organisational change to be major prerequisites for its introduction. Less than two per cent thought there was a need to restructure an organisation and only a little over twelve per cent said that integration of administrative and operational functions was needed.

4.40 An approach which takes account of organisational factors is to look for a cluster of functions, typically consisting of fractions of the current work of a number of people, which can be automated. Once a cluster of work has been identified and the computer application designed, it is also necessary to redesign the jobs of the people who interact with the computer application. A systems approach is necessary for the increased effectiveness of the organisation as a whole [24]. Any new tasks should be accommodated by the design of new organisational structures, rather than by adding them to the existing structure [25]. Organisational redesign requires specialised skills and we note from the in-depth case studies of public sector bodies that there is a shortage of computer systems analysts for office applications.
4.41 The survey revealed that office technology is usually introduced with as little organisational change as possible. The Government recently established the Australian Foundation for Management Development whose objectives are to improve the quality of Australian management, to stimulate the management education sector and to contribute to a more efficient and internationally competitive Australian industry. This body might consider ways of incorporating the study and appreciation of organisational implications in the implementation of new office technology into existing and future management education curricula.

References


4. Op cit ref [1]


17. Op cit ref [1].


28
5. **NEW OFFICE TECHNOLOGY AND LABOUR**

### Employment

5.1 In Australia more people are employed in offices than in any other place of work. This type of employment is still increasing, although at a slower rate than was the case some years ago [1]. Much of the increase is occurring in the service sector. There are, however, considerable numbers of office workers in the manufacturing, agricultural and mining sectors. In these respects, Australia is similar to other western countries [2].

5.2 Within offices, information processing occupations are the major contributors to overall growth, although clerical and related occupations have also grown, but less quickly than in the past. These occupations have continued to rise in importance as a source of employment for women entering the labour force.

5.3 The importance of office work, and particularly information-based activities, as a source of employment growth has led to a fear that new office technology may have a major effect on employment growth within the workforce as a whole. There are arguments which suggest that technological change brings into operation important equilibrating forces which act to restore overall employment levels, even though this process may not be perfect [3]. These forces include:

- increased domestic demand resulting from higher real incomes;
- increased foreign demand resulting from improved price and non-price competitiveness;
- increased demand for investment goods in order to implement the new technology;
- dynamic effects such as the multiplier effects on real incomes following increases in investment expenditures;
- changes in wage relativities.

5.4 Preliminary conclusions from an OECD simulation study on the impact of information technology on employment suggest that these compensatory effects may be insufficient to offset the direct displacement effects on employment, and that the main threat to employment lies in the application of microelectronic technology to services generally, including office based services in other industries [4].

5.5 Some commentators have predicted that new office technology will result in large scale unemployment [5][6][7][8]. Typically, such predictions are based upon a belief that there will be large labour productivity gains superimposed on low rates of growth of output. Historically, periods of rapid rises in productivity have also seen fast growth in output and relatively high levels of employment. It remains in doubt, however, whether such patterns will be repeated in the case of new office technology. The full productivity effects of new office technology have yet to be realised, partly because advanced, integrated office systems are not yet in widespread use. Even when they are, the extent to which...
employment is affected will depend upon whether the cheaper office services and
new types of services resulting from technological change result in increased
demand. The second-order effects of integrated office systems have not been
quantified, although there is some evidence of reductions in employment from
particular technologies such as word processing.

5.6 The office sector is a major source of employment for school leavers
and also for adult women. Labour-saving technology threatens at least to curtail
the recent role of the office sector as a source of expanding employment.
Since these groups are the least organised into trade unions, they are less able
than other workers to resist such trends. The growth of part-time work is further
evidence of the increase in the unorganised labour force. The jobs most at risk
appear to be those in the 'routine' information category, such as filing clerks,
messengers, telephonists and correspondence clerks. Generally it will be the less
skilled jobs that will be most affected, although some middle levels of
management and administration which exist only to transmit information up or
down through the hierarchy could also be eliminated by effective computerized
internal communications systems. There might be new types of office jobs
created, such as data managers and programmers.

5.7 Results from the ASTEC survey were ambiguous regarding employment
effects, because firms found it difficult to isolate the effect of technology from
other factors and the reclassification of trained personnel made it difficult to
ascertain an aggregate effect. Nonetheless, the general experience appeared to be
no net decrease in employment. The in-depth case studies undertaken in
conjunction with the survey showed that employment effects were masked by
growth in output without growth in employment - 'jobless growth'.

5.8 In summary, the net impact on employment in the office will depend
on the extent to which labour productivity rises for a given set of functions, the
increase in the volume of office functions resulting from their reduced cost, and
the growth in 'office-intensive' areas of the economy. A related issue is the rate
at which the new office technology is introduced in a country relative to its rate
of introduction in its main competitors, which affects its trade performance.
Differences in the rate of adoption of technology affect the international dis-
tribution of employment. It is not obvious what the net effect of these separate
factors will be on total employment in the office in the foreseeable future,
although in our view the most likely long-term outcome is a decline in
employment in less skilled office jobs. We believe that close monitoring of the
trends in the number and types of office jobs in Australia is essential.

5.9 Institutional arrangements to enable a smooth adjustment of the
labour market to negative impacts as possible, although recommended by various
government inquiries, are, in our view, still inadequate. The situation requires
consultation between employers and affected employees and their unions, as well
as the provision of vocational training and retraining and new forms of training
appropriate to the use of new office technology. Plans might also include
incentive packages to induce withdrawal of labour from the workforce and
assistance arrangements such as the 'social safety net' advocated by the
Committee of Inquiry into Technological Change in Australia in 1980 [9]. In
combination with an early warning from government of changing job prospects for
new entrants and assistance for labour mobility, these measures could help in
labour market adjustment.
5.10 Although these ideas are not novel, we believe that there has been a record of government inaction on these matters. There is still no clear view about the proper division of responsibility between private industry, unions, and state and federal governments. A firm articulation by government of the appropriate allocation of responsibilities and the roles of the major actors is, in our view, long overdue and essential for the development of adaptable, flexible and coherent human resource policies. We note that other bodies, including the Australian Education Council and the National Training Council, are at present studying the training requirements of new office technology. We argue below that technology agreements between employers and employees could be useful in mitigating the negative effects and enhancing the benefits of new office technology.

ASTEC recommends:
That the Minister for Employment and Industrial Relations ensure that changes in the number and types of office jobs in Australia are monitored and evaluated in order that appropriate employment and training responses can be made. (R4)

Occupational health and safety

5.11 Aspects of the physical environment associated with new office technology are capable of improvement but in general the office is still a safer environment than factories or mines. The qualitative effects on office employment are mixed. On the one hand many workers will have an increased range of tasks and a capacity to perform these more effectively. New office technology has the potential to enhance skills and capabilities, increasing job satisfaction. On the other hand, extensive use of keyboards and work-stations can lead to negative physical and psychological effects, stress and less variety in tasks. The technology also offers more flexibility in place and time of work. Given the present concentration of women in keyboard occupations, it appears that women, rather than men, will be most affected by the negative aspects of office technology.

5.12 The emergence of repetition strain injury (RSI) as a major social cost in Australia is both unexpected and puzzling. Comparisons with experience in other countries are difficult to make. The National Occupational Health and Safety Commission notes in a recent report that 'a wide variety of terms are used in other countries to describe the condition known as RSI in Australia' and suggests that this 'has probably contributed to the widespread belief in Australia that RSI is a uniquely Australian condition' [10]. The prevalence of the complaint in Australia suggests that prevention and management of this problem are matters of urgency. The costs include physical disability to individuals, psychological trauma and disruption of family life, economic costs from loss of productivity and the considerable burden on the public purse from compensation claims [11].

5.13 Where studied, RSI in public sector bodies is associated with new office technology and its incidence appears to be about seventeen to twenty per cent of the workforce in keyboard occupations [12][13]. Our survey gave some data for the private sector, although not in a form directly comparable with the statistics for the public sector. Of 432 respondents with relevant technology, eleven per cent reported occurrences of RSI, although most of these firms had only a few cases. The apparently higher incidence of RSI in the public sector may be attributed to:
early reporting of pre-clinical RSI;
a raised awareness of the problem due to extensive publicity;
the subjective nature of diagnosis;
relatively generous workers' compensation arrangements compared to the private sector;
a 'snowball' effect caused by an increased workload on remaining staff when workers suffering from RSI are absent;
job organisation which requires some staff to perform continuous keyboard work.

The absence of so-called 'ergonomic' furniture is often blamed by vendors of office equipment, but we are not convinced of the significance of this factor since new office technology is often installed with new furniture in the Australian Public Service. However, we feel that the fundamental problem can be tackled by redesigning present keyboard jobs.

5.14 The National Occupational Health and Safety Commission established an RSI Committee to advise it on the elements of a national strategy and code of practice for the prevention and management of the condition and on priorities for the co-ordination of research into RSI. The Committee produced an interim report in 1985 [14]. The Commission sought public comment on the issues raised in the report and set up a working party to consider those comments and prepare a final report, which it has now done [15]. The report sets out preventative strategies and a model code of practice, on which further comment is being sought. It also gives details of current research into RSI and makes recommendations for future work. ASTEC supports the Committee's work in this area and urges the Commission to continue to give it high priority.

5.15 Office stress connected with technology is a growing problem and can cause a variety of health problems. Stress may be connected with technology usage patterns such as high levels of self-paced work, monitoring the performance of workers and increased pressure to become proficient with the technology.

Skills

5.16 Changes in job skills have implications for training and the types of jobs available in the future [16][17]. Lack of suitable skill in using new technology is a barrier to technology diffusion. Organisations might encourage multi-skilling learning programs which integrate opportunities for continual skill formation with a recognition of, and rewards for, the achievement and utilisation of those skills. In particular, keyboard workers could learn a range of activities such as word processing, data processing, elements of programming and office administration. The training of large numbers of women for narrowly-defined occupations which rely upon proficiency in the use of particular word processing systems limits career opportunities and under-utilises human resources. There is also a strong view that lack of job variety places such women at risk of suffering from RSI. The possession of programming skills could be particularly valuable in adapting applications software to the needs of particular organisations, as well as opening up new career opportunities for women.
5.17 Industrial relations issues are an important element in the successful introduction of new office technology. Technology agreements in the form of written contracts between management and unions are increasingly a feature of white collar work in the public sector [18][19]. We note that the private sector in Australia has not in general entered into technology agreements. The ASTEC survey showed only 1.4 per cent of firms responding had entered into such agreements. Current attitudes by sections of both management and unions need to change to accommodate adjustment mechanisms that provide workers displaced in one location with suitable jobs in another. Sections of both management and unions could take a more constructive approach when negotiating technology agreements. 'No redundancy' agreements tend to re-distribute unemployment to the potential job entrant. Employment policy options could include taking the benefits of technological change as shorter working hours coupled with a shorter working life.

5.18 Trade unions represent people who have to bear directly the social costs of technological change and hence it is in their interest to place more emphasis on the quality of employment. Management consultations with unions at the time when technological options are being considered could be valuable in reducing human costs. The ASTEC survey showed that sixty-four per cent of firms did not consult with employees during the stage of system planning. The quality of management in this area could be improved by formal management education. Many management education courses contain material on industrial relations, but the emphasis, in our view, is too much on the legal and institutional dimensions of the subject and insufficiently on the industrial relations aspects which encourage a co-operative and involved workforce. While this concern has a general relevance to the introduction of any technology, it is of special significance in the introduction of new office technology because of the range of systems available, which may not all be equally socially desirable.

5.19 Previous ASTEC reports have contained recommendations for greater emphasis to be placed on consultation at the time of introduction of new technology [20][21][22]. The technology agreements negotiated by public service unions (both state and federal) have clauses which require technological change to be introduced with as little disruption to existing staff as possible [23][24]. It is noteworthy that productivity improvements often accrue from changes of organisational structure when office procedures are rationalised, even without the technology. Indeed substantial changes in office procedures are necessary for the successful implementation of integrated office systems. We believe the opportunity to redesign jobs, which the introduction of new office technology affords, ought to be taken by both unions and management to make jobs more pleasant, less stressful and more interesting. Thus the introduction of technology may be a trigger for thorough reassessment of job content, skill levels, methods of work, job satisfaction and an examination of occupational health and safety factors. Technology agreements which place less emphasis on employment concerns and more emphasis on consultation, participation and on the quality of working life, might be a mechanism of achieving this end. We note that the National Technology Strategy, under development by government, industry and unions, seeks to promote the greater use of consultation and technology agreements.
ASTEC recommends:
That the Minister for Employment and Industrial Relations ask the National Labour Consultative Council to promote technology agreements between employers and employees in the private sector as a mechanism for distributing the benefits and minimising the social costs of technological change in the office. Agreements should be consistent with established wage fixing principles. (R5)

References

4. Op cit ref [3].


6 A ROLE FOR GOVERNMENT

Forms of government intervention

6.1 Actions taken by the Commonwealth and State Governments may have considerable influence on the nature, extent and timing of the introduction of new office technology in Australia. Such actions could include:

- encouraging the growth of the information services industries;
- promoting the diffusion of new office technology;
- promoting the production of new office technology, both hardware and software;
- promoting the provision of the necessary communications infrastructure; and
- developing standards to ensure compatibility.

Encouraging the information service industries

6.2 The office is still a source of increasing output and employment. To date, as new technology is introduced, improved service quality has been a stimulus to demand. In order for the country to benefit from this growth, it is desirable to create and retain a domestic capability in office services and to export those services. The rate of adoption of product innovations, such as those arising from the use of new technology, is important because faster rates of diffusion relative to other countries tend to maintain or increase output and employment. Faster diffusion can thus yield benefits with wider economic advantages, through increased international competitiveness [1]. There are also important domestic benefits to be obtained from the use of new office technology for the development of service industries. An efficient office sector assists efficiency in all areas of the economy, since all use office services.

6.3 One means of assisting the development of the information service industries is through investment by the Australian Industry Development Corporation (AIDC). The AIDC's priorities, as set out in its Act, include the development, marketing and use of new or improved technology, together with related research and development. The Corporation has pursued this area of priority in the office technology field and taken equity in companies producing computers and systems for use in the office, and producing software for office use. The Corporation also seeks, as far as is practicable, to encourage participation by Australian residents in the ownership and control of companies in which it invests. It might be helpful if there were a greater awareness of the role which the Corporation can play in providing investment loans and capital.
Promoting the diffusion of new office technology

6.4 A nation can use information technology without necessarily being a producer of equipment or services. The effective use of new office technology is vital for the economic development of Australia. It is likely to contribute more than the production of the technology because it has the capacity to affect the productivity and competitiveness of a wide range of industries.

6.5 The ASTEC survey indicated widespread diffusion of new office technology, at least among large firms. Given the limitations of sample size and the probable bias to firms who have adopted new technology, which precludes extrapolations to the economy as a whole, it is still significant that fifty-eight per cent of respondents had computer-based office technology. The high cost of research and development in the computer industry compels firms producing such equipment to follow aggressive marketing strategies which in turn have an effect on the diffusion of new office technology. It may be that the present rapid penetration of the market is in part, perhaps even largely, due to an industry push, particularly by overseas-based companies, which have the resources for aggressive marketing and advertising.

6.6 There is no evidence to suggest a general need for government intervention to promote the adoption of new office technology. There are, however, particular cases which require special consideration. The increasing integration of all activities within an organisation, which the new technology permits, has blurred the traditional distinctions between office work and production activities. In the case of the manufacturing sector rapid adoption of computer-based techniques is necessary in order to maintain competitiveness, but an anomaly exists in the interpretation of certain exemptions in the Sales Tax Act. At present a sales tax of twenty per cent applies to computers and related equipment, unless they are used as 'aids to manufacture'. Computers used in offices, even for such tasks as computer aided design and the production of tapes for computer-aided manufacture, are not exempt from this tax. ASTEC believes that activities in the office contribute to the overall productivity of a manufacturing enterprise in the same way as activities on the shop floor. This must be recognised if the Government wishes to encourage manufacturing firms to adopt and obtain the greatest benefits from computer-related technologies. In a recent report ASTEC has recommended that the definition of 'aids to manufacture' be extended to include all computer systems used in manufacturing establishments [2]. This issue was also considered, and a similar although somewhat narrower recommendation was made, in the Cashman report [3]. We wish to make the point here that, as organisations progressively integrate all their activities, it will become increasingly difficult to separate individual functions. This must be taken into account in developing policies to assist particular sectors of industry.

6.7 Despite its widespread diffusion, it is not clear from the ASTEC survey whether the technology adopted is always appropriate. The development of acquisition and evaluation procedures have lagged even among a select group of companies in the United States [4]. Firms are beginning to realise the danger of uncontrolled equipment purchasing. There must, in these circumstances, be serious doubt about the effectiveness of policy intervention to encourage more rapid adoption since the chief beneficiaries might prove to be the overseas suppliers of office equipment. Government intervention could be counter-productive for Australian industry.
Promoting the production of new office technology

6.8 The domestic production of equipment incorporating new office technology can be expected to generate a closer relationship between users and producers, thereby making technology more relevant to local circumstances. Local production also helps in generating and retaining skills. Information technologies are expected to be so fundamental to the world economy over the next half decade, that failure to develop some capability could make many markets inaccessible to Australian producers.

Hardware production

6.9 In Australia, hardware and software production have developed as two separate industries with different labour inputs, methods of production, capital investment and markets. Australia has to select carefully and to focus sharply upon specific areas in the office technology field where it might have an advantage or the ability to create an advantage. Exploitation of world markets is crucial to success in the hardware industry, since the small domestic market will not be able to sustain the necessary research and development expenditure that must be incurred to maintain a competitive position.

Software production

6.10 The number of software firms in Australia has grown substantially in recent years. This contrasts with the limited growth in the hardware industry. There is some evidence from a recent survey of the industry conducted by the Department of Trade to suggest that the local industry is internationally competitive [5]. An important characteristic of software is that it can support process innovation in the primary, secondary and tertiary sectors of the economy. In addition, software affects product innovation in the service sector, for example, in the development of new financial services. Software production thus has the potential to improve productivity in all sectors of the economy. At present, locally produced software is thought to account for ten per cent of the domestic market, the bulk of the market being supplied by packaged imported software. Unfortunately, software imports and exports are not identified separately in trade statistics. It is, therefore, not possible to say how much software imports and exports are worth.

6.11 New office technology is largely imported and therefore the supply of technology to Australia is dependent upon the policies of overseas firms. We believe a major impediment to local software development for personal computer and microcomputer applications is the lag in the availability of new hardware. By the time the latest model of personal computer or microcomputer is available on the Australian market from commercial sources, the accompanying software is already available as imported packaged products. Australian software houses are thus fighting an uphill battle against their overseas competitors, who have earlier access to new equipment.

6.12 For these reasons, a case can be made for government support for the software industry. This might best be provided through the Government's offsets and purchasing arrangements. A recent report on offsets recommended that acceptable types of offsets be limited to certain categories of activities which include:
We believe that offsets arrangements could be used to provide additional opportunities for the local software industry whenever a large purchase is made from a hardware supplier. Either the offsets obligation could be discharged by contracting the software component of the order to local industry or hardware not yet available on the local market could be made available so that software suitable for it could be developed. Arrangements of this sort should be restricted to firms with an appreciable Australian equity. If these practices are adopted, overseas vendors might form partnerships with local software companies to tender jointly for government purchases of office systems, giving local companies the experience and record of achievement they need to establish themselves. Local companies could then be in a better position to compete with overseas software companies for large contracts offered by multinational hardware companies.

6.14 Software can be reproduced easily and there are no economies of scale in writing original software. Proprietary protection is therefore difficult to provide. The Government amended the Copyright Act in May 1984 to include software explicitly in the existing copyright category of 'literary work'. This will give authors of software the same protection currently afforded to the authors of literary works. The legislation is understood to be a short-term measure. Long-term policies for the protection of software have yet to be formulated. It is not clear if the copyright legislation is the most appropriate form of protection and whether it resolves all or some of the issues associated with the question of protection for software. The appropriate form of proprietary protection for software for Australia needs to be determined. The same considerations apply to firmware, a term used to describe the instruction sets which are built into computer hardware.

6.15 Although new office technology could be supported by existing telecommunications networks by using digital-analogue conversion devices or modems, the benefits of additional flexibility and the higher switched transmission rates which users are likely to require will only be fully realised when all users have access to a national digital communications service that can support voice, text, graphics, and data transmitted as digital signals. Even though such a service is likely to be more expensive for the user, it will be more cost-effective. The Integrated Services Digital Network (ISDN) proposed by Telecom Australia, as well as the telecommunications authorities in other OECD countries seems appropriate. The ISDN concept is simply a network which can provide a 'socket in the wall' to which any type of communications terminal device up to a certain speed may be connected. The socket connects to a universal network which can support any type of communication between compatible terminals.

6.16 The Integrated Systems Digital Network should be established as early as possible and Telecom states that it is working towards this objective. It is developing a high capacity digital network for telephony which will be extended to provide ISDN services. Primary rate access (2 megabits per second) for inter-
connection of local area networks (LANs) and private automatic branch exchanges (PABXs) will be available in 1988 and basic rate access (64 kilobits per second) for interconnection of terminals will be available in 1990. It is important that ISDN services be available in Australia at least at the same time as similar services become available in other western countries. Late availability of an adequate data-communications network is likely to be an obstacle to users achieving productivity gains. Investment in such a network should be seen as having economic importance comparable to that of the investment in the road network or in the electrical supply system. Provision of such a network is perhaps the most effective way in which this country will be able to obtain an advantage over its competitors. It will both create the environment for the adoption of new office technology and also provide a direct stimulus to the information technology industry.

Standards

6.17 The speed with which technological developments are occurring and the requirement for communication between terminals, no matter which manufacturer supplies them, impose two other conditions on a national communications network:

- flexibility, to allow any available items of hardware to be added on to an existing system;
- standardisation of the operating characteristics of communications networks.

The requirement for flexibility is important because the various types of communications network available are not equally convenient for the attachment of new devices.

6.18 There is a need for standardisation of the operating characteristics of communications networks. The development of integrated office systems, the portability of software between different systems and different sites, the interchangeability of equipment and, more broadly, open markets and economies of scale, all depend upon the existence of standards.

6.19 Most of the standards used in OECD member countries, including Australia, have been 'de facto' ones, imposed by the small number of hardware manufacturers with a dominant position in the market. There is, however, a growing need for international agreement on standards which will best meet the needs of the users of communications systems. Some existing standards depend on the 'homogeneous network' concept, in which all components are specified by a single manufacturer. It is clearly in the interests of the user to have a 'heterogeneous network' which will allow the use of equipment supplied by different manufacturers in competition.

6.20 International standards, called the Open Systems Interconnection, are currently being developed by the International Standards Organisation and the International Consultative Committee on Telegraphy and Telephony. These standards have the flexibility to cater for new technological developments. Telecom is participating in their development. It is difficult to organise and implement such standardisation nationally, because of the commercial interests involved. Nonetheless, we support continued efforts by Telecom and other government agencies and telecommunications service providers to ensure the
adoption of these standards in Australia. ASTEC notes with approval proposals for
the formation of a National Protocol Support Centre by Telecom, the Overseas
Telecommunications Commission, the Australian Information Industries Association
and several Commonwealth and State government departments and agencies. This
centre will transfer technology by informing industry of the scope, application and
status of OSI standards and will provide testing and certification for compliance
with these standards.

6.21 Organisations can plan to adopt new office technology with greater
confidence if they know in advance what telecommunications services will be
provided and when they will be available. Telecom already reports on the work
of its research laboratories. A convenient report describing developments in
telecommunications services overseas in the area of office automation, together
with as much of Telecom's plans as can be disclosed without breaching commercial
confidence, would be of considerable assistance to business. We understand that
Telecom, through its Telecommunications Industry Liaison Committee, has begun
informing Australian industry of its plans for the implementation of the ISDN in
Australia. This should provide direction and stimulus to Australian industry. We
hope that other developments will be publicised in this way.

Government purchasing

6.22 The Australian Government plays an important role in industrial
development because it is a major purchaser and user of equipment and it can
lead in the adoption of new technology. Expenditure on information technology by
the departments and agencies of the Commonwealth Public Service has increased
steadily in recent years and in 1983-1984, the last year for which separate figures
were compiled, was estimated to be $460 million.

6.23 A recent ASTEC report considered government purchasing and offsets
policies and made recommendations intended to improve the opportunities for local
manufacturers [?]. In that report we noted:

From our investigations it is clear that Australian firms and goods
'made in Australia' have often been disadvantaged by some of the
practices and attitudes in government purchasing. It is necessary to
remove disadvantages to Australian firms and enable them to compete
on a more equal basis, both by directing government purchasers through
appropriate regulations and by motivating them to consider the longer
term implications of purchasing decisions.

6.24 We believe purchasing of computer hardware and software has special
features, notably constraints on choice caused by the adoption of 'de facto'
standards and the dominance of overseas hardware suppliers, which make it
particularly difficult for Australian producers to compete for government orders. In
addition, the software industry may be disadvantaged by the way in which the
computer market has developed, with the principal emphasis being placed on the
selection of a machine and with the choice of software being a secondary
consideration. Actions which could be taken to give greater opportunities to the
local office technology industry include:

. preparing tenders in a way that describes fully the total system
  required;
allowing a software supplier to be the main contractor or alternatively
inviting tenders specifically for the software system;

- promoting joint tenders between local and overseas suppliers of software
  and hardware, even though these tend to be administratively more
  complex; and

- publicising future requirements of departments as early as possible to
  allow industry to prepare for tendering.

ASTEC recommends:
That the Minister for Local Government and Administrative Services assist the
Australian hardware and software industries to tender for government contracts by:

(i) encouraging all government departments and agencies to give careful
consideration to the purchase of Australian goods and services,
especially when drafting specifications;

(ii) enabling the software supplier to be the chief contractor;

(iii) ensuring that specifications encourage joint tenders by Australian
manufacturers or by an Australian manufacturer in collaboration with
an overseas supplier;

(iv) ensuring that the methods used to evaluate tenders do not place joint
tenderers in an unfavourable position. (R6)

Statistics

6.25 In order to enable policy-makers to identify trends in the information
sector, we believe the present government statistics should be improved. Effective
economic analysis and policy-making is dependent upon statistics which reflect
more closely the structure and nature of economic activity in the country. This
structure has changed substantially recently with the growth of the tertiary
sector, particularly the information sector sub-set of it. If science and technology
policy is to have a sectoral basis, the importance of distinguishing the information
sector from the traditional sectors should be recognised. The Committee for
Information, Computer and Communications Policy of the OECD is doing valuable
work in comparing and analysing statistics from member countries. The Australian
Bureau of Statistics is participating in the development of the proposed categories
of statistics. The work needs to be completed in all OECD member countries
before it can be applied to the preparation of international comparative data. In
order to facilitate this work, it is essential that Australian statistics are
comparable with those of other member countries, and conform to that
committee's proposed framework for the collection of information, computer and
communications statistics. It is noted that the value of software production and
trade is not distinguished from that of hardware in available government sta-
tistics.
ASTEC recommends:
That the Australian Bureau of Statistics collect and present statistics to enable:

(i) output and employment in the information sector to be determined;

(ii) production and trade in computer hardware to be distinguished from production and trade in computer software;

and that these statistics be comparable with classifications and definitions being developed by the Committee for Information Computer and Communications Policy of the OECD.

References


4. 'US Business Response to Automation', Information Hotline, 19, 9 October 1984,


APPENDIX

WORKING PARTY ACTIVITIES

A.1 A working party was established in July 1983 to examine and report on the social and economic effects of the introduction of new office technology. The membership of the working party changed during the course of the study, reflecting changes in the membership of the Technological Change Committee and the inclusion of experts from outside the Committee.

A.2 The following members of the Technological Change Committee served on the working party:

- Professor D McL Lamberton, (Convenor until October 1984)
- Dr S Richardson, (Convenor from October 1984)
- Professor B L Johns, (until May 1984)
- Mrs E Manly MBE, (until May 1984)
- Mr J P Maynes AM, (from February 1984)
- Mr K H McLeod, (until February 1984)
- Professor G A Rigby (from October 1984)

A.3 Expert assistance was provided by two members of the working party drawn from outside the Technological Change Committee. These were:

- Mr A W Goldsworthy OBE, General Manager and Chief Executive of the Suncorp Building Society; National Chairman of the National Information Technology Council.
- Mr D Sobell, Office of the Public Service Board.

A.4 The working party benefited greatly from the contributions made by these outside members. ASTEC expresses its greatful appreciation of their assistance.

A.5 Secretariat support was provided by Mr P St J Dawe, Dr V D Sarma and Mr A E James.

A.6 At the end of 1983 a contract was let to W D Scott for a short pilot study of the Australian office technology market, a comparison of Australian and overseas experience and a sample survey of the effects of new office technology on organisational structure. This provided some basic information as a guide for later work.
A.7 During the latter part of 1984 and early 1985 a survey was undertaken by the Information Research Unit of the University of Queensland to determine the extent to which new office technology was being used by Australian firms, and to determine the views of senior executives on its economic and social effects. This survey was supported by a series of case studies of public sector organisations. In addition, members of the working party held discussions with staff of Telecom, IBM Australia Ltd. and Wang Computer Pty. Ltd. ASTEC wishes to thank all those firms and organisations that participated in this survey and provided information, and also to acknowledge the contributions made by staff of the Information Research Unit.

A.8 The results of this survey, together with a review of the literature on new office technology, undertaken by the working party, provided the material for three publications. The survey results were published in April 1985. These results, together with information gained from the literature review, formed the basis for the report 'New Office Technology: Review and discussion', which was published in May 1986, and which offers an expanded treatment of the issues considered in the present volume.