

Appendix 3

Information Technology and the Service Sector

I. OVERVIEW

3.1 Services are the most important single sector of the economy in both developed and developing countries, and by 1980 their share of GDP had reached almost 60 per cent in developed market economy countries and 45 per cent in developing countries; even in low-income countries services contributed 40 per cent of GDP. In all categories of country the proportion is an increasing one. The sector accounts for an even larger share of employment in many countries (70 per cent in the United States, for example, compared to 64 per cent of GDP) and for the majority of new jobs created in the last couple of decades (over 80 per cent of those created in Canada, for example, during the ten years to 1979). This reflects the relative labour intensity of most services, and has led some critics to observe that the growth of the sector is constraining overall economic growth. This is somewhat doubtful, however, as data show that even in the late 1970s, value-added per person in manufacturing was for several countries not much higher than in services, while for a number of others, including the United Kingdom and Singapore, it was slightly lower.¹ Subsequently it is likely that the rapid change in technologies in some leading service industries in developed countries has raised labour productivity levels substantially. The issue which we address here, however, is how far developing countries will be able to take advantage of these new technologies and what the effects on their economies are likely to be.

3.2 The most pervasive new technology being applied to services is the so-called 'information technology'. This is based on the digitalisation of data, which can then be processed by microelectronics equipment such as electronic typewriters and word processors, automated teller

machines, point of sale terminals, optical character recognition systems, business computer systems, electronic mail and facsimile machines, viewdata and videotex systems, and miscellaneous computer systems. Such equipment is being used increasingly in telecommunications, banking, insurance, engineering and other technical information services, some public services and even retailing and wholesaling. It also has important, but perhaps less widespread, implications for other service industries, such as social services (health care and education in particular), public utilities, tourism, transport and construction. Other changes in technology—for example the use of fibre-optics instead of copper wire in telecommunications—are also occurring, but overall these appear to be rather less significant and so are considered here only briefly.²

3.3 Information technology is affecting service industries in a variety of ways, some of which are apparent from the following examples. The use of this group of technologies is:

- improving the quality of existing services.* For example, computerised networks linked by telecommunications systems allow consumers to have faster access to more reliable information. Such data can range from, say, details of potential suppliers of agricultural inputs or second-hand construction equipment, to confirmation of bank balances or hotel bookings;
- creating new services.* Banks, for example, are now able to offer clients new corporate management systems which help them to increase returns on their financial assets;
- raising labour productivity.* Again using banks as an example, automation has allowed the same quantum of service to be provided by a lower number of workers and has thus led to employment displacement. Instances include automated teller machines replacing bank tellers, and automated bank clearing systems replacing clerks and messengers;
- increasing capital intensity.* Much of the new technology involves substantial capital investment in hardware (input/output terminals, processing equipment and network facilities) and software. However, once a network is in place, the marginal cost of opening another terminal in a new location is low;
- increasing economies of scale.* The large sums involved in installing information technologies have led to increases in the minimum scales for many types of operation to be undertaken efficiently. This is particularly marked in telecommunications, banking, and insurance. Though there are some instances of scale economies being lowered, on balance the increasing use of information technology is likely to reinforce present trends towards greater concentration in these industries;

- creating new economic structures.* Information technology is not only affecting the structure of service industries, it is also blurring the division between them and the rest of the economy. The economies of scale involved mean that once a retail company, for example, has a computer terminal linked to an external information network, there is only a low marginal cost in using that terminal to provide services, such as travel or finance, which are unrelated to its original activity. In addition, the application of information technology to non-service sectors, and the resulting increase in the service content of goods, is blurring the division between different sectors of the economy. For example, in the United States 10 per cent of value-added in agriculture comes from services, as does more than 20 per cent of that added in minerals and manufacturing;
- improving productivity in the rest of the economy.* The increased use of information technology in producer services, such as public administration and banking, as well as in general business management (monitoring production, stock levels, marketing, etc) should raise productivity in the non-service sectors of the economy;
- increasing the tradeability of services.* Traditionally, the nature of most services has meant that only a very low proportion of the total has entered international trade—8 per cent in 1980 compared to 45 per cent of world agricultural output and 55 per cent of mining and manufacturing. But the new ways of handling information, coupled with improvements in telecommunications (satellite transmission, digital networks) have increased the tradeability of many services. For example, banking services or an entire library can now be transported from a terminal in one country to a terminal in another. Developed countries (notably the United States) see tremendous potential for their exports of services now that the natural trade barriers have been overcome, and in GATT and other fora these countries are putting pressure on developing countries to remove their controls on imports of services. Whether developing countries are able to benefit, either as consumers or as exporters, from this increasing internationalisation of services in a market dominated by multinational companies, is discussed further below; and
- affecting international competition in goods.* The increasingly widespread use of information technology by developed country manufacturing and other non-service industries, through helping to raise efficiency, is benefiting their international competitiveness. In particular, improved access to data about world markets and better communications with customers can improve export performance, making it more difficult for developing countries to compete. On the other hand, the ability of transnational corporations (TNCs)

to extend greater control over their global operations might encourage them to increase their involvement in developing country export activities.

3.4 The main technological advances in four major service industries—telecommunications, banking, insurance, and tourism—together with the chief elements of office automation, are considered below. (A more detailed examination of the impact of services on employment, trade and development was undertaken in Volume I, Part II, Chapter 1 of this Report.)

II. MAJOR SERVICE INDUSTRIES

Telecommunications

3.5 The ability of new technologies to digitalise speech, numbers and graphics is leading to a revolution in the range of services offered by telecommunications agencies in most developed and some developing countries. Parallel changes in communications hardware mean that the speed of these services is being steadily increased while costs are falling. Four developments in hardware are particularly important.

3.6 The first is the replacement of mechanical cross-bar and hybrid electro-mechanical analogue switching gear with electronic *digital switching*, which is cheaper, can be centrally controlled by a computer, and allows an increase in the capacity of automatic exchanges, as well as a broader range of services. The second is the use of *fibre-optic cables*, which not only have a cost and capacity advantage over traditional (copper) cables, but also can be hung alongside electricity wires without any problems of feedback. The third is the increasing use of *satellites* for direct telephone, telex and television links nationally and internationally. Finally, there is the use of *microwave* air frequencies in radio-relay systems for subscriber trunk dialling in some countries and, with the help of microchip technology, for cellular radio mobile phones.

3.7 Despite the large costs involved, several developing countries are updating their equipment with these new technologies, in recognition of the key role which telecommunications can play in their economies. For example, the Malaysian Government has increased development expenditure on telecommunications to M\$3 billion (US\$1.3 billion) over 1981–85 at a time when spending on agriculture, education, health, and housing was static or falling. This is in recognition of the importance of telecommunications to the country's modernisation and to Kuala

Lumpur's future as a regional financial centre. In Singapore, spending on fibre-optic cables, digital exchange equipment, etc. and new services, is to reach US\$1.5 billion over the five years to 1990. The bulk of the equipment has to be imported, though some countries (for example, South Korea, India) are producing digital switching gear. Some smaller-scale technologies are being developed in an attempt to reduce the financial problems. For example, amateur radio operators in the United Kingdom, Canada and the United States developed a small low-flying satellite with a micro-computer and an off-the-shelf transceiver in a ground unit costing some \$10,000. This provides a cheap storage and forward messaging system, and if linked to a technical information service it could make information available to governments and others, with a 24 hour turn-around and at a relatively low cost.

3.8 Besides traditional voice-to-voice communication, many telecommunications networks now offer several other services. These include: *teletex*, which is claimed in Singapore to be 40 times faster than the ordinary telex system; *electronic mail*, somewhat slower than teletex, where words or numbers are communicated electronically, sometimes using *packet switching networks* which transfer data from point-to-point in discrete packets, i.e. more cheaply than if transferred as a continuous stream; *telex*, which allows facsimile reproduction over long distances by a telephone linked to a computer and VDU at each end; *datel*, whereby information (public or private)³ is transmitted via a computer/phone system, and *teledata or teletext*, where it is shown on a VDU or television screen; *videotex*, which allows communication by the recipient of the data with its source (used, say, by travel agents to book holidays); and *tele- or video-conferencing*, whereby a group of people in different locations can hold a meeting over the phone, with or without visual information. In China (Taiwan), the telecommunications agency offers local subscribers access not only to its information data bank, but also to its computer for *data processing* jobs. Other services which could be developed in the medium term include: remote medical diagnosis; monitoring fire, safety and medical alarms; remote utility meter reading; and telecontrol of mechanical processes and opinion polling.

Banking

3.9 New information technology is being extensively used by banking firms in most developed market economies and a few of the technologically more advanced developing countries (Hong Kong, Singapore) to lower the cost of their services, to improve their quality (especially speed) and to extend their range.⁴ In other developing countries the level of office automation, though generally far behind that of developed countries, is more advanced in banking than in other sectors.

3.10 In the front office, banks have invested heavily in automated teller machines (ATMs) and cashier operated terminals. There are over 48,000 ATMs now in the United States compared to 9,800 in 1976, and over 5,000 in the United Kingdom compared to 1,200 in 1979. The substantial investment involved not only in the terminals but also in the network hardware, has restricted their use to the larger banks and building societies, and in Japan this has led to regulations on the hours during which ATMs may be operated, as a means of protecting the smaller banks. Combining unstaffed deposit-taking machines with ATMs has allowed banks to extend their opening hours (including Saturday mornings in the United Kingdom) without any counter-staff. Counter-terminals, which allow transactions to be recorded automatically, can be linked to computers in the back office to provide cohesive branch information. Here, the installation of mainframe computers and, more recently, mini-computers has coped with various data processing tasks, for example settlement of transaction information, target balance reporting, and money transfer facilities, together with systems to allow dealers to update their trading positions quickly, and real time information systems showing market developments. Some banks are also able to offer foreign exchange brokers an automated confirmation service replacing the existing manual method of recording deals between them. At the same time, clearing banks have begun to automate their payments systems, both nationally and internationally. More than 1,500 banks in 39 countries are able to transmit transactions via a computer system operated by the Society for Worldwide International Financial Telecommunications (SWIFT) at a fifth of the cost of telexes.⁵ Many banks and credit card companies also operate their own international networks.

3.11 Second generation systems are being developed which could further extend access to bank services, such as home banking (offering information about balances, the ability to transfer funds from one account to another, or even brokerage facilities) and 'cashless shopping' (electronic funds transfer at the point of sale or EFTPOS). Both systems are in operation in a few countries, but as yet on a limited scale, principally because of the high installation costs involved. The benefits (in terms of cutting transaction costs) will depend on the extent to which the systems are used. According to one banker, EFTPOS would not be economic in the United Kingdom even if it replaced all credit card vouchers and half of the cheques used, and plans to launch a nationwide system in 1986 have been temporarily shelved. However a French invention, the 'smart card' (a credit card containing an inbuilt one-chip microprocessor and memory, on which transactions may be recorded) may allow the use of less sophisticated machines (authenticators instead of terminals) in retail outlets, and so lower the cost of cashless shopping. The cards have the added advantage of making

fraud more difficult, while they can also be used for other purposes such as storing individual health records or for identity controls. Meanwhile an EEC study on banking technology concluded that home banking would not be widespread before 1990. Home shopping, which combines elements of home banking and EFTPOS with viewdata information on goods and prices, is another development being promoted in the medium term.

3.12 Besides the hardware embodying these new technologies, there are major costs involved in the development of the associated software, as well as in the reorganisation of the banks themselves. A number of banks have therefore jointly funded R & D companies to develop programmes suited to their various needs.

3.13 While the new information technology is allowing the creation of new financial services and enhancing the quality of existing ones, and is therefore likely to generate increased demand on the banking sector, there is concern among bank workers that the elimination of several manual operations by automation will inevitably reduce the demand for their labour. According to the Clearing Bank Union in the United Kingdom, for instance, employment in the clearing banks will fall by 10 per cent in the next decade. At the same time the occupational skills required will shift from cash handling and administration to financial advising. In India, the opposition of bank workers' unions to computerisation, on grounds of likely job losses, has been a major factor in the banks' failure to instal their own internal telecommunications system.

Insurance⁶

3.14 The earliest and now the most widespread use of electronic data processing technology in the insurance industry was in the automation of accounting, in particular maintaining the customer's policy record. This involves producing premium bills, updating policy accounts, paying agents' commissions, calculating reserve requirements, paying policyholder dividends, and keeping policy loan accounts—as well as computing actuarial tables and managing investment portfolios. Branch office personnel can have rapid access to policy information via real time computer networks for use in preparing specialised insurance packages for individual clients. Thus new technology has allowed the introduction of new products and better customer services, in addition to lowering the cost of accounting, increasing the speed of cash collection, and improving investment management. For example, in the United Kingdom one computer company has announced that it will be providing a national network linking Lloyds syndicates with 'high street' insurance brokers, allowing information on rates to pass quickly

between companies and brokers, and quotations to be calculated with the aid of a software package, as well as handling correspondence between brokers and underwriters. It seems likely that this network will be extended internationally, thereby strengthening Lloyds role in the world insurance market.

3.15 The first category of insurers to become automated has tended to be the life offices, though even here a large proportion of smaller firms have been slow to adopt automated techniques, partly because of the indivisibilities involved. But the advent of the mini-computer and computer service bureaux has made automation economically viable for most small firms. However, there are still problems facing the small independent agencies, affiliated to more than one insurance company. In particular the incompatibility of different information systems has meant that each agency has to have a different terminal for each insurance company using a different system. Whether or not standardisation is achieved will depend on the extent to which the industry is prepared to coordinate its technological development.

Tourism

3.16 The rapid changes in the speed and nature of world telecommunications services, notably the introduction of teletex, telefax, national and international data networks, coupled with developments in computer technology, have radically altered the administration of the world tourist industry. There have been three major innovations. First, the use of information networks provides travel agents with almost instant access to details of schedules, prices and availability of flights, hotel rooms and rented cars. There are about 30 such international networks—14 for hotels alone—which are accessible to agents throughout the world via a central switching link in Boston, USA, and many more national ones. Second, most document preparation is now automated, and therefore quicker and more accurate, being produced by micro-computers with a printing capability, i.e. the terminals are attached to the data bases. Third, the same terminals can be used to calculate an agent's total daily sales and also to record marketing information, such as details of customers' requests for new services, which are then communicated to the travel company's headquarters (or the national tourist board) for analysis. In this respect the terminals are used in a way similar to point of sale terminals in merchandise retail outlets.

3.17 These changes have important implications for the development of tourism in developing countries. On the one hand they could help to stimulate demand by improving links with distant and previously unused locations. In addition the ability to confirm flight and hotel

bookings rapidly, if not instantly, by reducing uncertainty (including worries about double-booking) may increase the number of people willing to holiday (or conduct business) abroad. On the other hand, countries which are not able to get information about their tourist resorts onto any of the tourist industry data networks may find that some of their trade is diverted to others. This could also apply to hotels (or tour operators) within particular countries—small, locally owned hotels (or tour operators) may find that the cost of participating in such a data network is too high (or that they are unable to obtain sufficient foreign exchange for it). This is likely to reinforce the dominance of hotels owned (or tours run) by TNCs in a tourist industry whose integrated purchasing, management and marketing networks, strengthened by the new information technology, as well as often integrated ownership with airlines, already present significant entry barriers to locally-owned firms in developing countries.⁷ In response these firms might wish to consider setting up a computer-based marketing network on a cooperative basis. Such a facility already exists in the United Kingdom where several family operated hotels have jointly used the services of a computer bureau to establish a data base, with details of room availability, that can be linked with hotel data networks serving travel agents nationwide. But they will also need to cooperate in other areas (such as the purchase of supplies, legal and financial services) if they are to compete effectively with the larger, transnational chains.

Office automation

3.18 New technology is being used in nearly all the offices of major companies in developed countries and increasingly in smaller companies' offices to improve their capacity to handle words and numbers, and to improve their communications. In most cases the chief objective appears to be to cut costs by reducing the number of staff, but additional aims are to increase the speed and accuracy of office work, and to enhance its usefulness by making it more information-intensive.

3.19 There is a long list of machine categories available for office automation, and a wide range of models within each category, with substantial price differentials. Communication systems having already been discussed, the following concentrates on electronic typewriters, wordprocessors and small (micro, mini) computers.

3.20 Electronic typewriters contain chips which store information on tabs and spacing, and commands. The memory can be used to store text until all mistakes have been corrected or alterations made, before the text is printed; it can also be used to reproduce standard letters or other documents, and store regularly used names and addresses, or standard paragraphs. The typewriters may be used for printing when

attached to a computer, for example a mobile computer receiving messages across telephone lines, and when two electronic typewriters are linked in this way they can form a type of super-telex system. However, their overall use is still fairly limited, with only 1.8 million being operated in Europe compared to 10 million typists.

3.21 Dedicated wordprocessors allow a greater degree of text manipulation, with a full size screen compared to the single line display of most electronic typewriters, which makes it easier to reposition sentences or paragraphs. They have several other editing facilities such as inserting new paragraphs, as well as storage benefits with large volumes of text being stored on compact floppy or hard disks. Print speeds are almost three times as fast as for electronic typewriters (but still not fast enough to replace photocopiers).

3.22 General purpose micro- or mini-computers with a wordprocessing function are gradually taking the market away from most dedicated wordprocessors. They are generally easier to use and with the large number of software programmes on the market, they can perform nearly all the same handling tasks; moreover they also offer the capacity for data manipulation (for instance financial planning) at little, if any, extra cost.

3.23 One problem with the wide variety of equipment on the market is the risk of incompatibility. Although there have been some attempts to develop 'translators' which allow machinery of different makes to interact, it seems that incompatibility is still widespread, even within individual offices. A study of micro-computer use in the public sector in Mexico found more than 350 different models, many mutually incompatible.⁸ This invariably increases the need for training and maintenance, and also means that the technological capacity of a piece of equipment may not be fully realised. Another study estimated that as much as 20 per cent of the £5 billion or so spent on information technology in the United Kingdom in 1984 was probably wasted because wrong systems had been chosen and unnecessary capacity installed, with the proportion as high as 50 per cent for smaller companies.⁹ A contributing factor appears to be the way in which most decisions on new technology are taken by finance directors rather than by directors of operations. There is also a tendency to overconcentrate on the potential for saving jobs (usually by cutting them) through raising labour productivity, which leads to the neglect of how the new technology can be used in other ways (such as to improve the quality of services).

3.24 According to one estimate the world market for office automation products is growing at more than 15 per cent annually, having reached

\$5 billion in 1982; others put the market for word processors in the United States alone at \$2 billion in 1980.¹⁰ Certainly the level of investment per office-worker is rising rapidly—in the United States it is forecast to reach \$8,000 to \$10,000 by 1989, four times that of 1984.

3.25 Despite the gradual reduction in the cost of office equipment, particularly at the lower end of the market, there is little evidence of office automation in most developing countries (with a few exceptions as noted above in the sections on telecommunications and banking). This is partly because the equipment is still too expensive (and the foreign exchange often not available for its import). In addition the relatively low levels of wages have not led to the same pressures for reducing staff sizes. Computers would appear to be an exception, with a significant increase in the use of mini-computers in developing countries in the 1970s. However, computers are still overwhelmingly used for routine data processing applications, rather than linking up with other office (or production) equipment. This makes economic sense given the low wage levels and lack of skills. But in the medium term increasing competition from developed country producers of more automated services may put pressure on developing countries to automate a wider range of office tasks.

NOTES*

1. See UNIDO, *Industry in a Changing World*, New York: UN, 1983, p. 94.
2. The introduction of biotechnology and renewable energy technologies, while clearly affecting the overall cost of health care and transport respectively, may not affect the value added in these services as much as in the pharmaceuticals and energy industries, respectively, and are not therefore considered here.
3. In 1981 there were 472 business and industrial information data bases publicly available, and 223 for science and technology. Most were located in the developed countries. (UNCTAD, *Technology in the context of services and the development process*, Geneva: TD/B/1012, 1984, p. 3.)
4. In the United Kingdom five clearing banks trebled their investment to £750 million in the six years to 1981—an annual growth rate of 19.5 per cent. (R. Barras, *The Case of Office-based Systems*, Paris: OECD, ICCP Series, 1984.)
5. The system itself cost over \$1 billion to develop.

* In those cases where only abbreviated references are given here to works cited, complete references will be found in Appendix 10, Selected Bibliography.

6. This section draws on S. Globerman, *The Adoption of Computer Technology by Insurance Companies*, Ottawa: Economic Council of Canada, 1984.
7. See UNCTC, *Transnational Corporations in International Tourism*, New York: UN, 1982.
8. Nochtieff and Lahera (1982).
9. T. Bevington and M. Hand, *The Barriers and Opportunities from Information Technology—a Management Perspective*, London: A. T. Kearney, 1984.
10. Hoffman (forthcoming).