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COMMITTEE FOR INFORMATION, COMPUTER AND COMMUNICATIONS POLICY

RESTRUCTURING IN PUBLIC TELECOMMUNICATIONS OPERATOR EMPLOYMENT

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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SUMMARY

At its Twenty-Fifth Session the OECD's Committee for Information, Computer and Communications Policy agreed to derestrict a statement on the Benefits of Telecommunication Infrastructure Competition. One of the principal findings of that statement was that, where infrastructure competition had been introduced, it had encouraged greater efficiency in public telecommunication operators and opened up new employment opportunities in and beyond the telecommunication sector.

Given the importance of this finding it was decided to make telecommunication employment the major subject for discussion of ICCP's Working Party on Telecommunication and Information Services Policies (TISP) meeting on 6-7 December 1994. This document has been prepared with a view to examining further the relationship between telecommunication development and employment. **Section 1** of the document summarises the factors impacting on employment in public telecommunication operators (PTOs) in the OECD area. These include structural changes resulting from new policy frameworks such as corporatisation, privatisation and the liberalisation of markets. However, the document concludes the most important factor impacting on employment changes in the telecommunication sector is technological change. The section highlights the need for PTOs, whose revenue per mainline is falling in real terms, to harness digitalization to achieve greater efficiencies and launch new services to maintain current financial returns in the sector.

Section 2 investigates in more detail changes in employment trends in five PTOs in Australia, France, Japan, the Netherlands and the US. The pattern that emerges across these countries is very similar and appears to have very little relationship to the type of market structure in place. Traditional telecommunication jobs connected with network expansion, modernisation, maintenance and operation are being reduced due to the digitalization of the network. Moreover the downsizing that has been occurring in the direct employment of PTOs appears to be gathering pace as more advanced digitalization rates are achieved. An example is given of how Nynex, a US carrier which has downsized by 20 per cent and plans a further reduction of 22 per cent over the next three years, has won praise from Unions and the US Administration for the manner in which this will be achieved. The impact on those public telecommunication operators with low productivity levels that do not make appropriate structural adjustments ahead of necessity is likely to be harsher than would otherwise have been the case. They are also placing an unfair burden on telecommunication users and raising the cost of universal service.

At the same time further investigation of the experience with liberalisation of telecommunication infrastructure has shown that it stimulates market growth and innovation which creates new jobs in incumbent operators and new rivals. Spectacular examples of this are provided from the UK and Japan, where an ending of the duopoly arrangements for mobile telecommunication has stimulated dramatic growth in new subscribers and concomitant employment growth. While this growth is not in all cases enough to offset direct employment losses in public telecommunication operators, it is clear that liberal markets are best able to capture new job growth.

More importantly as **Section 3** discusses, the major benefits of a more efficient and creative telecommunication sector are likely to flow to other sectors of the economy, including content jobs in the

information industries. The employment growth in these sectors is expected by Member countries to far outweigh losses in the direct employment of public telecommunication operators. The document also illustrates how a major industrial user of telecommunication and information technology, the petroleum industry, critically depends on improved efficiency in the sector.

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TABLE OF CONTENTS

SUMMARY	1
SECTION 1 EMPLOYMENT TRENDS IN PUBLIC TELECOMMUNICATION OPERATORS	5
SECTION 2 EMPLOYMENT RESTRUCTURING IN PUBLIC TELECOMMUNICATION OPERATORS	17
2.1 Telstra, Australia	17
2.2 PTT Netherlands	26
2.3 France Telecom	27
2.4 NTT, Japan	28
2.5 Nynex, US	29
SECTION 3 TELECOMMUNICATION AS THE FOUNDATION OF GROWTH	39
3.1 Telecommunication and Growth in the Information Industries	39
3.2 Applications of Telecommunication for Efficiency in other industries: the Petroleum Industry as an illustration	45
ANNEX	50
NOTES	59

SECTION 1 EMPLOYMENT TRENDS IN PUBLIC TELECOMMUNICATION OPERATORS

Employment in public telecommunication operators (PTOs) has been steadily reduced over the past decade in the OECD area. Between 1982 and 1992 total employment levels in PTOs fell by around 7.5 per cent, from 2.7 million to 2.5 million staff (Table 1). All indications are that this trend is continuing, and may be gathering pace, with most incumbent PTOs in the process of implementing significant staff reductions. In 1994 several PTOs that have already cut employment levels by large amounts in the recent past, such as BT, NTT, GTE, Telecom Eireann, Telecom New Zealand, and the Regional Bell Operating Companies (RBOCs), announced that further reductions will take place over the next few years.

There is a multiplicity of factors underlying the trend toward less employment by PTOs. A major long term reason is that the expansion of telecommunication access has now reached the point where, from a base of one telecommunication main line for every two people in the OECD area, expanding the network has ceased to be a primary driver of telecommunication development. Concomitantly jobs related to network expansion, a staple of telecommunication employment for over a century, have declined in total. At the same time network upgrading, the primary driver of demand for new telecommunication mainlines, is being undertaken with digital switching and transmission technologies with lower installation and maintenance requirements. **The intelligence increasingly built into networks, and into the customer equipment those networks support, has reduced the need for telecommunication staff in PTOs.** This is true not only in network management but in the provision of services (e.g. directory assistance) to customers, even though demand for these services is often increasing very rapidly.

Table 2 shows the number of digital mainlines added by twelve Member countries in the three years 1990 to 1992. Some of these lines were for new customers but most were upgrading the lines of existing customers. By deducting the number of new connections from the number of new digital lines it can be observed that these selected countries upgraded the lines of more than 30 million existing customers. Between 1990 and 1992 for every one new customer connection to the public switched telecommunication network (PSTN) there were at least another two digital upgrades for the lines of existing customers. In countries with a high telephone penetration rate Sweden led the way with more than 13 existing customers having their lines upgraded with digital equipment for every one new customer. Similarly in Canada, which in 1992 had more than 80 per cent digital mainlines, the relationship was four to one.¹

Policy instruments, such as **corporatisation, privatisation and liberalisation**, aimed at facilitating the efficient development of the telecommunication sector, are changing the character of the industry. Telecommunication is becoming a more demand led and less of a supply driven industry. Accordingly the policy changes are influencing the pace of change, **but they are not the sole determinants of employment reductions in PTOs.** Liberalisation, for example, has meant that PTOs need to increase their efficiency. When this entails cutting costs, the level of staff receives close scrutiny. However it is also true that in a competitive market PTOs need to pay more attention to customer requirements or lose business to alternative suppliers. As a result employment is actually growing fastest

in some of the most competitive telecommunication markets, such as mobile telecommunication in Japan and the UK, and in the provision of long distance telecommunication service in the US. The new jobs being created within PTOs are directly related to competition and the new demand orientation, such as the increased emphasis on sales and service employment. On the other hand in most monopoly PTOs employment is declining but without the offsetting benefit of job creation by new suppliers.

The restructuring that is occurring within PTOs is not in response to a catastrophic loss of market share or loss of demand. Despite losing market share to new suppliers all incumbent carriers have greater business volumes following liberalisation. In 1994 several incumbent PTOs in competitive markets, such as AT&T, Telstra, Telia and Telecom New Zealand, announced record financial results. One reason for this is that incumbents find the stimulus provided by competition increases the total market and encourages more efficient operations. More generally the telecommunication sector is one of the most profitable areas of all commerce (Table 3). Demand for many existing and new telecommunication services provided over networks continues to grow apace. **However this demand is being met with less PTO employees because of the rapidly advancing technological capabilities of networks.**

PTO restructuring, through **corporatisation** or **privatisation**, has given telecommunication managers new freedoms to operate their business as efficiently as possible. Even so the variety of new service demands, and the pace of change, is such that no one PTO can hope to be all things to all customers. PTOs have to target those markets they can best serve. At the same time PTOs have realised that many of the services they need to operate can be provided more efficiently by other suppliers rather than being carried out in-house. Sometimes these functions had been undertaken internally even though the PTO had no claim to a comparative advantage over outside suppliers (e.g. furniture making, health services for employees). However in the rapidly changing telecommunication market, current outsourcing practices are also related to specialist expertise needed for core telecommunication operations (e.g. software development). The trend toward outsourcing is creating new jobs in and beyond the telecommunication sector but reducing direct employment by PTOs.

It is useful to examine some trends in the largest 20 PTOs, measured by revenue, in the OECD area (Table 4). Collectively these PTOs have more than 75 per cent of the market for telecommunication services. In 1992 they provided service to 342 million mainlines which represented 83 per cent of all mainlines in the OECD area. The total assets of these PTOs was US\$601 billion in 1992. They operate in a mix of competitive and monopoly markets and because of their size there is a close relationship between trends in the largest 20 PTOs and the OECD average. Using 1988 as a base year Table 4 shows the following:

- **Revenue** per mainline is falling but **operating expenditure** per mainline has been reduced at a comparable rate.
- **Network cost**, to the extent it is represented by assets per mainline, is falling.
- **Capital intensity** as measured by revenue over assets is constant.
- **Capital substitution** as indicated by assets per employee is increasing.
- **Productivity** as indicated by mainlines per employee is increasing.
- **Employment**, or more particularly direct employment, is decreasing.

How do these trends relate to some of the statements made in the preceding paragraphs? Why, for instance, is revenue per mainline falling in real terms if demand for services is increasing? There are several reasons including the fact that competition is driving down prices, technological advances are enabling large efficiency gains, and “second residential lines’ may not generate the same amount of traffic as the initial connections. At the same time competition in the largest telecommunication market, the plain ordinary telephone service (including the provision of alternative access paths -- fixed and wireless), is still largely in its infancy. Competition for local service, to residential and small business customers, is just beginning to take off where regulatory barriers have been lifted to give customers a choice of service supplier. Accordingly the impact competition has had in stimulating growth in services, such as long distance, international and mobile telecommunication, has yet to be felt in the largest telecommunication market.

Declining revenue per mainline, while not a uniform trend, means that PTOs are under pressure to reduce costs. Rapidly advancing technology is enabling a reduction in labour costs and the amount capital stock per mainline. The latter point is particularly interesting in terms of the historical position of the telecommunication sector relative to other industries. It is often noted that telecommunication is a capital intensive industry. In 1992 for every US\$1 of assets, the largest 20 PTOs generated around US\$0.50 in revenue. This relationship held constant between 1988 and 1992. This compares, for example, to the petroleum refining industry, where every US\$1 of assets held by the largest corporations, US\$1 of revenues was generated in 1992 (Table 3). However, as the emphasis shifts from network expansion to network upgrading the amount of capital embodied in assets per mainline is declining. This is because the cost of upgrading mainlines is lower than new mainlines, and that the number of new mainlines is being reduced relative to the size of the total network.

Between 1988 and 1992, despite rising demand, revenue per mainline decreased significantly in real terms. The index for revenue per mainline declined from 100 in 1988 to 89 in 1992. However PTOs in the OECD sustained robust profitability over this period, and out-performed most other sectors, because operating expenditure per mainline was reduced at about the same pace. Between 1988 and 1992 the index of operating expenditure per mainline declined from 100 to 89. One of the major ways cost reductions were implemented by PTOs was by reducing direct employment. This enabled a reduction in the total bill for wages and salaries, expressed as an index, from 100 in 1988 to 90 in 1992 (Table 5). On a per mainline basis wages and salaries were reduced in real terms from 100 to 84 between 1988 and 1992 (Table 5). However the average wages and salaries per employee increased in real terms from 100 in 1988 to 111 in 1992. In other words those employees who retained their jobs, and those employees who were hired over this period, were on average paid much more in real terms. Several factors may be contributing to this trend including:

- Privatisation has usually meant employees are paid according to private sector pay scales which are above public sector equivalents.
- Similarly, **corporatisation** often goes hand in hand with a shift to employment on a contractual basis with the inducement of higher wages.
- PTO **restructuring** is shifting the occupational structure away from craft based jobs toward managerial, professional and marketing jobs with higher average wages. This impacts on **employee recruitment**, where PTOs are increasingly competing against each other, and all other sectors of the economy, for the same skills (e.g. software creation, marketing, management). Consequently wages are higher in these fields.

- Moreover PTOs are often **recruiting** labour that has been trained outside the company (e.g. universities) and doing less craft based training in-house. On the one hand higher average wages reflect higher educational qualifications. On the other hand given the relatively low wages paid to “trainees”, outsourcing training is having a significant impact on average wages.
- **Organised labour** has traditionally been a strong force for higher wages in the telecommunication sector.
- **Profitability** has remained buoyant amongst PTOs enabling higher wages to be paid. Employee share ownership schemes are not included in this data but would increase the real gains made by some employees of private PTOs.

Notably wage and salary costs in PTOs are falling faster than total operating costs suggesting a substitution of capital for labour (Table 5). The enabling technology underlying this trend is the digitalization of the network. The upgrading of telecommunication networks through digitalization is allowing PTOs to cut costs in virtually all areas of their business. Some leading examples are Telecom New Zealand, France Telecom, and the US based carrier GTE. In the 10 PTOs shown in Table 6 there is a clear tendency for those carriers with the most advanced digitalization to have made the greatest relative reductions in operating expense.

Carriers such as GTE and France Telecom that had relatively advanced digitalization programs by 1988 made the largest relative gains in lowering costs per mainline. Carriers such as BT, NTT and Telecom New Zealand who were subject to competition during this period made the largest leap in terms of digitalization and recorded most benefit in terms of cost reductions toward the end of this period. Between 1990 and 1992 BT undertook five digital upgrades for every one new customer connection (Table 2). The cost of faster digitalization may have increased operating expenditure per mainline during the initial years for companies such as BT and NTT. The increasing costs for Telefonica relate to a large investment program timed to coincide with the Barcelona Olympics and Seville Expo and it would be expected that this would reduce in future years. It may also be relevant that SIP and Telefonica have relatively low telephone penetration rates. The case of Telmex, with around 8 mainlines per 100 people in 1992, is somewhat the reverse of other PTOs in the OECD area. Following the privatisation of Telmex the first task was to modernise core facilities so that expansion could be built on an efficient network. Interestingly the Telmex trend for expenditure per mainline after 1990 has been downward reflecting the impact of digitalization.

Those PTOs that had a “fast track” digitalization between 1988 and 1992 such as BT, NTT, Telecom New Zealand and Telmex were leaders in increasing their mainline per employee ratios. GTE with a relatively advanced digitalization program over the entire period also boosted its mainline per employee ratio significantly. Experience of employment trends in OECD countries with very advanced rates of digitalization is limited. Telecom New Zealand's restructuring has been little short of momentous. Staff levels in TCNZ have been reduced from 23 900 in March 1988 to 9 257 in March 1994.² TCNZ projects it will have a total workforce of 7 500 employees by March 1997, of whom 6 500 will be core operations personnel. TCNZ reports the further downsizing will be largely driven by the upgrading of its information and operating systems.³ This raises the question of what will be the experience in other Member countries once they have reached New Zealand's level of digitalization. Here it should be noted that the very large productivity improvement in Telecom New Zealand has been in itself a “catch up” exercise with several OECD benchmarks of operating efficiency. **By March 1994 the huge gains in mainlines per employee has brought TCNZ on a par with the average for the OECD area in 1992.**

Accordingly the New Zealand experience will not necessarily be repeated in countries with high existing mainline per employee ratios.

One reason that the New Zealand experience is not necessarily applicable to all Member countries is that many other PTOs already have outsourcing practices, rigorously adopted in TCNZ, in place. In fact although mainlines per employee have generally not been a reliable guide to efficiency, when considered as a stand alone measure, it has tended to indicate which PTOs have outsourced activity to the greatest extent. For example Telecom Italia, formed through the merger of several operating companies including SIP, has a very high mainline per employee ratio. However a sister company, Sirti which is 49 per cent owned by the parent company STET, does much of the installation and engineering work for Telecom Italia.⁴ Similarly France Telecom's employment of around 155 000 in 1992 is net of "inside wiring" installation work carried out by around 18 000 independent contractors. In 1992 both France Telecom (194 lines per employee) and Telecom Italia (223 lines per employee) had mainline per employee ratios well above the OECD average (168 lines per employee). A further point is that reductions in TCNZ direct employment do not necessarily correspond to sector reductions. One of the first initiatives TCNZ took was to outsource the installation of telephone service. As a result many former TCNZ employees became subcontractors undertaking tasks such as inside wiring for telecommunication connections.

It is too early to foresee what the final impact of advance digitalization rates will have on PTO employment. Most of the available evidence points toward a continuation of downsizing in traditional areas of telecommunication network construction and operation. The OECD average for mainlines per employee, as TCNZ recognises, is not best practice. In 1992 PTT Netherlands, after Luxembourg, had the highest mainline per employee ratio in the OECD area (238 mainlines per employee). In November 1994, PTT Netherlands announced 3 000 jobs, nearly 10 per cent of telecommunication staff, would be cut in an effort to boost productivity.⁵ It was reported the reductions would be concentrated in telecommunication maintenance where fewer people were required to maintain a digital network. PTT Netherlands had a digitalization rate of 93 per cent at the end of 1993. PTT's goal is to increase mainlines per employee by 15 to 20 per cent by 1997. The company had previously announced a target of reducing wage costs by 10 per cent.⁶ In short best practice performance is going to continue rising over the next several years placing the greatest pressure on those PTOs with low productivity.

Potential productivity gains from improved operational efficiency for PTOs in the OECD area are very large. One recent benchmarking exercise of 72 PTOs in 59 countries calculated that annual savings of US\$78 billion were possible if all these carriers operated at world's best practice levels for PTOs with similar telecommunication densities.⁷ This would be the equivalent of a reduction in overall labour related expenses (salaries, benefits etc.) of 40 per cent. In Europe, the study found potential savings of US\$35 billion were possible in 20 PTOs from a total operating expense of US\$78 billion. Reductions of US\$22 billion were found to be possible for PTOs in the Pacific region and US\$18 billion for telecommunication carriers in the US. A regulatory environment that does not encourage competitive pressure on efficiency levels preserves higher costs for all telecommunication users, including raising the cost of universal service.

In so far as reductions of direct employment by PTOs reduce sectoral telecommunication employment this is exacerbated in those Member countries that prohibit infrastructure competition. On the other hand the new jobs that are being created in and beyond the telecommunication sector depend on digitalization. In its 1994 **Annual Report**, TCNZ notes that employment outside its core operational staff depends on the rate of growth of other business. The same is true of other PTOs in the OECD area. PTOs need to reap the benefits of digitalization in terms of cost reduction to maintain the current ratio between costs and revenue. With revenue per mainline falling, in real terms, those PTOs that do not reduce costs

will not be in a position to pass on benefits to the wider economy. In terms of sectoral employment those PTOs that are not encouraged by competition to promote innovation and introduce new services, that the added functionality digitalization can facilitate, will not be creating new jobs to offset losses.

Growing demand has stimulated an increasing awareness in business, government and the public at large that an efficient telecommunication system is fundamental for general economic and social development. For example the penetration of business telecommunication mainlines per 100 employees in the OECD area grew from 15 to 27 between 1982 and 1992.⁸ This rise occurred even though there was increased use made of private branch exchanges and multiplexing. However the distinction between business and residential lines will increasingly blur as more “home workers” take advantage of the digitalization of local access networks. Between 1988 and 1993 the number of people working at home in the US grew to 15 million.⁹ Home workers, defined as people who bring work home from the office, comprise some 31 per cent of the US workforce. The most rapidly growing segment are telecommuters who work at home during “office hours”. The number of telecommuters in the US was 6.6 million in 1992, an increase of 20 per cent over 1991, which in turn grew by 40 per cent over 1990.¹⁰ One study has projected this number will increase to 10 million by 1995.¹¹ Accordingly this group has been increasingly identified as a distinct market for PTOs and value added service providers. In the US home workers spent US\$12.3 billion for telecommunication products and services in 1992, which was up 21 per cent on 1991, and US\$12.7 billion for work related telephone calls and on-line services, an increase of 10 per cent over 1991.¹²

Telecommunication is not only impacting on the location of employment but on the efficiency of investment made by virtually all sectors of business. In 1970, information technology as a share of total investment in producers' durable equipment in the US represented around 10 per cent.¹³ By 1980 it had climbed to 20 per cent and by 1993 had reached 45 per cent. Between 1983 and 1993, total capital per worker in the US services sector rose from an index of 100 to 110, while “high-tech” capital per information worker rose to 170.¹⁴ The efficiency of the telecommunication networks and services in the US is fundamental to the productivity this investment generates. The WEFA study on telecommunication policy reform in the US stated the major impact could be allowing business to take fuller advantage of the capabilities of information technology, especially through the use of enhanced telecommunication and information services.¹⁵ WEFA concluded increased competition in the provision of telecommunication infrastructure and services could help drive the following outcomes:

- Industrial equipment purchases per employee gain 25 per cent over the next 10 years. This reverses a declining trend over the last two decades and helps boost the capital labour ratio to support economic growth over the next ten years.
- Computer hardware purchases per employee, which doubled over the last ten years, double again over the next ten years.
- Purchases of software per employee more than tripled over the last ten years and quadruple over the next ten years.
- Purchases of information services, which grew to become a US\$25 billion industry by 1993, increase over 500 per cent during the next ten years.

This is why the major concerns of government go beyond a simple paradigm of telecommunication based employment being confined to telecommunication carriers in their consideration of policy reform. The growing reliance OECD Member countries place on the efficient application of communication and information technology to support economic and social development means that far

more ambitious goals are being defined. It is increasingly common for Member countries to forecast employment increases in national economies, as the result of extending and upgrading communication infrastructure, that are in themselves many times greater than the total direct employment by telecommunication carriers. The following examples highlight this trend:

- **From Canada:** "The global integration of markets makes the timely exchange of information a critical competitive advantage. New businesses are rapidly developing to feed new markets. In an information-based economy, most of the new jobs created require the ability to generate, access, analyse and use information. These capabilities have become essential for economic growth and social well-being."¹⁶
- **From France:** a recent report has projected employment for telecommunication value added services. From a base of 65 000 in 1993 the study projects total employment of 170 000 in the year 2005, or 370 000 jobs by the same year with a more rapid roll out of information infrastructure.¹⁷
- **From the European Community:** "...the enormous potential for new services relating to production, consumption, culture and leisure activities will create large numbers of new jobs."¹⁸ **and** "A new "information society" is emerging in which the services provided by information and communications technologies underpin human activities. It constitutes an upheaval but can also offer new job prospects."¹⁹
- **From Japan:** "In an advanced info-communications society, the infrastructure facilitates the exchange of information and knowledge. It will also help in solving some of the problems confronting Japan, such as the need to structurally reform existing industries and create new employment opportunities, as well as problems arising from the advent of a greying society with low population growth."²⁰ **and** "The new jobs created by building a fibre optic network would outnumber those in the automobile industry"²¹
- **From the US:** "The telecommunications and information industries account for almost US\$1 out of every US\$10 spent in the United States. Telecommunications and information businesses support jobs for more than 4.6 million Americans. The Council of Economic Advisors has concluded that legislation and regulatory reforms will increase competition in telecommunication markets, as recommended by the administration, could add more than US\$100 billion to our GDP over the next decade, and 500 000 new jobs by the end of 1996."²²

For these outcomes to be realised, with consequent employment growth in some sectors and greater productivity gains in other sectors, telecommunication policies need to promote lower prices, service innovation and increasing quality of service. In its recent work the OECD, through the ICCP Committee has commended the value of telecommunication infrastructure competition to assist in achieving these goals.²³

Table 1. PTO Employment in the OECD area

	1982	1990	1991	1992
Australia	88 100	83 839	77 953	72 164
Austria	17 390	18 415	18 305	18 300
Belgium	29 474	26 031	26 087	25 911
Canada	111 088	104 335	100 655	97 140
Denmark	15 900	17 700	18 100	17 700
Finland	21 100	20 198	19 080	16 072
France	165 000	156 615	156 100	155 300
Germany	203 751	212 000	225 628	229 710
Greece	31 148	28 026	27 593	26 716
Iceland	1 058	959	985	995
Ireland	18 932	13 472	13 544	13 425
Italy	104 480	104 610	106 327	106 081
Japan	330 000	272 626	266 111	252 970
Luxembourg	639	703	760	800
Mexico	31 385	49 912	49 488	48 937
Netherlands	27 457	31 770	30 794	30 972
New Zealand	24 582	17 131	14 925	13 642
Norway	17 933	18 794	18 159	17 717
Portugal	23 800	23 563	23 069	22 636
Spain	71 170	78 518	78 815	77 819
Sweden	39 970	42 254	42 399	39 540
Switzerland	16 452	20 170	20 705	20 855
Turkey	65 369	90 085	90 783	91 072
United Kingdom	246 600	240 236	224 197	197 150
United States	973 680	912 005	899 196	881 456
OECD	2 676 998	2 583 594	2 549 700	2 475 578

Note: Where possible employees of new telecommunication service suppliers have been included from the year of service initiation. For instance the UK figure for 1992 includes BT, Mercury, Vodafone, Kingston Communications and Cable Telephony providers. In some cases a figure for group employment has been used.

Source: OECD.

Table 2. Expanding and Upgrading Telecommunication Exchanges in Selected OECD Countries

	Additional Mainlines Connected to Digital Exchanges	Network Expansion (Digital/Analogue)	Digital Replacement
	1990-92	1990-92	1990-92
Austria	582 406	243 332	339 074
Belgium	599 074	351 342	247 732
Canada	5 349 371	950 781	4 398 590
Greece	455 133	494 619	n.a.
Iceland	17 525	9 031	8 494
Italy	6 264 000	2 443 000	3 821 000
Norway	346 657	136 196	210 461
Portugal	913 863	634 872	278 991
Sweden	973 754	70 300	937 754
Switzerland	656 098	242 140	413 958
Turkey	1 995 485	2 578 614	n.a.
UK	4 823 725	789 133	4 034 592
US	27 809 493	7 719 710	20 089 783

Source: OECD Communications Outlook.

Table 3. **Telecommunication Services compared to Fortunes Magazine's Largest Industrial and Service Companies, 1992, US\$ billion**

Sector and Number of Companies	Sales	Profit/Loss	Assets	Employees (million)	Sales/Assets (per cent)
Industrial:					
Motor Vehicles and Parts (44)	940	(24.4)	1 005	3.91	93.5
Petroleum Refining (48)	902	18.5	907	1.49	99.4
Electronics, Electrical (46)	736	12.0	932	4.27	78.9
Food (51)	438	16.0	319	2.21	137.3
Chemicals (45)	405	1.2	455	1.77	89.0
Telecommunication Services (1)	364	37.0	679	2.00	53.6
Metals (32)	343	(5.9)	332	1.82	103.3
Computers, Office Equip. (17)	233	(6.9)	269	1.22	86.6
Industrial and Farm Equip. (27)	218	(2.5)	257	1.19	84.8
Aerospace (16)	169	(3.1)	147	1.06	114.9
Pharmaceuticals (25)	160	19.7	181	0.83	88.3
Forest and Paper Products (25)	140	(.3)	187	0.66	74.8
Service Sector:					
Retail (50)	750	8.4	379	n.a.	197.8
Diversified Financial (50)	547	13.6	3 360	n.a.	16.2
Telecommunication Services (2)	390	39.0	717	2.25	54.3
Transport (50)	377	(6.8)	601	n.a.	62.7
Commercial Banking (100)	n.a.	36.8	16 282	n.a.	n.a.

Note: Number of companies listed in brackets except (1) Data compiled for largest 25 PTOs with revenues greater than US\$3 billion, using **Fortune 500** cut off point; and. (2) Data compiled from 39 PTOs in the OECD area with revenues greater than US\$1 billion, using **Fortune** "Service Sector" cut off point.

Source: Fortune Magazine, OECD Communications Outlook.

Table 4. Asset and Employment Trends in the Largest 20 PTOs in the OECD area

	1988	1989	1990	1991	1992
Mainlines	100	104	108	112	116
Assets per Mainline	100	98	95	91	89
Employees	100	99	98	95	92
Assets per Employee	100	103	104	111	113
Mainlines per Employee	100	105	110	117	126
Revenue/Assets	100	100	99	100	101
Revenue per Employee	100	103	104	107	112
Revenue per Mainline	100	98	94	92	89
Operating Expenditure per Mainline	100	99	96	94	89

Note: Largest 20 PTOs by revenue.

Source: OECD.

Table 5. Wage and Salary Trends in Selected PTOs in the OECD area

	1988	1990	1991	1992
Total Wages & Salaries	100	100	99	95
Wages & Salaries per Employee	100	103	108	111
Wages & Salaries per Mainline	100	92	91	84
Wages & Salaries/Operating Cost	100	97	93	90

Note: Index for 14 of the largest 20 PTOs by revenue including an aggregated average for the 7 RBOCs. Data for 1989 excludes RBOC average and is therefore not consistent.

Source: OECD.

Table 6. **Digitalization and Expenditure per Mainline for Selected PTOs**

	1988	1989	1990	1991	1992	Increase 1988-92
Telecom NZ (Digitalization)	30	50	72	92	95	65
(Op. Expenditure per M'line)	100	96	94	93	83	
(M'line per Employee)	100	115	127	142	160	
France Telecom (Digitalization)	60	65	70	79	83	23
(Op. Expenditure per M'line)	100	97	96	80	77	
(M'line per Employee)	100	106	111	131	120	
GTE (Digitalization)	66	70	74	77	82	16
(Op. Expenditure per M'line)	100	99	90	78	71	
(M'line per Employee)	100	107	113	135	148	
Nynex (Digitalization)	38	49	55	61	67	29
(Op. Expenditure per M'line)	100	104	97	94	79	
(M'line per Employee)	100	103	107	121	126	
BT (Digitalization)	23	38	47	55	64	41
(Op. Expenditure per M'line)	100	103	94	90	87	
(M'line per Employee)	100	104	115	125	157	
Bell South (Digitalization)	38	44	51	57	61	23
(Op. Expenditure per M'line)	100	96	91	87	82	
(M'line per Employee)	100	102	105	115	118	
NTT (Digitalization)	20	28	39	49	60	40
(Op. Expenditure per M'line)	100	97	96	94	91	
(M'line per Employee)	100	108	116	123	134	
Telmex (Digitalization)	18	24	31	41	52	34
(Op. Expenditure per M'line)	100	102	122	111	106	
(M'line per Employee)	100	112	122	139	157	
SIP (Digitalization)	17	25	33	40	49	32
(Op. Expenditure per M'line)	100	101	99	104	103	
(M'line per Employee)	100	102	105	106	109	
Telefonica (Digitalization)	11	20	28	34	36	25
(Op. Expenditure per M'line)	100	101	104	111	113	
(M'line per Employee)	100	108	114	114	113	
Average (Digitalization)	32	41	50	59	65	
(Op. Expenditure per M'line)	100	100	98	94	89	
(M'line per Employee)	100	107	113	123	134	

Note: Digitalization is the per cent of mainlines connected to digital exchanges. Operating Expenditure per mainline is represented as an index with 1988=100. Calculation carried out using 1990 US\$ in ppp. Average is a simple average. For the graphic of this table refer to Figures 1 and 2 in the appendix.

Source: OECD.

SECTION 2 EMPLOYMENT RESTRUCTURING IN PUBLIC TELECOMMUNICATION OPERATORS

2.1 Telstra, Australia

Telstra (Telecom Australia) provides one example of a PTO which has embarked on major restructuring in recent years. Between 1980 and 1992, albeit with some interim fluctuations, Telstra reduced its workforce by 13 600 staff. Some 92 percent of these reductions took place between 1990 and 1992. The decrease in staff levels coincided with a decision in 1990 by the Australian Government to liberalise the telecommunication market. While the introduction of competition can be expected to have provided an incentive for Telstra to boost efficiency, it would be simplistic to suggest liberalisation was wholly responsible for job losses. Other factors that need to be taken into account include technological change, new operational practices and the rate of network expansion and modernisation. These factors are, of course, themselves intertwined with Telstra's response to a competitive market.

In the past Telstra has had one of the lowest mainline per employee ratios in the OECD area. In June 1993 the company had 69 300 employees and a ratio of 123 mainlines per employee. Several factors have been suggested for Telstra's position relative to other PTOs in the OECD area, including the large size of Australia, a relatively low digitalization of the network (26 per cent in 1991 compared to an OECD average of 47 per cent), and a tradition of carrying out most operations in-house (e.g. network construction). However Telstra is now amongst those carriers in the OECD area, with low mainline per employee ratios, that have been making the greatest reductions to their workforce. By June 1994, the rate of digitalization in Telstra's network had doubled to be more than 51 per cent and a major restructuring was underway in response to competition.

At a slightly simplified level Telstra's restructuring can be categorised in three parts. **First** is a group of traditional telecommunication jobs comprising the core activities of maintaining, upgrading and expanding the network. Under the classification scheme used by Telstra these duties largely fall under the responsibilities of **Communications Officers** and **Telecom Technical** staff (Table 7). **Telephone Operators** is also a traditional telecommunication occupation. Historically these were occupations for which Telstra, like many other PTOs in the OECD area, trained a large part of its staff internally. In 1975, Telstra employed 6 500 trainees (7.3 per cent of total staff), and while numbers fluctuated over subsequent years, this had been reduced to 400 (0.6 per cent of total staff) in 1992.

Collectively the group of employees in core telecommunication activities has faced the largest amount of downsizing. The most significant factors being the advance of technological development and liberalisation of telephone installation. Telstra's experience with outsourcing training is being repeated in other PTOs. In November 1994, BT announced that it would be cutting its 4 000 personnel staff by 50 per cent with the heaviest cuts being in training. BT says that specialist training will remain "in-house" but that general training, such as welding or computer skills, will be done externally.²⁴

The **second** group of Telstra staff is largely made up of middle management, administration and general support services. The major influences on restructuring in this category have been the greater use

of outsourcing and the deployment of information technology in offices and for functions such as billing. In respect to outsourcing, non-core telecommunication activities, such as **artisans, building services and food services**, all show reductions. The reduction of **media and print staff** is one example where outsourcing has been significant given the large increase in marketing/advertising expenditure by Telstra since the introduction of competition. While middle management shows an increase over a decade, staff numbers have been decreasing since 1990 in line with general reduction of **administrative** labour.

Third, is a group of occupations enjoying substantial job growth, though not in itself enough to offset reductions elsewhere. The two main influences among this group are the creation of jobs around new technology, such as **information technology** workers, and significantly the onset of competition boosting the need for sales staff. The dip in the number of information technology workers in 1992 may be a sign of an increasing reliance on outsourcing. **Executive staff** numbers have also increased either because of reclassification of management staff or the need to recruit new leaders with the skills necessary for a competitive environment.

On an occupational basis the largest reductions between 1990 and 1992 occurred amongst **Telecom Technical** staff and **Communications Officers**. Telstra's largest occupational category is the technical officers whose responsibilities include maintaining and operating exchanges and in the installation of customer premise equipment. Between 1975 and 1990, this category rose by 23 per cent from 20 500 to 26 100. Since that time downsizing has occurred due to lower fault incidence and maintenance brought about by increased digitalization. In 1990 Telstra had a relatively low level of digitalization and a vast number of small exchanges. By mid 1992 Telstra's digitalization had been increased to more than 40 per cent of subscriber and the number of exchanges was being reduced. The digitalization of exchanges enables direct labour reduction because the embedded diagnostic capabilities facilitates remote testing and adjustment. The modular construction of new exchanges enables simple disassembly, and software adjustment to be achieved with the removal and insertion of cards.²⁵

From the mid 1980s Telstra has deployed an extensive amount of fibre optic cable in its national network. Among other developments this was a key factor the changing level of employment amongst **Communications Officers**. Staff employed in the category Communications Officers have as their major duties those tasks involved in laying telecommunication lines, line maintenance, fault finding and repair. One estimate is that the laying of optical fibre is one fourth less labour intensive than copper.²⁶ Accordingly the introduction of fibre optic cable has coincided with a 30 per cent reduction of Communications Officers since 1985. Other factors include the completion of a national fibre optic and microwave radio grid encircling the Australian continent. Moreover Australia had reached a relatively high telephone penetration rate of 95 per cent of households by 1992, including the completion of Telstra's rural and remote area programme to upgrade capabilities in underserved regions.

In 1975 Telstra employed nearly 11 000 **telephone operators** comprising 12.3 per cent of the company's work force. By 1992 the number of operators had nearly halved to less than 6 000. While to tasks undertaken by telephone operators are diverse, data for various services show that new technologies have made tremendous productivity gains possible. For example the number of calls made to directory assistance by Telstra customers more than doubled in the 1980s (Table 8). This increasing demand for directory assistance made it possible for a number of telephone operators to shift to this service from working in the dwindling number of manual exchanges.²⁷ By 1991 over 500 000 calls per day were being handled by Telstra's directory assistance service. However further network modernisation was making possible greater efficiency gains in directory service through the introduction of computerised voice announcements. Whereas the number of directory assistance calls was 8 700 per operator in 1980 it had climbed to 29 000 per operator by 1991.

Similarly the number of operator assisted international calls grew from 2.2 million in 1975 to a peak of 15 million in 1989. Yet as a percentage of total traffic, operator assisted international calls were shrinking because of the growing number of subscriber lines with international direct dialling (IDD) capabilities. In fact 1990 witnessed the turning point when Telstra customers made some 2 million less operator assisted international calls. The case of employment of telephone operators is illustrative of a wider trend in the telecommunication sector. **Even at a time of rapidly increasing use of various telecommunication services, technological development is allowing this demand to be met with less labour and new features.** One example is the directory assistance service, available in some OECD countries, which allows the option of being directly connected to a number after making an inquiry without the customer having to re-dial.

The shifting nature of employment in traditional telecommunication activities has obviously had an impact on Telstra's strategy for training staff. It would be too simplistic to say that liberalisation has ended internal training. The available data clearly shows the reduction in internal training commenced long before the introduction of competition in the Australian telecommunication market. More likely this has been due to the lower number of employees required in traditional telecommunication tasks and a commercial judgement about where the new software based skills required to run telecommunication networks are best facilitated. This is not to suggest, however, that in liberalising telecommunication markets, governments should not be cognizant of the impact of training programs of state owned PTOs. In becoming more like any other firm operating in a competitive market PTOs will increasingly make commercial judgements about training requirements. This has implications for government policy in education and training not only to provide the necessary skills for their PTOs to compete in global markets, but also to satisfy the increasing need for telecommunication and information technology based skills across the entire economy.

Within PTOs the consistent creation of new jobs has mainly been based on the increasing demand for "information technology" workers. In 1975, Telstra employed 250 staff (0.3 per cent of total staff) in the category **Information Technology**. By 1980 this had risen to 500 staff (0.6 per cent of total staff) and by 1990 over 1 600 staff (1.9 per cent of total staff). In 1992, the number of staff employed in Telstra's information technology category dipped from the peak of 1991. Given the rate of digitalization nearly doubled and demand for software increased, in areas as diverse as network management and customer billing, the reduction could signal that Telstra is beginning to outsource its requirements. Nevertheless the general trend over the past decade has been for PTOs to increase the demand for information technology workers either by their own hiring or through outsourcing to specialised firms. At the same time **Engineers** and other **Professional Staff** have maintained or slightly increased employment levels in Telstra.

In liberal markets employment growth based on IT inside PTOs has been complemented by a growth in **sales** and **senior management**. Much of this change can be directly attributed to the desire of PTOs to "re-engineer" themselves to face increased competition. In times past PTOs have primarily been engineering and supply driven organisations. Presently they are undergoing a shift to service and demand driven organisations. In competitive markets providing customers with services they require, and increasingly tailoring those services to meet specific needs are the major challenge before PTOs. Where PTOs face competitive suppliers sales staff need to find and convince customers that they can provide the best service and work with other staff to ensure this demand is met. This requires immense change within PTOs, once comfortable with monopoly supply, and the management skills often have to be imported from different industries. Indeed it has been almost a universal practice amongst relatively new market entrants such as Clear Communications, MCI, Mercury, and Optus not to recruit senior staff from incumbent rival operators despite their intimate knowledge of telecommunication markets.

The increase in Telstra's **Executive** staff is evidence that the company is moving to re-orientate itself to a competitive market. Most growth in this category has occurred since Telstra was incorporated in the late 1980s and competition introduced in the early 1990s. One reason for this increase has been the creation of a greater number of business units, such as mobile communication, to more closely focus on market requirements, with an attendant need for executive management.²⁸ Nevertheless the reduction to the previous trend toward increasing the number of employees in the more general **Management** category is highly significant. The experience of most PTOs in competitive markets has been to reduce middle management and introduce flatter corporate structures. Certainly the amount of **Administrative** staff in Telstra is undergoing a substantial downsizing.

A different perspective on Telstra's restructuring is provided by an examination of changes to employment in the company's business units (table 9). Several areas that have experienced the greatest reductions are in response to technological change (i.e. Network Engineering, Operator Services) and outsourcing (i.e. Automotive Services, Food Services, Material Services, Property Services). The increase in **Information Technology**, 50 per cent between 1989 and 1992, can also be ascribed to technological change. However the structure of business units also reflects market demand and those areas of the market subject to greatest competition.

One area of strong growth in employment within PTOs due to increasing demand is mobile telecommunication. Two of the largest mobile service companies in the world, McCaw in the US and Vodafone in the UK, were not providing telecommunication services as little as a decade ago. Growth in Telstra's business unit dealing with **mobile telecommunication** has been strong and increased by 44 per cent between 1989 and 1992. However it can also be the case that competition drives PTOs to improve services in a particular area where they previously had the luxury of a monopoly. The spectacular growth in the number of Telstra staff working for the **Payphones** unit, may in part be driven by technological change (i.e. modernisation and expansion with cardphones) but probably also reflects competition in a market increasing viewed as one with a wide variety of commercial opportunities. Employment in other areas that are attractive initial markets for a new entrant, such as **Corporate customers** (Telstra's largest clients) and **Business services**, have also maintained their employment levels in a competitive market.

That employment increases in the most competitive business segments is fairly clear from an examination of Telstra's experience. However this raises the question of the extent to which technological change and outsourcing are driving changes in areas where the impact of competition has yet to emerge -- and if in reducing staff numbers service quality has been sacrificed. For policy makers a major concern in liberalising markets is to ensure that the quality of service to those customers in less competitive markets does not suffer. This is a well recognised principle in the application of performance indicators in association with the introduction of price caps so that lower quality can not be substituted in lieu of price rises. The same quality of service measures are imperative in newly liberalised markets to ensure service levels are maintained to those users without a choice of service supplier, particularly if staff reductions are undertaken.

Examples of reductions in the number of staff where vigorous competition has yet to emerge for local access services are in Telstra's **Residential business unit** and the **Country business unit**. No doubt the same factors mentioned for downsizing, in the discussion of Telstra's occupational categories, are at work in the residential and country (i.e. rural) divisions. These reductions are welcome if the greater efficiencies are passed to customers in the form of lower prices and improved service. To ensure that is the case AUSTEL, the telecommunication regulator in Australia, monitors and publishes quarterly quality of service reports using indicators such as the timeliness of provision and restoration of service.²⁹ **Importantly, these data are reported for different categories of customers including business and residential users in both metropolitan and rural areas.** More over an indicator is published to track the

number of rural customers with itemised billing (54 per cent as compared with 99 per cent for metropolitan customers) to ensure improved service is increasingly available to all customers.

The restructuring undergone by PTOs may also have an impact of the location of employment which may have implications for regional development for some Member countries. Between 1989 and 1992 Telstra's **Country** division reduced staff by 20 per cent compared to a company wide 13.3 per cent reduction. In small country towns in Australia this trend was first evident in the 1970s with loss of jobs for telephonists as the number of manual exchanges declined. More recently the number of telecommunication jobs in regional areas has declined because of the increased ability through digitalization for remote diagnostics and maintenance, lower fault incidence, and the centralisation of service centres. Moreover the number of small rural exchanges is being reduced in the process of upgrading the network. These trends are evident in other parts of the OECD area. For example, US West, the RBOC often compared to Telstra because of the vast territory it serves has also been downsizing staff and centralising service sites.³⁰ In restructuring announced in September 1993, US West said it would reduce staff by 9 000 employees over three years in connection with a consolidation of 560 service centres in the company's 14 state service area into 26 centres in only 10 cities.

It would be wrong to conclude that the labour restructuring in rural telecommunication is the result of the introduction of competition. In 1994 US West still had a virtual monopoly over the provision of PSTN within its service area. It could also be argued that Telstra held a similar position given that Optus, in its start up phase, has initially rolled out terrestrial service to Australia's urban areas. Certainly competitive forces are presently greater in urban areas than rural regions even in liberal markets. Accordingly the lack of competition in rural areas has meant that the new jobs being created by liberalisation, which tend to offset losses in urban areas, is not happening to the same extent in regional cities and towns.

Some may question whether it could be otherwise. For them the key question is whether a competitive market, necessary to create new jobs, is sustainable in rural areas. Some may draw a parallel with the residential market and ask the same question. In this case the UK experience is apposite. When faced with competition from cable telephony operators in the residential market, BT established a "cable defence team" with a specific mandate to market services to customers in all cable franchise areas.³¹ This group has been established at a time when BT is undergoing rapid downsizing. In a programme known as "callback" customers in cable franchise areas are given information on BT services, including advice of different service options, and asked whether they are satisfied with BT's service. For those customers that choose to opt for another service supplier BT leaves their connection in place and the "cable defence team" contacts them a few weeks later to see if they would like to return to BT. For those customers that return, BT reports having a "welcome back process" in which they receive advice on BT services. The "cable defence team" also asks these customers why they have returned to BT so the company "can improve service" and "keep a check their rivals and their weaknesses".³²

Regarding the question of the economics of competition in rural areas few independent, rigorous and systematic studies have been carried out in monopoly markets. Certainly there is a tendency for monopoly incumbents to inflate estimates of the cost of universal service, particularly in respect to rural areas, to argue against the introduction of competition.³³ Where independent and systematic studies have been carried out it has often been found, contrary to widespread belief, that in most cases rural telecommunication is a profitable business. This is also a common experience in practice when new customers are connected in rural areas, not least because of the high number of long distance calls these customers make, and this sometimes surprises PTOs. In Spain, Telefonica is increasing customer access to its national network in rural areas by using wireless technology. Like many PTOs, Telefonica has found rural subscribers to generate more traffic, and therefore revenue, than initial projections showed.

"It has surprised us [Telefonica] that there is more traffic being generated by these new customers than we expected. Each new line is generating about the same as we get from our mobile customers."³⁴

After a careful study of the telecommunication market, the Australian Bureau of Transport and Communications Economics (BTCE) noted,

"It is popular belief that cross-subsidised telecommunication services are mainly in rural and remote areas. In fact the overwhelming majority of rural services are profitable; most universal service obligations are incurred in providing access to low volume users, many of whom are in city areas. This has significant implications for the rollout of emerging services and appropriate industry structure for universal coverage... Universal service is likely to be more rapidly achieved in a competitive market environment."³⁵

Moreover studies often reveal that the direction of subsidies sometimes runs counter to expectations and contrary to policy objectives.³⁶ In Australia this is one reason the BTCE concluded:

"Universal communications services arouse strong views which tend to be exploited by commercial and other interest groups. Incumbent suppliers have an incentive to over-estimate the cost of supplying such services. The actual cost of supplying such services is equal to the extra costs imposed on a supplier of having to roll out a network further (or sooner) than it otherwise would; incumbent suppliers tend to include joint costs which, if funded under universal service obligation arrangements, actually lead to the cross subsidisation of commercial activities. Not only does such funding allow an incumbent supplier to recoup more costs for universal services than it actually incurred, it subsidises them for services provided in competition with other suppliers."³⁷

The structural changes occurring in rural telecommunication, including the reduction in staff numbers in Telstra's **Country** division since 1989, should have further improved the financial returns from rural markets. Downsizing in the country and residential divisions of Telstra has occurred due to technological change, and may have occurred to a larger extent than would otherwise have been the case if competition was more mature. In other words the creation of jobs and the enhancement of universal service, in rural and residential markets, through the introduction of competition is a likely outcome. In respect to universal service in Australia, the OECD country with the lowest population density per square kilometre, has concluded that "New service roll-out to marginal areas is likely to be more rapid under a regime of vigorous competition."³⁸ The corollary is that jobs will be created in the roll out of services, by new suppliers and incumbents to partially offset the steady decline, if liberalisation is permitted.

The other aspect of the changes occurring in Australia is what impact market liberalisation is having on total sector employment. Employment in communication services (including non-telecommunication based services) historically showed a fairly close relationship with Telstra employment until 1992. Accordingly reductions in employment by Telstra, responsible for more than half the employment in communication services, had a significant impact on total employment in this category (Table 10). Had monopoly provision of service remained there is no reason to expect that Telstra's employment trend would not have continued downward though arguably at a different pace. However this would also have meant that new service suppliers, such as Optus and Vodafone, would not have been creating new jobs which are at least in part offsetting Telstra losses. Moreover the greater freedom other service suppliers have, both in choice of a network supplier and in areas such as resale, has also created jobs. While it is too early to determine the net impact of change in the sector it is notable that as Australia emerged from a recession in the latter part of 1993, while Telstra continued to downsize, communications employment has increased.

Table 7. The Changing Nature of PTO Employment -- Telstra

	1980	1985	1990	1991	1992	Gain/Loss	
						1980-92	1990-92
Comms. Officer	22 603	22 448	19 331	17 831	15 754	- 6 849	- 3 577
Telecom Technical	23 045	25 216	26 148	24 989	23 248	+ 203	- 2 900
Administration	19 510	20 333	19 818	18 405	17 029	- 2 481	- 2 789
Operator	9 043	7 442	6 679	6 316	5 839	- 3 204	- 1 603
Trainee	2 575	4 563	1 221	646	424	- 2 151	- 797
Artisan	2 213	2 234	1 914	1 532	1 319	- 894	- 595
Material Dist.	1 211	2 216	1 773	1 547	1 326	- 115	- 447
Building Services	1 519	1 300	832	663	549	- 970	- 283
Drafting	1 435	1 418	1 163	1 023	882	- 553	- 281
Production & other	n.a.	n.a.	333	259	125	n.a.	- 208
Manager	84	697	1 401	1 329	1 277	+ 1 193	- 124
Technical	408	427	193	151	131	- 277	- 62
Media & Print	n.a.	n.a.	58	33	10	n.a.	- 48
Food Services	215	181	117	101	81	- 134	- 36
							+ 15
Professional	n.a.	n.a.	170	175	185	n.a.	+ 59
Info. Technology	514	745	1 628	1 733	1 687	+ 1 173	+ 80
Engineer	2 219	2409	2 603	2 681	2 683	+ 464	+ 93
Executive	164	285	730	759	823	+ 659	+ 345
Salesforce	n.a.	235	879	933	1 224	+ 989	n.a.
Miscellaneous	1 400	1 138	n.a.	n.a.	n.a.	n.a.	- 12 505
Total Telstra	88 230	93 287	87 018	81 106	74 606	- 13 624	

Note: **Administrative Group** includes accounting machinist, administrative officer, clerk, clerical assistant, data processing operator, secretary, telegraphist, and typist staff. **Operator Group** includes manual assistance, message bureau, phonogram operator and telephonist staff. **Professional Group** includes professionals shown incorporated under Miscellaneous category until 1985. **Miscellaneous Group** includes media and print, production and other, professional, and telex staff where not shown separately. For a graphic of this table from 1985-92, refer to Figure 3 in the appendix

Source: Telstra, CIRCIT.

Table 8. Telstra employment of telephone operators and demand for operator services

	1975	1980	1985	1989	1990	1991	1992
Operators	10 998	9 043	7 442	6 227	6 679	6 316	5 839
DAC(m) ¹	n.a.	78.3	114.8	154.5	166.4	182.5	n.a.
IDD Lines(%)	0.0	5.3	51.0	92.7	n.a.	n.a.	100
Customer Lines without IDD(m)	3.5	4.5	3.1	0.5	n.a.	n.a.	n.a.
IDD Traffic(%)	0.0	51.9 ²	79.7	85.6	89.2	n.a.	n.a.
International Calls(m)	2.2	11.0	34.6	104.7	117.1	n.a.	n.a.
Operator assisted international calls (m)	2.2	5.2	7.0	15.0	13.0	n.a.	n.a.

1. Calls to directory assistance. An estimate is used for 1991 based on a reported 500 000 calls per day.

2. Data for June 1982.

Source: Telstra and Annual Reports.

Table 9. Telstra employment and business unit restructuring

	1989	1990	1991	1992	Change (per cent) (1989-92)
Special Business products H/O	8	12	16	32	300.0
TA international	22	26	30	76	245.5
Payphones	296	586	719	904	205.4
Information technology	1 766	2 019	2 950	2 650	50.1
Mobiles	672	858	847	969	44.2
Elect. Info & Transmission	141	190	200	158	12.1
Research	525	574	566	567	8.0
Corporate centre	866	950	1 006	930	7.4
Directories	628	680	685	659	4.9
Corporate customer	7 644	8 440	8 256	7 846	2.6
Group Shared Resource Unit H/O	3	3	3	3	0.0
Metro centre	449	58	n.a.	n.a.	n.a.
Business services	5 303	5 592	5 130	5 160	- 2.7
Network engineering	10 262	10 675	510 404	9 416	- 9.2
Broadcast	808	797	771	702	- 13.1
Residential	22 556	21 731	20 334	18 912	- 16.2
Training	1 175	1 120	1 026	980	- 16.6
Property services	1 465	1 436	1 336	1 180	- 19.5
Country	18 992	18 544	16 057	15 249	- 19.7
Operator services	6 841	6 907	6 581	4 742	- 30.7
Accounting	1 087	916	854	736	- 32.3
Food services	121	117	101	81	- 33.1
Automotive plant	1 148	1 080	897	751	- 34.6
Material services	1 301	1 278	968	790	- 39.3
Industries	1 923	1 876	1 432	1 113	- 42.1
Total Telecom	86 002	87 018	81 106	74 606	- 13.3

Note: H/O stands for head office.

Source: Telstra, CIRCIT.

Table 10. **Telstra and Communication Employment in Australia**

	Telstra	Communication Services		Telstra as per cent of Communication Services
		<u>Feb.</u>	<u>Nov.</u>	
1988	84.3	139.0	141.0	60.6
1989	88.0	143.9	143.2	61.2
1990	83.8	144.4	148.9	58.0
1991	77.9	145.5	138.0	56.4
1992	76.7	136.1	117.9	56.4
1993	69.3	117.1	129.6	59.1
1994	66.0	131.6	n.a.	50.1

Note: Figures include Telecom and OTC prior to merger. Telstra data for 1994 is May 1994.

Source: ABS, Telstra.

2.2 PTT Netherlands

PTT Netherlands, the telecommunication arm of KPN, had nearly 32 000 full time staff at the end of 1993 (Table 11). Currently all markets apart from the PSTN are open to competition in the Netherlands and PTT is on notice that it will face a competitor in the near future. Although PTT has announced plans to downsize in order to more efficiently meet the challenge of competition the recent trend is that employment had been increasing until 1992. However the net change in PTT employment does not reveal the amount of internal restructuring that has been occurring within the company in response to technological change and in preparation for market liberalisation.

Table 11. **PTT Netherlands Employment**

	1989	1990	1991	1992	1993
Employees at year end	31 500	31 770	34 480	34 949	34 359
Average full-time staff	28 977	29 262	30 819	32 327	31 981

Source: PTT Netherlands.

The most obvious restructuring has taken place between different employment categories (Table 12). There is also a major trend toward different education levels in PTT's workforce (Table 13). In addition PTT's employment trends are instructive of the outsourcing occurring in the telecommunication industry (Table 14). PTT's areas of employment growth mirror those of Telstra. Strong growth has occurred in sales and marketing and informatics (information technology). The number of staff in the **finance** and **economics** section of PTT has also risen. Net change in the traditional telecommunication functions of network construction and operation are more difficult to discern because of a change in the structure of categories. However the general trend, as for Telstra, is for a downsizing in the number of permanent network construction and maintenance jobs. There is also a clear trend toward downsizing support sections of the organisation such as internal facilities, training and logistics.

Employment data for PTT is instructive of the changing education levels required by PTOs in the OECD area. Between 1989 and 1993 there has been a major trend toward more employment opportunities for people with higher educational levels and less permanent employees with lower educational qualifications. Whether there are lower employment possibilities for less skilled labour is not clear given that they make up a high proportion of outsourced employees. In 1992 the number of outsourced employees with primary and primary professional qualifications was proportionally equivalent to 61 per cent of permanent employees with the same level of education. By way of contrast outsourced employees with higher professional and university degrees made up the equivalent of only 2 per cent of the number of permanent employees with the same qualifications. This may be because PTT buys services from other firms, for activities requiring higher educational qualifications, by way of outsourcing but hires additional staff from contractors for work requiring lower educational qualifications.

At an aggregate level for every 10 permanent employees another two were hired as outsourced labour in 1992 (Table 14). This number would have increased since that time as part of PTT's policy of downsizing by contracting out work and routine staff departures.³⁹ The primary activities being outsourced by PTT are the traditional network construction and maintenance jobs. Labour working on **cable** is the major area of outsourced employment. In 1992 for every 10 permanent employees working on cable in PTT another 9 were hired as outsourced workers. The major area of outsourced activity for workers with higher educational qualifications was under the **informatics** category.

2.3 France Telecom

Restructuring in France Telecom is proceeding at a slower pace than many other PTOs in the OECD area. Between 1987 and 1992 employment was reduced by only 2.2 per cent (Table 15). This change is very slight compared to other PTOs with very high rates of network digitalization. By 1993, over 94 per cent of France Telecom's lines were serviced by automatic electronic switches that could provide services such as call forwarding, call waiting, reminder calls and three way conference calls. The modernisation of the network was clearly impacting on traditional telecommunication occupations. Between 1985 and 1990 the number of technical staff was reduced by 16 per cent and craft workers cut by 48 per cent (Table 16).

One reason France Telecom's experience with downsizing has not been the same as Telecom New Zealand, is that TCNZ's telecommunication installation work was carried out entirely in-house prior to corporatisation. While a reduction did take place in the number of inside wiring workers, as represented by the FICOME association, these workers were independent of France Telecom. In other words France Telecom already had in place the outsourcing practice adopted in New Zealand. Nevertheless that many high growth activities, that tend to offset employment downsizing in other PTOs, were in Group France Telecom's subsidiary company CODGECOM means that very little job shedding has occurred to date.

Accordingly, although operating expenditure per mainline has been reduced, as the benefits of network modernisation come on stream, wages and salaries have risen in proportion to operating costs. As France Telecom's revenue per mainline is falling faster than wages per mainline, in real terms, the company will face pressure to seek greater productivity gains through downsizing. This will be particularly true if the employees are to continue to be rewarded with real wage increases in recognition of the changing occupational and skill structure, increasing productivity.

2.4 NTT, Japan

The employment restructuring experience by NTT largely mirrors the trends described in other OECD carriers. Like Telstra employment in directory assistance has been reduced with the number of directory assistance centres being reduced from some 500 in 1986 to 280 in 1992. Accordingly employment in the **customer information** category of NTT staff was been lowered by 42 per cent between 1990 and 1993 (Table 17). At the same time the need for fewer **facilities installation and maintenance staff** has caused employment in this category to drop by 23 per cent between 1990 and 1993. Once again this reduction was related to fewer operational sites. Between 1986 and 1992 NTT reduced the number of telecommunication exchange maintenance centres from 1 300 to 360. Other large scale reductions occurred in general management and administration employment. Worthy of note in a competitive market, customer service employment has remained largely unchanged.

In Table 17 NTT employment is shown as 215 000 for 1993 (i.e. March 1994). This excludes employment in subsidiary companies and total NTT employment in March 1994 was 248 000.⁴⁰ NTT reports its rationalisation efforts include eliminating and integrating sales/service offices, relocating human resources and cutting back recruits. Most NTT employees, excluding supervisory staff, are members of the "All Japan Telecommunications Workers Union" and NTT has had no significant strikes over the past decade. In 1993, in order to facilitate restructuring, NTT offered to employees for the first time the option of voluntary early retirement. In fiscal 1994, some 4 100 employees elected to take early retirement and the company foresees that some 10 000 employees will accept the proposal at a total cost of 40 billion Yen. Another avenue available to NTT staff has been to take a job in a subsidiary company. This reason the number of personnel reduction for NTT is less than the company wide reduction is due to internal transfers of employees to subsidiaries and the enlargement of business operations in the subsidiary companies. Changes in the number of personnel have been in the context of salary increases of 4 per cent and 5 per cent in the fiscal years 1994 and 1993 respectively.⁴¹

One interesting question is whether NTT's employment trends would have been different under a continuation of monopoly conditions. There is, of course, no answer to this hypothetical question. The case of domestic telegram services, which are still reserved for NTT in an otherwise competitive market, suggests the trend toward downsizing would have been the same. NTT reduced telegram staff by 25 per cent between 1990 and 1993. The same factors involved in directory service and facilities maintenance were involved in this process. Between 1986 and 1992 NTT reduced the number of telegram offices from 190 to 40. During this time the market changed from the traditional message service into one with "value added products", such as musical telegrams for birthdays or weddings. The value added telegram market has grown as a percentage of all telegram messages driving up revenue (Table 18). Accordingly NTT's telegraph revenue, which includes telegram and telex income, increased by 32 per cent between 1990 and 1993, despite the winding down of the telex business. The increased revenue has coincided with tremendous productivity increases, such that the number of telegrams per telegram employee has increased by 43 per cent and telegraph revenue per employee increased by 76 per cent. Since the telegram business is increasingly about value added services, which are generating higher

revenues at lower labour costs, liberalisation of the market may generate employment in other service providers to offset the losses in NTT.

In fact it is the most competitive markets that are generating most of the new jobs in NTT and its subsidiary companies (Table 19). For example, since the further liberalisation of the mobile telecommunication on 1 April 1994, subscriber growth has burgeoned. Prior to this time average monthly growth in mobile subscribers was 34 900. In the seven months following the admission of two new digital service suppliers in Tokyo (bringing the total number of Type 1 mobile carriers to four) the average net growth has been 128 000 subscribers per month (Table 20). The benefit in terms of employment growth is evident in the difference between mobile employment growth, with a sharp upturn in employment in 1994. NTT's mobile employment alone increased by 28 per cent and additional jobs were generated by the new market entrants.

One of things that makes Japan unique amongst Member countries with liberalised markets is that data is available on employment in Type II carriers (including resale, value added services, corporate outsourcing units, etc.) As such it is possible to provide an indication of trends in employment after liberalisation in this sector than most other Member countries. Thus whereas it is reasonable to assume that US firms with carrier access codes and other value added service suppliers have generated a great deal of employment it may not possible to give an accurate figure on the increase. In Japan the available evidence suggests that, although NTT has shed more labour than any other PTO in the OECD area over recent years, as many new jobs have been created in the New Common Carriers (NCCs) and Type II carriers. These data are very significant because they provide firm evidence for what is generally believed to be the case for other liberal markets. **As many new jobs have been created in the overall telecommunication sector in Japan, as have been lost by NTT since 1980 (Table 21).**

2.5 Nynex, US

Nynex corporation provides telecommunication services to approximately 12 million customers in the north-eastern United States. In the decade after the divestiture of AT&T, Nynex employment was reduced by 20 per cent from 94 600 to 76 200 (Table 22). The company believes that by redesigning its work processes an efficiency gain of 30 per cent will be possible between 1994 and 1996.⁴² Accordingly Nynex has announced a further downsizing will take place with a target reduction in its workforce of 16 800 employees by 1996. While the seven RBOCs, including Nynex, face competitors in a number of markets, and this is expected to increase over the coming years, it would not be true to argue that this downsizing had been driven by competition. In 1993, competitive access providers received less than 1 per cent of the access revenues paid by long distance PTOs to carry traffic on local networks.⁴³ In other words incumbent PTOs, including the RBOCs and GTE, still receive 99 per cent of access revenues. Rather the major drivers of employment reduction in Nynex appear to have been a desire of the company to decrease operating expenses by taking advantage of technological development, particularly in the context of the tariff rebalancing process that has been occurring in the US.⁴⁴

By the end of 1993 Nynex had a digitalization rate of 72 per cent. Accordingly the downsizing that will occur between 1994 and 1996 will proceed based on an advanced network. Tasks that are being redesigned include installation and repair functions, as well as automating billing to make it less labour intensive.⁴⁵ Nynex is also consolidating the number of customer service and administration work centres from more than 300 sites in 1994 to 50 by the end of 1996.⁴⁶ Downsizing in Nynex between 1994 and 1996, based on network and operational changes, and will include both management and craft personnel.

Nynex **management personnel**, which includes all employees who are not represented by labour unions, ranging from secretaries to officers of the corporation, shows a 21 per cent reduction since the divestiture of AT&T. **Craft personnel**, which includes sales representation (e.g., arranging service for residential and business customers) in the telephone companies' business offices, installation, equipment repair, exchange maintenance etc., shows an overall reduction of 19 per cent. However it is notable that over recent years the largest net change has been made to management personnel where the amount of new jobs has not offset losses. In fact management staff have been reduced by 37 per cent since the peak year of 1989.

Nynex restructuring has been done in consultation with two Unions, the Communications Workers of America (primarily in New York) and the International Brotherhood of Electrical Workers (primarily in New England). Almost half the total number of positions to be reduced are CWA members. The agreement reached between Nynex and the CWA, has won praise from the US Secretary of Labor Robert Reich. Highlights, detailed by Barbara Easterling the Secretary-Treasurer of CWA at **LaborTech 94**, include:

- Employees with five years of service will be eligible for a two-year educational leave of absence. They will retain all benefits, receive up to US\$10 000 in educational assistance per year and will be guaranteed a job on their return to work.
- CWA members will have preferential hiring rights for any new subsidiary created by NYNEX, or in a company acquired by NYNEX where they have controlling interest, the union will be granted recognition.
- All craft employees will be eligible to take a two-year Associate Degree in Telecommunications Technology. They will work four days a week and go to school the fifth day. They will receive a full week's wages and lifetime experience credit will be given toward completing the degree.
- Upon graduation, the new "super techs" will receive about a 5 per cent wage increase. Remedial training to qualify for the program will be provided to those who need it.
- A very generous early retirement package will be offered to all employees through 1998. Six years will be added to service and age, plus a supplement of 30 percent or \$500 monthly-whichever is greater--until age 62. The package also includes lifetime health care benefits and \$3,000 for tuition reimbursement for one year.
- The company will create a central job bank listing available jobs and locations. Employees who have to move will receive an US\$8 000 move allowance.
- Skills assessment, out-of-home courses and correspondence courses will be offered at company expense. Courses will also be offered during working hours to help employees upgrade skills and to prepare them for company testing required for promotions.⁴⁷

Reductions in Nynex staff mirror development in the other six RBOCs and GTE. Collectively the seven RBOCs reduced telecommunication staff by 13 per cent between 1988 and 1992 (Table 23).⁴⁸ This occurred in a market in which local access carriers still exercised a high degree of monopoly power. By way of contrast employment in the competitive long distance market, amongst AT&T, MCI and Sprint, increased by 21 per cent between 1988 and 1993. Similarly in the competitive mobile telecommunication market employment increased at a CAGR of more than 50 per cent between 1984 and

1992 (Table 24). The competitive mobile market is generating jobs faster than almost any other occupational sector of the US economy. In fact many of the new jobs inside the RBOCs and GTE, offsetting losses, were in mobile telecommunication. The data on gains in the long distance carriers tends to understate the overall gain in employment from supplier industries (e.g. equipment, outsourcing) or smaller IXCs and resellers.

In the US most jobs seem to have been shed in the least competitive local exchange market. Harvard economist Michael Porter has suggested why employment gains are evident in the competitive inter-exchange market:

"Industries without competition tend to see low investment and job growth; without the incentive to compete on cost, service quality and new features, firms avoid the expense of creating new capabilities and harvest their existing business. Competitive industries are often characterised by the reverse, with significant investment and job growth, as they create new and better products that serve a broadening range of customer needs. The record of the past six years shows IXCs have been major investors in new facilities, service and R&D. Moreover their intense rivalry has led to such substantial investments that they have been net creators of jobs despite their significant productivity improvements."⁴⁹

Data on PTO employment alone, simply fails to capture the benefits of liberal policies. If a store can sell customer premise equipment more efficiently than PTOs, retail employment can be expected to benefit. If a bank can take advantage of the competitive services offered by PTOs and value added service suppliers, telecommunication employment opportunities for system integrators and maintenance increase in the finance world. This "new telecommunication" employment will not be recorded as such in national statistics. While the US Bureau of Labour Statistics (BLS) show a decrease of around 70 thousand jobs in the telecommunication sector over the past decade it is important to clarify what these figures measure. The BLS samples 380 thousand US employers. Firms are grouped according to their main product or service. Employment is not divided into occupations within these firms. Thus all persons working in "telecommunication occupations" in firms whose principal activity is not telecommunication are not included in the category for telecommunications. A person running a private telecommunication network in a bank will be recorded as a bank employee.

Yet one of the major benefits of increasing liberalisation of telecommunication policies has been greater freedom for users to manage their own telecommunication requirements. Data on the number of private networks in the OECD area is not widely available. However most estimates place the number in the US higher than in Europe by a wide margin. One partial indicator of growth in the US is the number of entities with carrier identification codes. Carrier identification codes are given to firms seeking to acquire certain types of interconnect arrangements with local telephone companies. Since the divestiture of the Bell system the number of entities obtaining such codes has grown from 42 to 692. Many of these organisations are not offering telecommunication services to others.⁵⁰ If the principal activity of these firms is not telecommunication, communication employees are recorded under different categories of labour.

Similarly, while telecommunication employment in the US has declined by about seven per cent since 1984, as measured by "telephone employees", cable-television employment has increased by about 22 per cent (Table 25). In a world where a growing band of PTOs either provide or seek to provide cable television and cable television corporations are vying to provide telecommunication services, PTO employment is a decreasingly reliable indicator of sector employment.

Table 12. The Changing Nature of PTO Employment -- PTT Netherlands

	1992 (Oct.)	1993 (Sept.)	1994 (Sept.)	Change 1992-94 per cent
Work on cables	4 367	2 654	2 098	- 51.9
Telephone Exchange and Transmission (digital and electro-magnetic)	4 479	4 228	2 695	- 39.8
Customer Premise Equipment	3 121	1 430	422	- 86.5
Combined work on Cables, telephone exchanges and transmission	1 548	761	1 596	3.1
Other technical	1 340	1 137	967	- 27.8
Logistics	655	656	584	- 10.8
Sales, commercial work	1 487	2 264	2 508	68.7
Consultancy (including telematics)	260	209	85	- 67.3
Information services	2 069	2 995	2 846	37.5
Human resources	451	495	438	- 2.9
Infomatics	1 345	1 769	1 961	45.8
Financial/economic	1 059	1 292	1 380	30.3
Internal communication/public relations	212	144	133	- 47.6
Internal facilities (canteens, internal mail delivery etc.)	1 224	1 288	1 124	- 8.2
Administrative & secretarial work	5 005	5 227	5 011	0.1
Training	434	379	342	- 21.2
Product Development/Product Management	293	237	273	- 6.8
Marketing/planning	406	484	511	25.9
Unknown/Deleted Category	923	188	13	- 98.5
				(Change 1991-92)
Equipment infrastructure	n.a.	3 351	4 009	19.6
Commercial-technical	n.a.	154	569	269.5
Administrative technical ¹	n.a.	1 439	2 202	53.0
Quality yet to be classified	n.a.	0	19	n.a.
	n.a.	910	1 549	70.2
Total	30 208	33 681	33 335	n.a.

Note: ¹ Data for 1992 includes temporary workers and may not be wholly equivalent to the following two years due to internal restructuring. For a graphic of this table, refer to Figure 4 in the appendix.

Source: PTT Netherlands.

Table 13. The Changing Educational Structure of PTO Employment -- PTT Netherlands

Education	1990 (Oct.)	1991 (Dec.)	1992 (Dec.)	1993 (Sept.)	1994 (Sept.)	Change (per cent)
Primary	2 083	1 181	867	1 134	1 463	- 29.8
Primary Professional	7 135	7 599	7 100	6 017	5 296	- 25.8
Secondary	6 654	7 320	7 558	4 949	4 350	- 34.6
Secondary Professional	10 930	12 171	12 820	16 088	16 475	50.7
Higher Professional	3 180	3 882	4 216	4 124	4 264	34.9
University Degree	1 115	1 502	1 565	1 369	1 487	33.4
Total	31 097	33 655	34 126	33 681	33 335	7.2

Note: Data is for actual staff including part time workers. For a graphic of this table, refer to Figure 5 in the appendix.

Source: PTT Netherlands.

Table 14. Outsourcing of PTO Employment 1992 -- PTT Netherlands

	Cable	Exchange/ Transmission	CPE	Informatics	Total (1)
Primary	707	17	7	0	829
Primary Professional	2 846	295	329	0	4 051
Secondary	0	0	0	0	247
Secondary Professional	384	172	24	37	840
Higher Professional	0	0	0	105	122
University Degree	0	0	0	3	7
Total	3 937	484	360	145	6 097
Total as per cent of PTT Category Employment	90.2	10.8	11.5	10.7	20.2

Note: This data includes 5 429 staff outsourced from contractors and 667 temporary staff hired from secretarial bureau's.

1. Including other categories.

Source: PTT Netherlands.

Table 15. **Employment Trends in France Telecom and the Telecommunication Sector**

	1987	1988	1989	1990	1991	1992
France Telecom	158.9	156.8	156.5	156.6	156.1	155.3
CODGECOM	2.5	4.3	9.4	11.4	12.0	12.5
Total Group FT	161.4	161.0	165.8	168.0	169.1	167.8
Other services	0.1	1.4	1.8	2.2	2.6	3.0
Installation(FICOME)	18.1	18.3	18.5	18.5	18.5	18.0
SSII (SYNTEC)	13.0	14.0	15.0	16.0	n.a.	n.a.
Total	193.5	194.8	201.1	204.7	n.a.	n.a.

Source: DRG.

Table 16. **Employment Trends in France Telecom**

	1976	1980	1985	1990
Management (Cat.A)	12 015	17 217	18 786	20 023
Management (Cat.B)	35 556	53 302	58 611	60 753
Technicians	61 898	80 567	80 728	67 858
Craft	4 774	4 967	3 065	1 582
Miscellaneous	509	452	419	395
Contractors	1 485	1 956	2 890	2 629
Auxiliaries	18 700	2 832	2 890	2 574
Total	129 000	156 372	165 944	155 219

Source: France Telecom.

Table 17. **The Changing Nature of PTO Employment - NTT**

	1990 (000)	1991 (000)	1992 (000)	1993 (000)	Change 1990-93 (per cent)
Customer Information	26.1	22.2	18.2	15.2	- 41.8
Customer Service	87.0	87.6	88.2	85.8	- 1.3
Facility Installation & Maintenance	77.9	74.1	66.8	59.3	- 23.8
General management, accounting section and others	63.0	62.7	56.1	52.6	- 16.5
Telegram	3.6	3.3	2.9	2.7	- 25.0
Total	257.0	249.9	232.2	215.6	- 16.1

Note: For a graphic of this table, refer to Figure 6 in the appendix.

Source: NTT.

Table 18. NTT Telegram Service and Employment

	1990	1992	1993	Change 1990-93 (per cent)
Telegrams (million)	43.4	47.0	46.7	7.6
Telegraph Revenue(1) (billion Yen)	59.0	70.6	78.2	32.5
Telegram Employees (thousand)	3.6	2.9	2.7	- 25.0
Telegrams per Employee (thousand)	12.1	16.2	17.3	43
Revenue per Employee (million Yen)	16.4	24.3	29.0	76.7

1. Including telegram and telex. Telex revenue was 3.6 billion yen in 1992, representing 5 per cent of the total.

Source: NTT.

Table 19. NTT Subsidiary Companies

	1992	1993	1994	Change 1992-94 (per cent)
NTT Mobile NTT	1 853	1 936	2 470	33.3
Data	7 765	8 228	9 410	21.2
Total	9 618	10 164	11 880	23.5

Source: NTT.

Table 20. **Mobile Subscriber Growth in Japan 1992 - 1994**

Financial Year	1992	1993	1994
April	34 146	5 638	100 423
May	30 420	21 227	99 666
June	34 389	27 613	129 282
July	36 950	31 977	155 941
August	18 078	22 279	134 001
September	21 781	25 333	140 685
October	26 076	58 331	136 919
November	24 069	49 347	--
December	32 633	54 385	--
January	18 996	35 885	--
February	23 627	46 478	--
March	33 272	40 329	--
Monthly Average	27 870	34 902	128 131
Change in NTT Mobile Employment (per cent)	n.a.	4.5	27.6

Source: MPT.

Table 21. **The Number of Employees in Type I and Type II Carriers**

	1980	1985	1986	1987	1988	1989	1990	1991	1992
Type I									
NTT	329 000	304 000	298 000	291 000	276 650	266 017	258 000	250 000	234 136
KDD	n.a.	n.a.	n.a.	6 730	6 602	6 393	6 205	6 004	5 881
NCCs									
No.	0	5	10	32	42	60	66	68	77
Empl'	0	n.a.	n.a.	3 140	4 698	6 901	8 421	10 107	12 953
Total	335 000	311 000	305 000	300 870	287 950	279 311	272 626	266 111	252 970
Type II (3)									
No.	85	209	356	530	693	841	943	1 036	1 128
Empl'	n.a.	n.a.	n.a.	76 800	54 400	58 700	74 863	n.a.	73 180
Total	335 000	n.a.	n.a.	377 670	342 350	338 011	347 489	n.a.	326 150

1. Figures are for the financial year ending 30 March.
2. NTT figures include the number of employees in NTT Mobile for all years. NTT Mobile Communications Network, Inc, which was separated from NTT in 1992.
3. OECD estimates based on MPT data.

Source: OECD, MPT, ITU.

Table 22. Nynex Corporation Employment

	Management	Per cent of total	Craft	Per cent of total	Total
1984	28 276	29.9	66 386	70.1	94 662
1985	26 653	29.8	62 701	70.2	89 354
1986	26 971	30.6	61 047	69.4	88 018
1987	31 276	32.8	64 038	67.2	95 314
1988	33 924	34.8	63 476	65.1	97 400
1989	35 381	36.9	60 557	63.1	95 938
1990	34 754	36.7	59 946	63.3	94 700
1991	31 284	36.7	53 946	63.3	85 230
1992	27 799	33.9	54 101	66.1	81 900
1993	22 374	29.4	53 818	70.6	76 192

Source: NYNEX.

Table 23. Telecommunication Employment for Selected US PTOs (1), (000)

	All Reporting Local Exchange Companies (2)	RBOCs	AT&T	MCI	Sprint
1987	n.a.	n.a.	n.a.	14.2	23.3
1988	601.7	468.5	85.5	17.6	37.7
1989	n.a.	n.a.	n.a.	19.2	41.4
1990	569.2	444.4	78.3	24.5	43.1
1991	537.8	415.9	77.9	27.9	43.2
1992	527.0	408.5	79.9	30.9	43.4
1993	n.a.	n.a.	84.3	36.3	50.0

1. Except for MCI and Sprint figures, which are taken from Annual Reports, data are as reported to the FCC for telecommunication employees. Total employment is larger in some of these companies but includes other business activity. For instance total AT&T employment in 1992 was 312 700.
2. This column includes RBOC employment.

Source: FCC, Annual Reports.

Table 24. US Cellular Telephone Service: Subscriber and Employment Growth

Year	Subscribers	Number of Systems	Percent of Industry Surveyed	Employees Reported in Survey	Estimated Total Employees (1)
1984	91 600	32	100.0	1 404	1 404
1985	340 213	102	99.0	2 727	2 755
1986	681 825	166	96.4	4 334	4 496
1987	1 230 855	312	95.2	7 147	7 507
1988	2 069 441	517	95.9	1400	11 887
1989	3 508 944	584	93.5	15 927	17 034
1990	5 283 055	751	88.3	21 382	24 215
1991	7 557 148	1 252	80.3	26 327	32 786
1992	11 032 753	1 506	79.0	34 348	43 478
CAGR	82 %	--	--	--	54 %

1. These figures are estimates based on the assumption that non-responding systems employed at levels consistent with respondents. CAGR was 49 per cent for respondents.

Source: FCC.

Table 25. Communications Employment in the US, (000)

Year	Telephone Communications	Cable-TV & Pay-TV	Total Communications
1983	956.0	--	1323.9
1984	953.4	--	1340.3
1985	920.7	--	1318.8
1986	883.4	--	1274.8
1987	901.9	105.9(1)	1281.5
1988	901.1	110.9	1279.9
1989	885.9	117.4	1272.1
1990	913.0	125.8	1308.9
1991	909.2	128.0	1298.8
1992	886.5	128.9	1267.5

1. January 1988. For a graphic of this table, including a breakout of total wireless employment, refer to Figure 8 in the Appendix.

Source: US Bureau of Labour Statistics.

SECTION 3 TELECOMMUNICATION AS THE FOUNDATION OF GROWTH

3.1 Telecommunication and Growth in the Information Industries

Historically the primary aim of PTOs has been the creation of a ubiquitous telecommunication network over which they could sell access and usage services. These two sources still make up between 60 to 80 per cent of PTO revenues in the OECD area. The development of new services has the potential to make more efficient use of the existing network and stem the decline in revenues per mainline. A good example of a new service which has developed very quickly over recent years are 800 services in the US. In 1993 AT&T's 800 number business generated 13 billion calls with another 9 billion on other carriers.⁵¹ The dramatic growth in the use of such services is one reason that network utilisation in the US is amongst the highest in the world.

The further convergence of telecommunication and information technologies holds out the potential for a more advanced information infrastructure. This could enable new forms of information commerce to be traded over the telecommunication network.⁵² One way to collectively categorise information commerce has been to label the sector as the "copyright industries". Included under this heading are the computer software industry, the motion picture industry, television and video industry, the music and recording industry, the book and journal publishing industry.⁵³ An example of a rapidly growing "copyright industry" using telecommunication networks is the on-line information services market which on a worldwide basis was estimated at US\$10.1 billion in 1992, a 9.2 per cent increase from US\$9.3 billion in 1991.⁵⁴

In 1991, the "core copyright industries" in the United States accounted for US\$206.6 billion in value added in real 1992 dollars, or approximately 3.6 per cent of GDP.⁵⁵ The total "copyright industries" accounted for US\$325 billion in value added in real 1992 dollars, or approximately 5.6 per cent of GDP. In 1991 this was around twice the size of the US telecommunication services industry. At the same time the "copyright industries" have been growing at more than twice the pace of the rest of the US economy and have sustained growth even during periods of recession (Table 26). Increased demand for information products and services has generated new employment growth. Employment in the core copyright industries grew from 1.6 per cent of US employment in 1977 to 2.5 per cent in 1991. Total "copyright employment" rose from 3.3 per cent of US employment in 1977 to 4.8 per cent in 1991 (Table 27).

Some of this growth has been generated by new products such as video games, US sales for which surpassed motion picture box office receipts in the early 1990s. In other cases existing products, such as motion pictures, have found new markets through technologies such as VCRs. The additional revenue generated by new distribution techniques and the merchandising of related products now far outweigh receipts at the box office. Home video revenues in the US from sales and rentals are now twice as large as box office receipts. At the same time video games are often based on themes from motion pictures. Larger and more diverse markets for film product has stimulated innovation with benefits for other industrial sectors. One example has been the development of technologies to create special effects for motion pictures.⁵⁶ These same techniques are now being applied in the manufacturing industry to assist in the design of prototype parts.

The importance of "copyright industries" looms large in many other OECD countries. For example, Statistics Canada estimates that, for 1990-91, the arts and culture sector directly contributed 2.4 per cent of Canada's GDP (C\$14.7 billion), and generated direct employment exceeding 332 000 jobs.⁵⁷ Revenues for the "copyright industries" in Canada totalled C\$13.4 billion, divided as follows: broadcasting and cable (C\$4.1 billion), news papers (C\$3.5 billion), film production distribution and exhibition (C\$2.6 billion), book publishing (C\$1.6 billion, periodical (C\$0.9 billion) and sound recording (C\$0.7 billion).⁵⁸ Together with the **Information Technology** market, with revenues of C\$43 billion (C\$19.1 billion from equipment and C\$24.3 billion from services) making up 5.6 per cent of Canada's GDP, and the **Telecommunication Services** market of C\$14 billion, the three converging sectors make up more than 10 per cent of Canada's GDP.

In Australia the communication and information industries have been estimated to range from A\$26 billion to A\$30 billion in 1991.⁵⁹ This represented to equivalent of 10 to 12 per cent of Australia's GDP. The communications and information industry is here defined as including: communications; network and interconnect services; entertainment; information services and publications; on-line transactions and information technology and advertising.

The largest industry players are already seeking to re-position themselves for the convergence of telecommunication and copyright sectors through strategic investment and joint ventures. In October 1994 a joint venture was announced between three RBOCs -- Bell Atlantic, Nynex, and Pacific Telesis -- together with the Creative Artists Agency, to produce television programmes and interactive entertainment, with a view to using the telecommunication network as the transmission medium.⁶⁰ At the same time Sprint, best know as a US long distance telecommunication carrier, teamed with three cable television corporations Tele-Communications, Comcast, and Cox Enterprises, with a view to offering local telecommunication service and a national wireless network.⁶¹ In addition Time Warner, the second largest cable television operator in the US discussed plans to offer local telephone service to 38 counties in Ohio, where the company currently has 700 000 cable customers.⁶²

Information technology and telecommunication (IT&T) software and equipment suppliers are also teaming with PTO's and media companies to forge multimedia services. In November 1994 Microsoft announced agreement with 10 companies, including Deutsche Telecom, NTT, Telstra and US West to develop an interactive television technology to deliver on-demand entertainment and information services.⁶³ The envisaged system will use television set-top boxes so that consumers can interact with content. In October 1994, CNN and Intel launched a news service which permits office workers to view broadcast news on their personnel computers.⁶⁴ To receive the service, companies need to purchase a system costing US\$5 000, which distributes the signal through their networks, and pay a usage charge of US\$12.50 per month per computer. Computerised video services are also available from Reuters, Dow Jones Telerate, Blomberg Business News, CNBC and Associated Press.

IT&T suppliers should also benefit from the development of new multimedia equipment products. One example comes from joint announcement by Sony and Texas Instruments that they plan to develop a new generation of digital cameras suitable for computers and workstations.⁶⁵ In a recent study Price Waterhouse found that employment in the telecommunication manufacturing sector worldwide increased from 650 thousand in 1980 to around 700 thousand in 1991 (Table 28). Most of the gains were made in the first half of 1980s. Since 1986 employment has decreased at a time when demand in the services sector has grown strongly and new markets are opening in developing countries. Convergence of all IT&T manufacturers toward software based products should enhance employment prospects in telecommunication equipment manufacturers and tend to offset downsizing due to productivity improvements. Other IT&T sectors have been creating new jobs at a much faster rate than the more narrowly defined telecommunication equipment sector (Table 29). Productivity improvements in

telecommunication equipment manufacturing was a major factor, as production doubled over the same period. One of the key assets in the telecommunication equipment industry is the strong tradition of R&D, with a higher percentage of personnel working in R&D (20 per cent) than the data processing equipment (12 per cent) (Table 30). Telecommunication R&D is still done overwhelmingly in OECD countries despite a shift of some assembly jobs to countries outside the OECD area. Nevertheless it has been assessed that there to be some dangers for European countries unless demand increases.

"Technology has moved rapidly ahead and there is some convergence with data processing, as sophisticated software increasingly lies at the heart of new equipment and standardisation of hardware allows substantial gains in productivity. Business communication products - such as faxes and mobile telephones - are becoming an increasing part of this sector where Japanese and some American firms have competitive advantage from their application of advanced technology. These forces will drive equipment suppliers towards structuring activities along lines closer to data processing equipment with a smaller proportion of employees in manufacturing and a growing proportion in sales and software development activities. At the same time, productivity increases may well more than offset growth in sales forcing firms to shed staff. **These forces therefore pose serious threats to the employee base in Europe.** Overall employment seems set to fall unless demand continues to grow at the rapid levels of the last five years. At least some manufacturing by European firms will probably be switched to the Far East to take advantage of lower costs."⁶⁶

The benefits of increasing competition, in a market such as mobile telecommunication, have been exemplified in Japan with a consequent rapid boost in the market for equipment. Europe has its own success story in the rapid increase in demand for mobile services in the UK after the ending of the duopoly. Like Japan monthly increases have dramatically increased since the introduction of a third and fourth competitor in the UK (Table 31). Like Japan mobile service providers have increased employment. Vodafone has increased its employment from 2 100 staff in March 1992 to 3 100 in March 1994.⁶⁷ The benefits for employment are not limited to infrastructure companies such as Vodafone and Cellnet. In March 1993 Vodafone provided network services to 1.2 million subscribers. Vodac, is Vodafone's own service provider. The subsidiary company, however, only provided services to 29 per cent of Vodafone's total network subscribers. About 35 other companies provided cellular services to the remaining of Vodafone customers and a further 10 companies provided paging services. Around 50 companies provide mobile services in the UK. For UK consumers increased competition has meant lower prices and an increasing range of tariff options. In October 1994 there were 16 tariff packages on offer from the Cellnet, One-2-One, Orange and Vodafone.

The available evidence indicates increasing the pace of liberalisation in the European telecommunication services sector could increase the size of the services market and encourage PTOs to source from the most efficient suppliers. It would also open new markets for telecommunication equipment manufacturers, and new types of suppliers. The latter point may be particularly important as different sectors of the industry converge. In liberal markets data processing manufacturers are likely to have a significant advantage over their counterparts in restricted markets. Several factors that come into play here are the incentive for market entrants to be innovative, and to stimulate innovation in incumbent operators. Gaining a competitive edge over an incumbent operator has usually meant that new operators turn to a range of suppliers. On the other hand the historical relationship some PTOs have had with national suppliers has not always fostered international best practice and higher costs have been passed to telecommunication users.

Technological convergence and the restructuring of the telecommunication industry means that many of new "telecommunication jobs" may not be recognised as such or fall into other industry

categories. In the US, between 1982 and 1991, the two sectors which recorded the largest increase in employment were in the field of information technology. Jobs for computer analysts and programmers increased by 84 per cent (719 000 to 1 321 000) and data processing equipment repairs by 55 per cent (98 000 to 152 000).⁶⁸ Many of these new jobs were created in PTOs but many more were working with converging IT and telecommunication applications in other sectors of the economy. One example is a joint venture announced in August 1994 between AT&T and Delta Air Lines to develop and market software for the travel and transport industry. The new entity has projected employment of 1 200 jobs.⁶⁹

In respect to employment in Australia, a recent study by the Bureau of Transport and Communications Economics found:

"...the number of people employed in the recreation, personal and other services sector has increased whereas the number of people employed by the communications industry has remained relatively constant over the period 1980-81 to 1991-92. This may indicate that employment opportunities are likely to be more significant, in terms of both quality and quantity in the content provision side of the converged industry".⁷⁰

Binding the growth of demand for information products (equipment and services) to use of the telecommunication network can be expected to generate further employment growth in the copyright industries. New jobs will be created in telecommunication operators but these may not offset those lost in industry restructuring. On the other hand sector wide employment should grow resulting from the increase use of networks, albeit the net change may not always be easy to discern. The boundaries between telecommunication, information technology and services will increasingly blur as new joint venture companies generate employment in "content" production while technological innovation and competition place pressure on the size of the "carriage" workforce.

Table 26. Average Annual Growth Rate in the "Copyright Industries"

	1977-91	1987-91	1989-91
Core Copyright Industries	5.8	4.2	1.6
US Economy	2.3	1.5	- 0.2

Source: IIPA.

Table 27. Employment Growth in the "Copyright Industries"

	1987 Employment (000)	1991 Employment (000)	Average Annual Growth Rate 1987-91
Core Copyright	2 574	2 989	3.00
Total Copyright	5 068	5 547	2.28
US Economy	112 440	116 887	0.97

Note: For a graphic of telecommunication and "core copyright" employment, refer to Figure 9 in the appendix.

Source: IIPA.

Table 28. Employment in Telecommunication Equipment Manufacturing by Region, 1980-91 (000)

	1980	1986	1991
Europe	375	405	375
USA	150	160	150
Far East	50	75	100
Rest of World	70	70	75
Total	645	710	700

Source: Price Waterhouse, 1992.

Table 29. Employment in IT&T Equipment Manufacturing by Region, 1980-91 (000)

	1980	1986	1991	Change Per cent
Telecommunication Equipment	645	710	700	8.5
Data Processing Equipment	1 075	1 365	1 400	30.2
Consumer Electronics	475	491	530	11.6
Electronic components	800	900	1 000	25.0
Total	2 995	3 466	3 630	21.2

Source: Price Waterhouse, 1992.

Table 30. Employment in Telecommunication Equipment Manufacturing by Activity, 1991 (000)

	R&D	Manufacturing & Assembly	Other	Total
Europe	60	135	180	375
USA	40	45	65	150
Far East	20	45	35	100
Rest of World	10	30	35	75

Source: Price Waterhouse, 1992.

Table 31. **Mobile Subscriber Growth in the UK After the end of the Duopoly**

	Number of Net New Subscribers over previous month	
1993		
March 1st	30 400	
April 1st	37 600	
May 1st	39 800	
June 1st	36 700	
July 1st	36 900	
August 1st	36 500	
September 1st	41 600	(Launch of One 2 One on 7 September 1993)
October 1st	42 700	
November 1st	58 200	
December 1st	71 400	
1994		
January 1st	139 600	
February 1st	64 200	
March 1st	85 300	
April 1st	107 500	(Launch of Orange on 28 April 1994)
May 1st	113 500	
June 1st	98 600	
July 1st	125 700	
August 1st	126 000	

Note: For a graphic of this table, refer to Figure 7 in the appendix.

Source: Financial Times: Hutchinson Communications.

3.2 Applications of Telecommunication for Efficiency in other industries: the Petroleum Industry as an illustration

The globalisation of commerce means that business expects the same support they receive in national markets at an international level. In some cases, if they are hampered by an inefficient national telecommunication operator, they may expect greater support. One example is the number of firms using call-back services not so much because of price but that itemised billing, and other value added services, are not available from their national monopoly operator. Countries with inefficient international telecommunication markets are in effect hampering transnationals' ability to undertake business and create employment.

Employment by transnational corporations is considerable. UNCTAD estimates transnational corporations employ 73 million people worldwide representing nearly 10 per cent of non-farm jobs and close to 20 percent in developed countries.⁷¹ UNCTAD believe the indirect employment may be more than double that amount of jobs. For instance it has been reported that Nike, the US sports footwear company, employs 9 000 staff but nearly 75 000 people work for its independent sub-contractors around the world.⁷² The Boeing Corporation provides another example. Boeing's increasing use of outsourcing means that, except for a few critical parts, most production is carried out by external suppliers. The manufacturer uses seven mainframe computers and 2 800 workstations to network suppliers that design and preassemble jets.⁷³

Telecommunication networks play a crucial role in the ability of transnationals such as Nike and Boeing, to operate on an international basis. Without efficient international networks the ability of firms to link supply and demand is seriously restricted. In an OECD survey of Eastern European countries export managers nominated poor telecommunication infrastructure as their largest barrier to trade. In the OECD area, where telecommunication has become a strategic tool for any business that wants to compete in global markets, the analogy could be a uncompetitive telecommunication infrastructure and service provision.

Telecommunication is increasingly important to international business and the petroleum industry is one of the most global of all industries. The sector contains five of the largest twenty transnational corporations ranked by foreign assets, including at number one Royal Dutch/Shell and at number two Exxon. (Table 32) These two corporations hold more than half their total assets in foreign countries, as does Mobil. In terms of sales Shell, Exxon, Mobil and British Petroleum (BP) had 66 per cent of their sales in foreign countries. In 1992 Elf, the French based transnational, had a third of its sales outside France. As a result of this internationalisation of corporate activity Shell, Exxon, Mobile and BP employed more than 65 per cent of their staff in foreign countries.

The application of information technologies and telecommunication (IT&T) are profoundly influencing the oil and gas extraction industry. IT&T is being increasingly used by the petroleum industry for exploration, analysis and resource cataloguing.⁷⁴ For example there is a lower exploration risk in the industry as the number of dry holes drilled per discovery has declined due to IT aided exploration. In addition information technology is being used to increasingly control machines and processes in extracting resources. However it is in the processing of the data gathered by seismic techniques that has most rapidly evolved over the past decade. A data analysis technology, computer aided exploration (CAEX) has evolved since 1984 through the development of workstations, super computers, software advances and rapid progress in three dimensional analysis.⁷⁵ The cost of CAEX workstation system dropped from more than US\$350 000 in 1986 to less than US\$100 000 in 1990 bringing it into the reach of an increasing

number of companies. Since 1990 the cost of data processing has tumbled. In 1994 it cost US\$50 000 to process the same amount of information that it cost US\$250 000 to process in 1990.⁷⁶

In 1994 a private survey of the largest petroleum corporations based in the US use of IT&T, was undertaken by the American Petroleum Institute (API). The survey of API members, with total sales of US\$328 billion, revealed that they collectively had IT&T operating expenditures of than US\$4 billion (**Table 33**). This figure represented the expenditure by the information systems departments of these corporations and excludes additional expenditure by user departments. A further US\$450 million was IT&T capital expenditure. Firms answering the survey employed 433 thousand workers of which 5 per cent worked within information system departments (Table 34).

Interestingly one firm (**Company 15**) spent more than US\$1.2 billion on IT&T operating and capital expenditure and just under 7 per cent of its employees were IT&T support staff. Of course many other employees, in user departments, have work tasks that fundamentally involve working with IT&T. **Company 3**, whose information technology departments spent some US\$360 million per annum on IT&T, estimated its company wide expenditure on IT&T would be 30 to 40 per cent higher than this figure. **Company 1**, which spends nearly US\$590 million on IT&T, points out that this is expenditure incurred by its Information Systems Department. Similarly the IT&T employees reported are the information systems staff.

To the extent that the company wide expenditure of **Company 3** provides an industry benchmark a considerable amount of IT&T application and support expense would be outsourced by user departments. **Company 1** notes outsourcing costs are included in its IT expenditure but again only to the extent generated by Information Systems departments, where there is only modest subcontracting services in applications and support. Obviously the outsourcing in IT&T support departments varies as the Information Systems department of **Company 11** reported outsourcing "Mainframe datacentre, POS Network, PC Aquisition/Installation, and some network management and a small amount of application support." **Company 8** outsourced much of its application development and desktop support to individual contractors (60 per cent of its IT&T staff) in 1993. What is clear from the available data is that firms in the petroleum industry as spending very large amounts of money both inside their companies on direct IT&T support and with outside supplier firms for indirect IT&T support.

As a consequence much of the employment creation is occurring in the firms providing services to the oil and gas extraction firms in the US. The US Bureau of Labour Statistics reports that the size of the production labour force employed directly by the oil and gas extraction companies is dropping, while the number of workers in oil and gas services is increasing. In 1994 US companies that have announced employment cut backs, or are reported to be studying them, include Amoco, Atlantic Richfield, Mobil, Texaco and Unocal. Mobil has downsized by around 17 000 employees in recent years.⁷⁷ Existing Mobil staff, of around 60 000 employees, are responsible for around US\$2.5 billion of the company's US\$10 billion annual operating expense. Mobil has stated it wants to make a significant reduction in staff before the end of 1994. Another company to announce reductions in late 1994 was Unocal who stated a 40 per cent reduction in corporate staff jobs (630 positions) over the next two years.⁷⁸ BP's US arm has also indicated it plans to reduce its workforce in that country by 20 per cent (1000 jobs) in 1995. The Associated Press "BP Oil may slice 1000 jobs", 14 November 1995. The reason given for the downsizing in both Unocal and BP was a shift toward outsourcing.

The BLS have attributed the more general trend towards lower employment to new technology and increasing use of outsourcing. This shift is not only important in terms of employment, but as the BLS notes is having an impact on other aspects of firm behaviour. One example is the shifting locus of research and development to service firms. The corollary being that the innovation process is dependent

on the efficient linkage between oil and gas extraction firms and service suppliers. **The linkages between these firms, operating around the world, are provided by telecommunication networks. Inefficient telecommunication infrastructure and service provision seriously hampers the ability of the integration of IT and the management of all aspects of their business.** For example, API make the point that the lack of fibre optic facilities in countries ranging from Chad to Vietnam, and in regions such as the South China Sea, directly impede petroleum exploration and transport operations.⁷⁹ In the alternative firms have been forced to pay US\$10 per minute for satellite communication while undertaking exploration and production in remote areas because of monopoly pricing by satellite service providers.⁸⁰ That such prices are above cost can be gauged by the fact that the charge of the International Satellite Organisation to provide the mobile link to a Signatory is US\$3.95.⁸¹ In other words users are paying more than 150 per cent mark up to link critical parts of their production infrastructure.

In suggesting industry requirements for the efficient development of the petroleum sector, the API make several points that would not only receive widespread support in the business community, but are fundamental to a discussion on the efficient development of international telecommunication:

"API strongly supports the global implementation of cost based rates for telecommunication services. A major impediment to a robust global information infrastructure is the cost underlying communications and switching transport. Excessive accounting rates underlie non-cost based international message telephone service sales to many countries ... **Indeed, so long as these rates are set well in excess of ascertainable costs or benchmarks, development of a truly "global" information infrastructure will be relegated to the distant future.**"⁸²

In a world where global business shifts toward greater outsourcing of input, and more particularly the critical input of information services, the international efficiency of telecommunication will be critical to capturing jobs at a national level. A recent comparative assessment of commercial centres by **Fortune** magazine around the world took telecommunication and information production as being key factors in the leading ranking of cities such as Hong Kong, New York and London, despite problems ranging from high rents to congestion.⁸³ The UK Government's decision to liberalise that country's telecommunication market no doubt contributed to **Fortune's** assessment of London the "unchallenged financial and communications heart of Europe". While rankings may be argued to be subjective there is little doubt that the globalisation of commerce will make such comparisons increasingly prevalent. In other parts of the CEC area the challenge is clearly to accelerate the ongoing process of liberalisation⁸⁴ The Bangerman report, recognised the uncompetitive nature of the pricing of telecommunication services in the CEC area when it stated, "As a matter of urgency the international, long distance and leased line tariffs should be adjusted to bring these down into line with rates practices in other advanced industrial regions."⁸⁵

In the future decisions will not only be taken for the location of firm activity, but from where firms will access and purchase on-line information products and services, as well as the specialist knowledge and expertise, they need to compete in a global economy. As the trend toward outsourcing continues, in industries such as the petroleum sector, the mobility of customer choice will be vast. Information service providers, particularly in the high growth core copyright industries, will be severely penalised if global customers can not access their services on a competitive basis.

Table 32. **Petroleum Refining Corporations in the Top 20 Transnational Corporations Ranked by Foreign Assets, 1992**

Rank/ Corporation	Assets Foreign Total		Sales Foreign Total		Employment Foreign Total	
1. Royal Dutch/Shell(UK/Neth)	69.4	100.8	45.5	96.6	91.0	127.0
2. Exxon (US)	48.2	85.0	93.1	115.7	59.0	95.0
12. Mobil (US)	22.6	40.6	49.7	64.1	28.2	63.7
14. Elf Aquitaine (France)	n.a.	45.1	13.2	36.2	n.a.	87.9
19. British Petroleum (UK)	n.a.	31.5	34.0	58.6	71.7	97.7

Source: UNCTAD.

Table 33. **IT&T Expenditure in the US Petroleum Industry, 1993**

Company	Operating Revenue US\$m	IT&T Operating Expenditure US\$m	IT&T Capital Expenditure US\$m	Percent of IT&T Expense to Revenue
8	n.a.	11.60	2.20	n.a.
18	78.00	1.00	0.05	1.3
16	25 900.00	454.00	156.20	2.4
7	52 400.00	587.00	(1)	1.1
3	36 200.00	320.00	40.00	1.0
6	554.00	0.87	0.72	0.3
15	78 080.00	1 061.00	149.00	1.5
13	3 364.12	15.90	3.63	0.6
5	3 281.00	32.40	(1)	1.0
10	2 700.00	7.58	0.68	0.3
12	10 035.00	86.00	8.00	0.9
1	56 576.00	815.00	37.00	1.5
2	12 309.00	58.00	5.00	0.5
11	5 924.00	77.40	6.90	1.4
17	30 943.00	328.00	30.00	1.2
4	1 250.00	13.50	1.02	1.2
9	682.00	4.00	1.00	0.7
14	7 261.00	125.00	8.00	1.8
19	158.00	8.50	0.50	5.7
Total	327 695.28	4 006.75	449.91	1.4

1. Capital and expense can not be broken down for these companies.

Source: API.

Table 34. **IT&T Employment in the US Petroleum Industry, 1993**

Company	Total Employees	Total IT&T Employees	Percentage of IT&T Employees
8	1 000	34	3.4
18	485	15	3.1
16	46 317	2 600	5.6
7	72 600	1 660	2.3
3	42 500	1 750	4.1
6	704	23	3.3
15	91 000	6 193	6.8
13	3 224	112	3.5
5	5 812	212	3.6
10	5 677	92	1.6
12	21 000	764	3.6
1	61 900	4 028	6.5
2	19 337	920	4.7
11	11 664	384	3.3
17	32 514	2 080	6.4
4	1 472	80	5.4
9	1 000	54	5.4
14	14 000	695	5.0
19	690	45	6.5
Total	432 936	21 741	5.0

Source: API.

ANNEX

Figure 1: Operating Costs per Mainline Index for 10 OECD PTOs

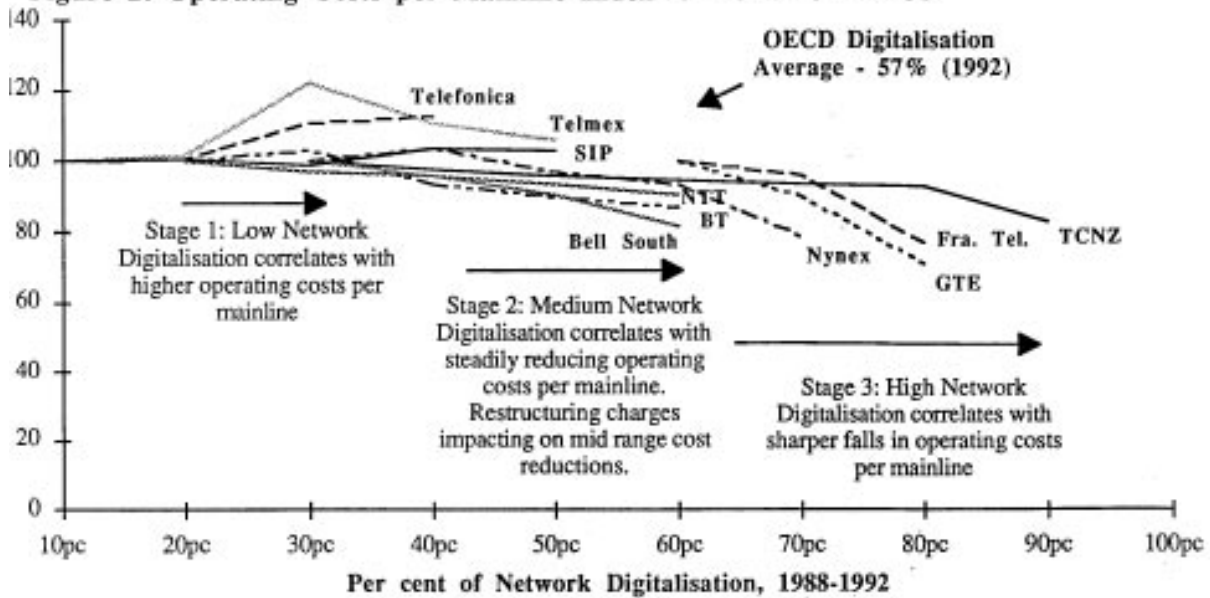
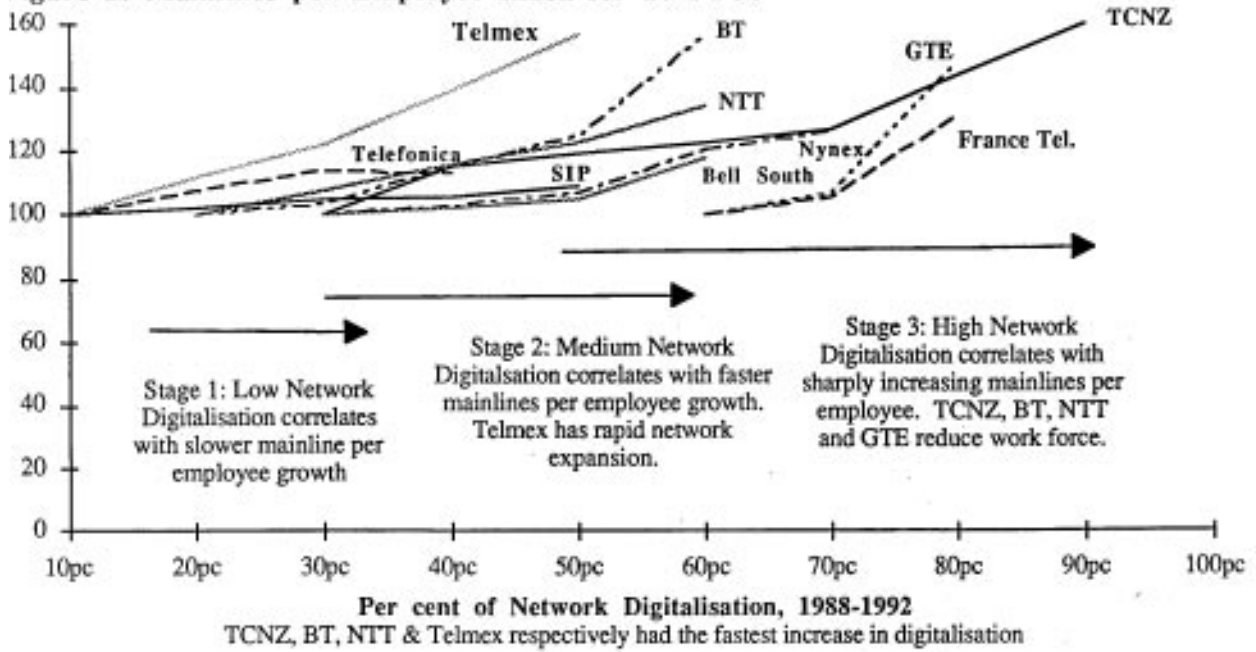


Figure 2: Mainlines per Employee Index for 10 PTOs



**Figure 3: Telstra Employment Change by Job Classification, 1985
1992**

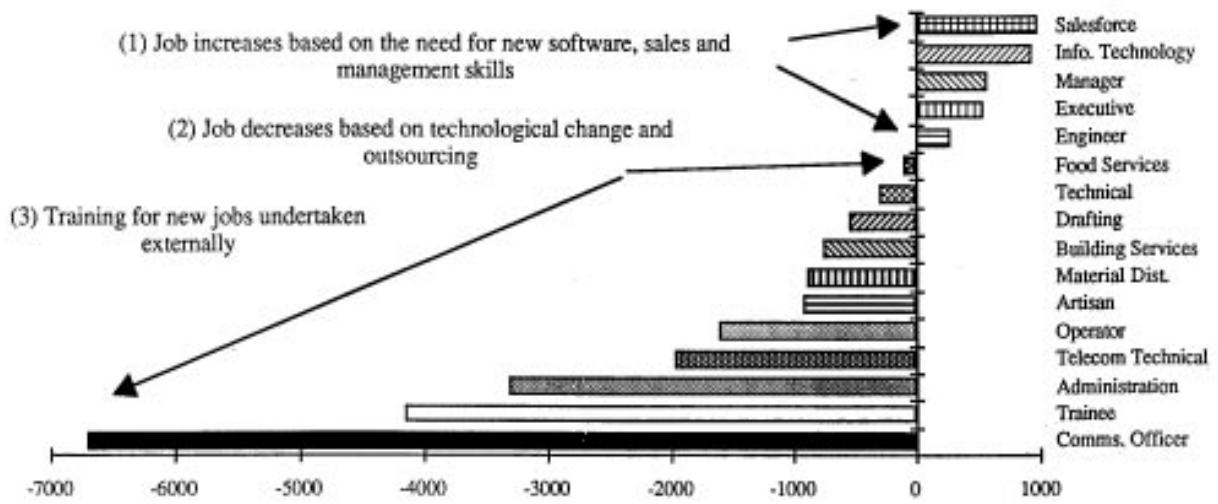


Figure 4: PTT Netherlands: Selected Business Unit Restructuring, 1992-1994.

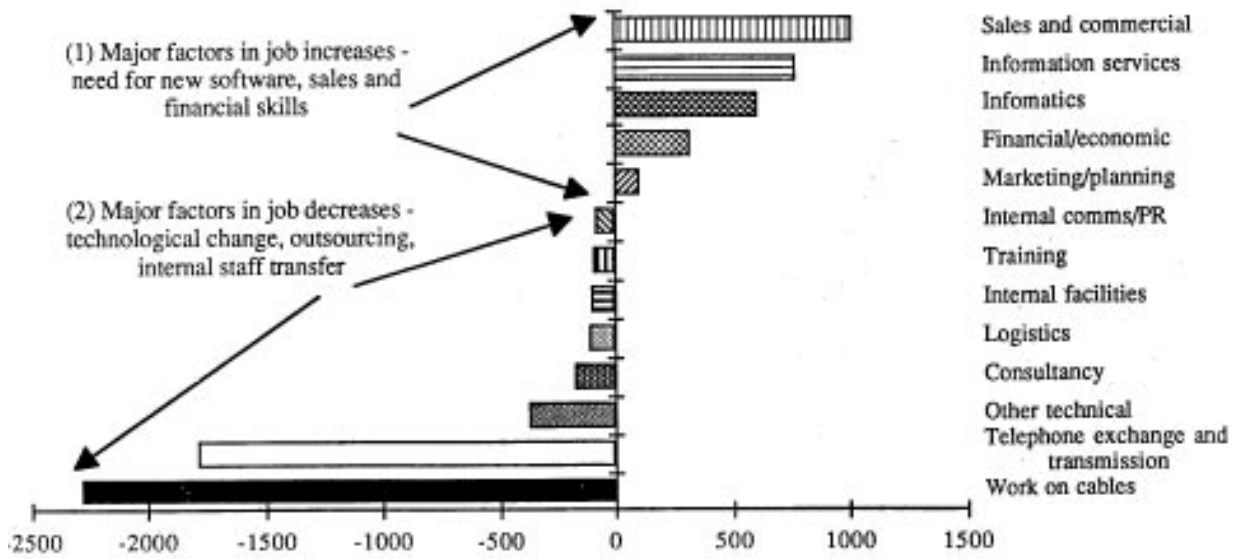


Figure 5: PTT Netherlands: Trends in Workforce Education Levels, 1990-1994

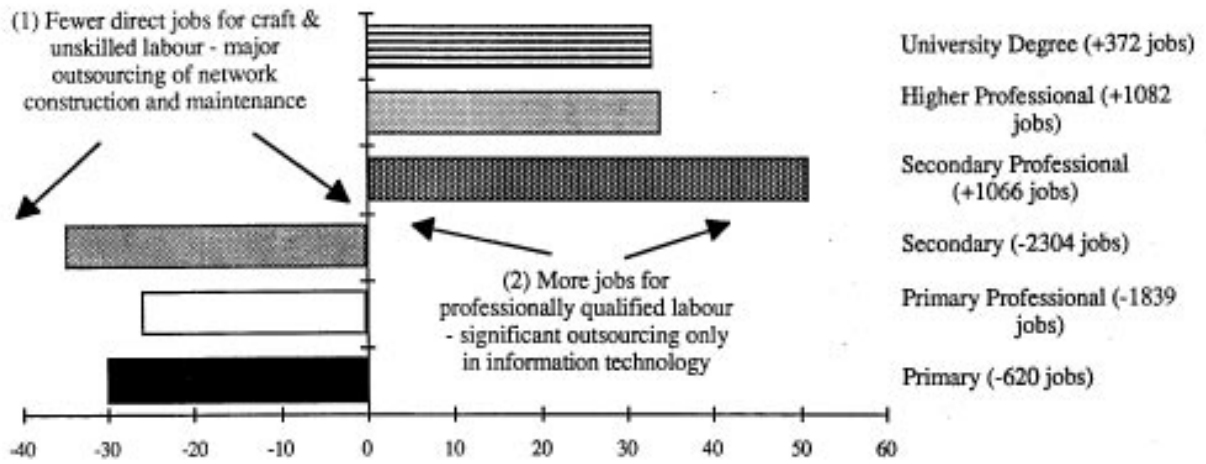


Figure 6: NTT Employment Trends, March 1991 - March 1994

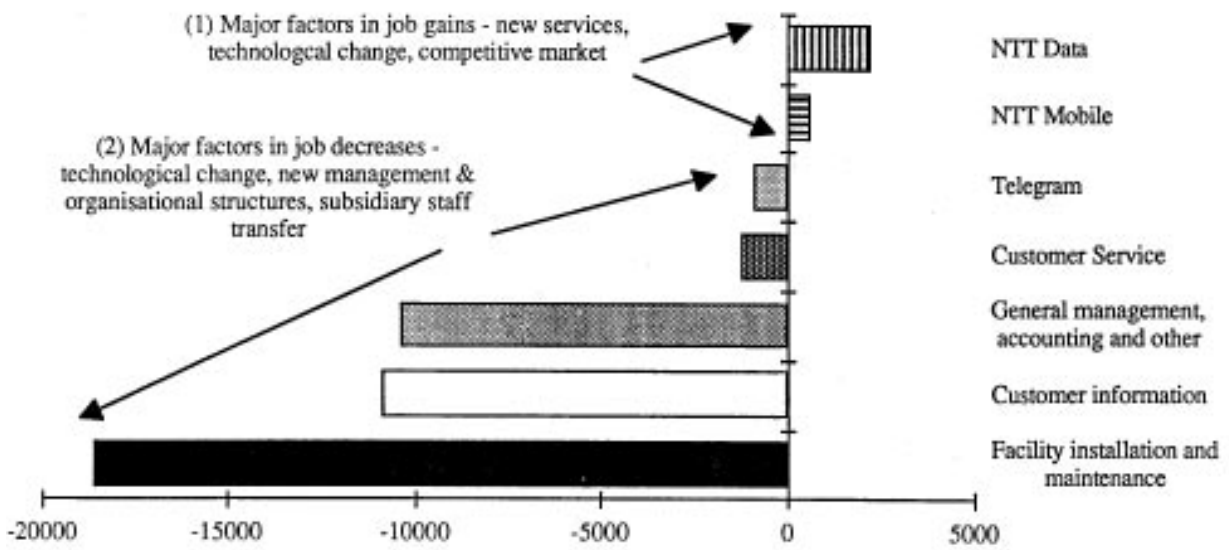


Figure 7: UK Mobile Subscriber and Employment Trends after the Duopoly

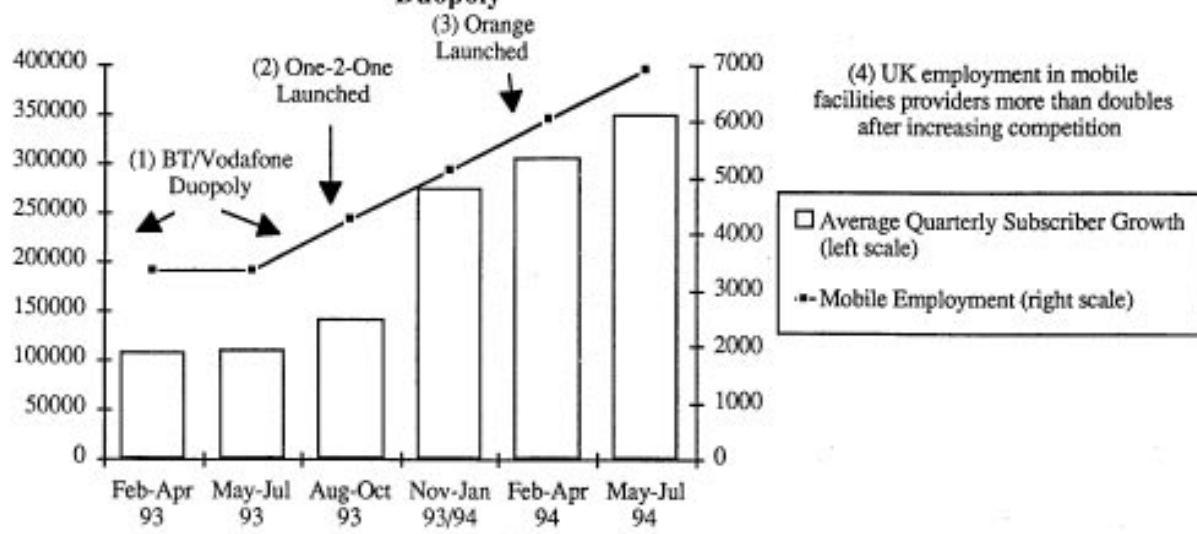


Figure 8: Employment in Selected US Communication Industries

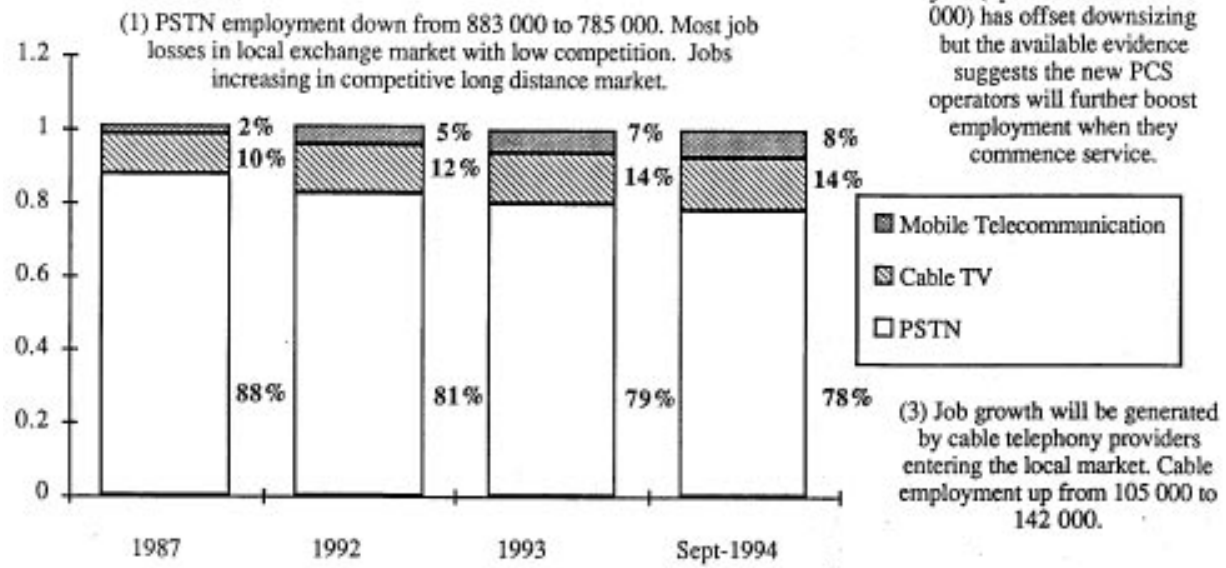
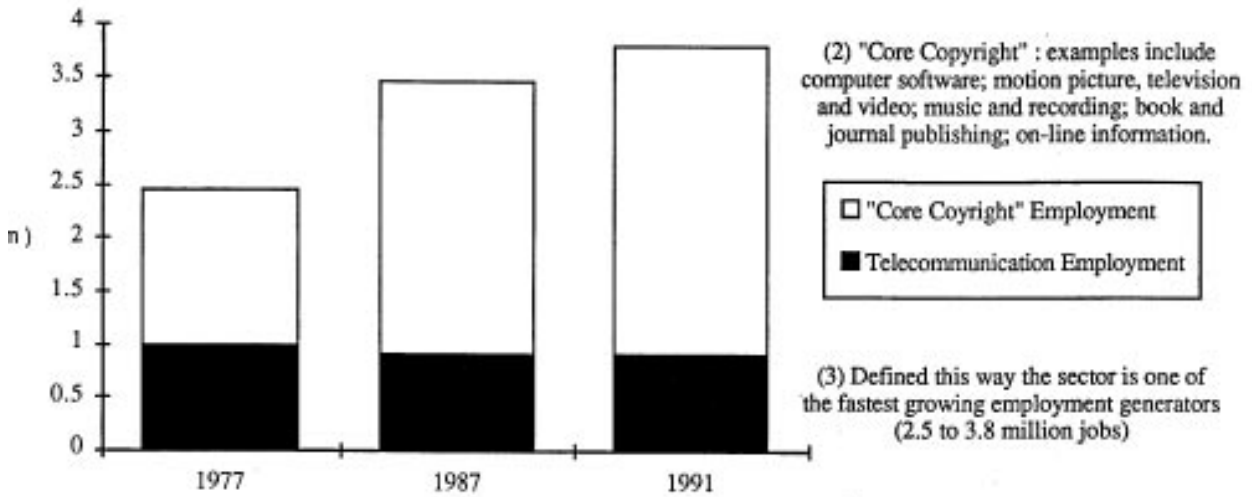


Figure 9: US Employment Trends in the Telecommunication and Information Industries

(1) Telecommunication (itself increasingly software driven) is converging with other information industries.



NOTES

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1. The expansion of networks in some countries with a lower telephone penetration rate, such as Greece and Turkey, was such that more new customers were added between 1990 and 1992 than digital mainlines.
 2. In the treatment of New Zealand data, the general practice of the OECD is to take data reported in March to represent the previous year. Therefore March 1989 represents 1988 and this methodology is used throughout this document in tables.
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 10. Ibid.
 11. Ibid.
 12. Ibid., p. 43.
 13. Office of Technology Assessment, "Electronic Enterprises: Looking to the Future", US Government Printing Office, Washington, May 1994, p. 14.
 14. Ibid.
 15. WEFA, op. cit.
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19. CEC, "Growth Competitiveness, Employment: The Challenges and ways forward into the 21st century", White Paper, Brussels, 5 December 1993, p. 104.
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 26. Ibid, p. 99.
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