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**Technological and regulatory changes
affecting multinational enterprises
in telecommunications: Aspects of the
impact on the workforce**

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Working Papers are preliminary material
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and critical comments

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Preface

Rapid technological innovation is revolutionizing telecommunications. The convergence of technologies in this field with those in computing, is making available a vast range of equipment and services that were unimaginable two decades ago. Pressures to open up different segments of the telecommunication market to competition have gathered an irreversible momentum, and as a result, many countries are at different stages of regulatory reform amidst growing demands for specialized networks, a wider choice of equipment at competitive prices and cost-related charges for telecommunication services.

The developments taking place in the telecommunication sector, which comprises different segments, have substantial consequences for the economy, society and labour. The new information and communication technologies are fuelling the growth of the service sector and facilitating international trade in a number of information-intensive services. They are permeating every aspect of our lives and are widely regarded as ushering in, what is widely referred to as the "information society". The impact on labour has been mixed. It depends to a large extent on the scope and stage of the reform process, the nature of the regulatory framework, the policies of governments as well as the nature of relations between employers and workers in telecommunication enterprises. Labour has experienced certain common problems in a number of contexts: redundancies; increased need for training and retraining to meet the demand for new skills; difficulties in organizing workers in certain enterprises and changes in the terms and conditions of employment.

These and other issues were addressed by the Joint Committee for Postal and Telecommunications Services of the International Labour Organization, at its Second Session, held in Geneva in May 1991. This working paper was commissioned in response to *resolution (No. 12) concerning multinational enterprises in the postal and telecommunications services*, adopted at that Meeting, which called for the ILO to carry out research on the social and labour practices of MNEs in the telecommunication sector. The aim is to gain some insight into the extent to which the policies and practices of these enterprises are in line with the ILO's *Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy*.¹

The following pages provide an overview of technological and regulatory developments in the telecommunication sector in general, and, drawing examples from certain countries (i.e., Brazil, Canada, Hungary, Japan, Mexico, the United Kingdom and the United States) and regions (i.e., Latin America, the European Union, and Central and Eastern Europe), they point out common experiences as well as the specificities of developments in different contexts. Aspects of the social and labour policies and practices in the following enterprises are discussed: AT&T; BT; Ericsson; MATAV; NEC; NORTEL; Siemens; TELEBRAS and TELMEX. This sample encompasses public telecommunication operators at various phases of privatization, as well as private enterprises involved in the manufacture of equipment and/or the supply of telecommunication services.

At the end of this text, there is an annex with a list of other industry-/sector-specific working papers, that have so far been published in response to requests by different sectoral meetings. Also included are the titles of other working papers, which have been prepared in

¹ See operative paragraph 3 of the resolution in the *Report of the Joint Committee for Postal and Telecommunications Services*, Second Session, Geneva, 8-16 May 1991, JCPTS/2/1991/16 (Geneva, ILO), p. 36.

response to the interest expressed by the ILO's constituents, through the Governing Body Subcommittee on Multinational Enterprises. Even though these papers may not be devoted to any particular industry or sector, the authors have drawn examples from different industries or sectors in their examination of other subjects (e.g., employment, training or occupational safety and health), covered by the ILO's *Tripartite Declaration*.

The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the ILO. The territorial designations and terminology used are also those of the authors.

Abebe Abate,
Chief,
Multinational Enterprises Branch.

List of abbreviations

AT&T:	American Telephone and Telegraph
BECTU:	Broadcast, Entertainment, Cinematographic and Theatre Union
BT:	British Telecom
CCA:	Cable Communications Association
CEEC:	Central and Eastern European Countries
CWA:	Communications Workers of America
CWU:	Communications Workers' Union
DANTE:	Delivery of Advanced Networking Technology for Europe Limited
ECU:	European currency unit
EMBRATEL:	The national telecommunication company of Brazil
ENTEL:	Empresa Nacional de Telecomunicaciones (Argentina)
EU:	European Union
GSM:	global system for mobile communications
HDTV:	high-definition television
ILO:	International Labour Organization/Office
ISDN:	integrated services digital network
ITU:	International Telecommunication Union
MCI:	Microwave Communications Incorporated
MNE(s):	multinational enterprise(s)
NAFTA:	North American Free Trade Agreement
NIC:	newly industrializing countries
NORTEL:	(formerly Northern Telecom)
NTT:	Nippon Telephone and Telegraph (Japan)
NYNEX:	New York New England Future
OECD:	Organisation for Economic Cooperation and Development
OFTEL:	Office of Telecommunication (UK)
ONP:	open network provision
OTA:	Office of Technology Assessment (US)
PHARE:	Poland and Hungary Assistance to the Restructuring Economy
PTO(s):	Public telecommunication operator(s)
PTTI:	Postal, Telegraph and Telephone International
RBOCs:	Regional Bell Operating Companies
SDH:	synchronous digital hierarchy
STET:	Societa Torinese Esercize Telefonici
TELMEX:	Teléfonos de México
UK:	United Kingdom
US:	United States
VASAS:	Vas., Fem-es Viliamosenergiaipari Dolgozók Szakszervezeti Szövetsége (the Alliance of Trade Unions of Employees in the Iron, Metal and Electrical Power Industries)

1. Introduction

When information surge happens, it sweeps through human society in a powerful, innovating wave that in some way changes everything everywhere. Surge brings together people and places and ideas in totally new ways. From these new relationships come new entities and new ways of living. (James Burke cited in Northern Telecom's *Annual Report*, 1994.)

Advanced information and communication technologies are widely associated with radical social and economic change. The emergence of that which is now widely referred to as the "new information society" is transforming the way we live and work. These new technological developments can contribute to the creation of new employment opportunities as well as to rising unemployment. Their rapid introduction and widespread use at the workplace are bringing to the fore the mismatch between the skills of today's workforce and those required to design and manage the network infrastructure and electronic services that will be in use in the next century.

The transitional problems associated with radical technical change are highly visible in the telecommunication industry, which enjoyed a relatively long period of stability when networks were constructed and operated by public telecommunication operators (PTOs). Those operators were predominantly state-owned, except in the United States and parts of Canada where private regulated monopoly was the preferred organizational form. The core business of the PTOs was the supply of network infrastructure and relatively homogeneous services.

Since the 1980s, however, software has become a critical component of telecommunication networks and services, and the PTOs are being challenged to deliver multiple service applications. Complex network systems are being designed and engineered to meet the requirements of multinational enterprises (MNEs) operating on a global scale as well as those of the small and medium-sized enterprises (SMEs) and individual consumers.

The telecommunication industry has expanded to become a veritable sector, made up of enterprises producing software, information systems, computers, wireless and "wired" equipment, and also providers of business, educational and entertainment services. These enterprises are seeking to redefine their core business activities. The requirements for competitiveness often make it necessary for them to change their business profiles, organizational structures and the mix of skills demanded of the workforce.

Flexibility is regarded as one of the keys to competitiveness and, as a result, the trend is toward corporate downsizing, organizational restructuring and business process re-engineering. Options for in-house production and outsourcing are regularly evaluated and the goal is to achieve an optimal mix of knowledge and capabilities for succeeding in new markets for information and communication products and services.

These developments are having a significant impact on, and major implications for, the workforce. The aim of this working paper is to examine some aspects of the situation of workers in a sector that is marked by a growing trend toward liberalization and globalization, with MNEs playing a critical role in these processes.

1.1 Objectives

PTOs and equipment manufacturers have been responding to changes in the technical, organizational and market environments by reducing the size of their workforce and introducing new patterns and modes of corporate governance. The objective of this research is to examine how the adjustment process is affecting employment trends and the quality of working life. While its scope does not permit a comprehensive view of worldwide trends, the sample of countries and enterprises does provide useful insights into the impact of technical innovation and market restructuring on employment in the contexts of selected developing, industrialized and transitional economies.

1.2 Sources of information

The research is based on a survey of existing literature and complementary company-specific information. Statistics on employment in the telecommunication sector are more comprehensive for the PTOs and major equipment manufacturers than for relatively new entrants and SMEs. However, these data must be interpreted with caution since many companies are engaged in joint ventures and alliances, and outsourcing, and there is growing use of part-time employees.

1.3 Structure of working paper

This paper reviews recent trends in telecommunication and related technologies, changes in the market and regulatory environments in which enterprises in this sector operate, and the impact of these developments on the workforce. The experiences of selected countries and companies in the United States, Canada, Latin America, the European Union and Central and Eastern Europe are examined.

Sections 2-4 review major developments that are changing the face of telecommunication infrastructure and services, and examine the relationship between regulatory reforms, technical innovation and employment. Section 5 looks more closely at the main technical developments that are contributing to the restructuring of the sector and the responses of large operators and equipment suppliers to the market opportunities that are being opened up. An overview of the convergent communication market is provided in section 6, while the main trends in employment are examined in sections 7 and 8 drawing on the experiences of selected multinational enterprises and countries in different regions of the world. The findings of the research are presented in section 9.

2. The telecommunication sector in the global economy

Telecommunication is no longer a "stand-alone" industry in which PTOs operating at the national level and a small number of equipment manufacturers provide limited facilities and services. Innovations in computing and telecommunication technologies have resulted in significant reductions in the unit costs of data storage, processing and retrieval, thereby

creating opportunities for an explosive growth of new services. Teleprocessing or telematics services are providing opportunities for industrial restructuring both within and across countries.¹ The audio-visual sector is becoming more thoroughly intertwined with telecommunication suppliers as existing and new entrants provide alternative networks (e.g. long-distance networks, cellular mobile systems, satellite networks, and cable television networks) and services (e.g. value-added services, digital voice and data services, multimedia).

Global network and service operators together with their counterparts in domestic markets are regarded as essential players in the drive to ensure that advanced information and communication technologies and services contribute to competitiveness and a better quality of life. According to one source:

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.²

It has also been noted that:

The enormous potential for new services relating to production, consumption, culture and leisure activities will create large numbers of new jobs.³

All these changes suggest that there is great potential for job creation and the development of new skills and capabilities both within and outside the traditional telecommunication industry. In its statement on the *Global Information Superhighway* prepared for the G-7 meeting in February 1995, the Postal Telegraph and Telephone International (PTTI) drew attention to the far-reaching significance of technical and organizational change for this sector. It noted that:

Modern digital networks simply do not distinguish between telephone calls, newspaper articles, information services, television pictures or films and videos. A growing number of companies are already involved in both communications and broadcasting and the advent of multimedia will further dissolve traditional boundaries between different industries and further blur dividing lines between different occupations ... The PTTI is concerned that there is still very little understanding of the employment implication of creating an information superhighway ... It is essential to know which jobs are likely to go, where jobs will be created and how best to smooth these processes so as to promote maximum employment growth and rising standards of living.⁴

The implications for jobs and skills in developing countries are important. In a 1989 report by the Advisory Group on Telecommunication Policy to the International Telecommunication Union (ITU), it was argued that:

... possibly the most significant issue underlying almost all the problems in developing countries is human resource development. Shortages of skills at all levels, including technical, operational, managerial and planning frustrate the performance of most aspects of telecommunication system improvement and expansion ... It requires attention to the structure of career and pay incentives, bureaucratic constraints, ongoing training and education opportunities. It requires that the

telecommunication operating entities have adequate authority to hire, recruit, promote and fire staff in competitive labour markets.⁵

The workforce which both supplies and uses advanced information and communication technologies is confronting difficult problems of adjustment in both industrialized and developing countries. In addition, trends towards oligopolistic rivalry are emerging among the largest network operators and service suppliers in the global market. Table 1 shows two models of trends in national and international communication markets.

Table 1. Two models of communication network and service evolution

Idealist model (the fully competitive scenario)		Strategic model (the dominant player(s) scenario)
Permeable seamless networks		Fragmented networks
Ubiquity (universal service diffusion)		Reduced ubiquity in service diffusion
Demand-led telecommunications industry		Supply-led industry, multinational user pressure
Open systems, common interface standards		Weak stimuli for competition
Cooperative partnerships, transparent network access		Monopolization and rivalry, non-transparent network access
Minimal regulation to achieve efficiency and equity		Increasing regulation
Technical and operational trends	Idealist model	Strategic model
Network interface standards	Open	Proprietary
Unbundled intelligence	Yes	No
Product differentiation	Strong, all sub-markets	Superficial, strong in selected sub-markets
Service competition	Strong, all sub-markets	Superficial, strong in selected sub-markets
Network access	Open	Closed
Network control	All suppliers and users	Selected suppliers and users

Source: Adapted from R. Mansell (1993).

Both models draw attention to technical and operational trends in the communication sector. The predominant scenario for network and service evolution is represented by the *idealist* model in which technical change and competition erode the monopoly power of the traditional PTOs. There is controversy over when this will occur and how governments can ensure that there will be a "level playing field" for all competitors. However, advocates of this model argue that this is the inevitable trajectory for network and service evolution. They assume that no single supplier (or group of suppliers) will dominate the marketplace. In this model, market liberalization is encouraged and new entrants are not protected by industrial or regional policies (e.g. infant industry policies) or by asymmetric regulation.⁶

In the *strategic* model the rivalry between a small number of firms in the international market (and in some national markets) and the continuing dominance of PTOs in many domestic markets are taken into account. So too is the possibility that new firms will achieve dominant positions in the market. This model emphasizes the ways in which new forms of

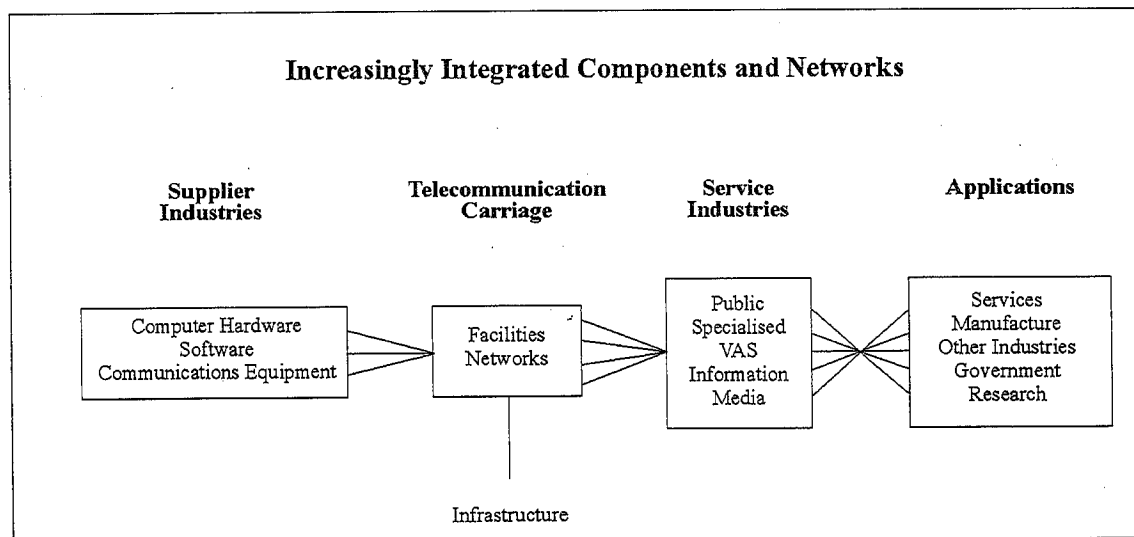
market distortion could create opportunities for the exercise of monopoly power. This, in turn, influences the technological design of infrastructure and services and the organization of companies active in the supply and use of communication technologies and services. In this model the behaviour and strategies of actors in the marketplace are of central interest rather than the theoretical behaviour of actors operating under idealized market conditions.

As table 1 suggests, the two models point to very different trends in the development of network interface standards, the unbundling of network intelligence (software), product differentiation and service competition, network access conditions and the overall control of networks and services. For example, in the case of the *strategic* model, empirical research has shown that the following conditions have emerged:⁷

- fragmentation of networks and a less than desirable degree of permeability, interconnection or inter-operability;
- reduced universality of advanced services;
- continuation of a largely supplier-led development of networks and services with pressure for innovation coming mainly from larger users in the business sector;
- relatively weak incentives for competition in traditional segments of the market although open systems and common interface standards emerge in areas which are not directly facing the threat of competition;
- increasing regulation aimed at restraining the anti-competitive practices of dominant firms and ensuring greater coordination among suppliers in the market.

At the level of the technical infrastructure, there is a convergence of computing, telecommunication, cable and other related technologies which is leading to a substantial overlap in activities previously carried out by distinct suppliers (see figure 1).

Figure 1: The new telecommunication sector



Source: Melody et al., 1993.

Cable operators can now offer voice telephone service and broadband video. High-definition television and multimedia services can be offered over broadband (e.g. optical fibre) switched networks, upgraded cable television networks, and broadband wireless

networks. Broadcast distribution can be provided by cable operators and satellite broadcasters, while point-to-multipoint data downloading (data casting) can be provided by satellite broadcasters and telecommunication operators. Local area networks supporting high-speed computing applications are being linked with higher capacity wide-area networks. Also, software developers and information systems integrators are playing a greater role in developing applications software for networked business services.

The market is characterized by mergers and acquisitions between telecommunication operators, cable operators and media companies as suppliers seek to increase future revenues by controlling both the telecommunication infrastructure and the content that will reach into the homes and offices of the twenty-first century. These developments are creating uncertainty in the market. They are also contributing to changes in employment trends as well as the policies and organizational practices that affect employers and workers.

Member States of the Organisation for Economic Co-operation and Development (OECD) are home countries of the world's biggest producers and exporters of telecommunication equipment. Similarly, the largest revenue earners among PTOs and private enterprises providing telecommunication services on domestic and international markets can be found in these countries (see tables 2, 3 and 4). Not surprisingly, therefore, these actors are at the centre of ongoing debates about the changing policies, structures and practices of telecommunication enterprises, and their effects on labour in both quantitative and qualitative terms. What is less discussed, but clearly deserves attention, is the situation that exists in non-OECD countries and the extent to which their responses to developments in the global telecommunication market either resemble or differ from those of the industrialized market economy countries.

Table 2. Top ten home countries of telecommunication equipment manufacturers, 1994

Country	US\$M	% share
United States	40 365	30.2
France	22 194	16.6
Germany	18 733	14.0
Japan	14 535	10.9
Canada	10 054	7.5
Sweden	9 947	7.4
United Kingdom	3 601	2.7
Finland	2 987	2.2
Netherlands	2 570	1.9
Switzerland	1 782	1.3
Total	126 768	95.0*
Global total	133 540	100.0

* Rounded.

Source: Adapted from Financial Times Survey (based on information from MarketLine Telecommunications Database), in *Financial Times* (London), 3 Oct. 1995, p. 23.

Table 3. Top ten countries by telecommunication service revenues, 1994

Country	Service Revenues (US\$M)	Revenue per inhabitant (US\$)	Revenue per mainline (US\$)	Revenue per employee (US\$)
United States	152 100.0	589.4	1 027	229 412
Japan	65 858.8	527.6	1 119	n/a
Germany	39 438.0	486.0	1 006	173 278
United Kingdom	23 990.4	413.3	876	130 952
France	23 662.3	409.9	749	155 061
Italy	18 047.2	315.8	735	164 065
Canada	10 872.4	390.9	660	129 885
Australia	10 379.6	581.8	1 173	152 641
Spain	9 581.6	242.3	652	132 697
Brazil	7 767.8	48.8	661	79 945

Source: Financial Times Survey (based on information from ITU) in *Financial Times* (London), 3 Oct. 1995.

Table 4. Top ten telecommunication operators (by domestic service revenue), 1994

Operator	Home country	Telecom revenue		Main lines	
		Total US\$M	% change 1993-94	Total (millions)	% change 1993-94
NTT	Japan	60 134.7*	2.8	58.46	2.0
AT&T	United States	43 425.0	8.9	-	-
Deutsche Telekom	Germany	37 712.6	3.7	39.20	6.2
France Télécom	France	23 288.4	1.8	31.60	2.6
BT	United Kingdom	21 262.6	1.6	27.07	1.6
Telecom Italia	Italy	18 047.2	-	24.54	-
GTE	United States	17 363.0	0.6	17.44	2.2
Bell South	United States	16 844.5	6.1	20.22	4.6
Bell Atlantic	United States	13 791.4	10.0	19.20	3.0
MCI	United States	13 338.0	11.9	-	-

Operator revenue change based on local currency; total based on US\$.

* Revenue figure for 1993.

Source: Financial Times Survey (based on information from ITU/BDT/INFS) in *Financial Times* (London), 3 Oct. 1995, p. 23.

3. The effects of regulatory reform

Regulatory reforms in the telecommunication sector are taking place in a context marked by rapid technological developments and the changing demands and structure of industry.⁸ It is now widely recognized that deficiencies in this sector can be a major barrier to economic and social development. The following are some of the main features of the reforms under way.

- There is an emphasis on bringing about major improvements in commercial efficiency by the PTOs and reducing the size of the workforce in what were, in many cases, over-staffed bureaucracies.

- Long-term investment is being undertaken to modernize infrastructure and the introduction of capital-intensive digital technologies is decreasing the demand for labour. There is a noticeable shift toward more customer-oriented jobs.
- Increased competition in the markets for terminal switching and transmission equipment is provoking changes in the aptitudes, knowledge and skills required to perform tasks for the manufacture, installation, marketing and maintenance of telecommunication equipment.
- There is also greater competition in the markets for new value added services and the resale of infrastructural capacity. Consequently, there are now advertising firms, systems integrators, consulting firms and software houses offering such services to business customers.
- Large corporate users are developing their own networks and there is a growing trend toward outsourcing professional services for the planning, design, development, operation and maintenance of such networks.
- The liberalization of markets in developing countries is opening up opportunities for exports of advanced hardware and services from industrialized countries. These include expertise for the planning, construction and operation of fixed and mobile public telecommunication networks, modern equipment and professional services.
- The policies and regulations being introduced are facilitating end-to-end international communication network inter-operability, thereby stimulating increased transborder communication, data flows and trade in a number of services.
- As PTOs and other firms in this sector move to seize opportunities for entering new markets, they are finding it necessary to reorganize the workforce, both in terms of size and skill profiles.

4. Impact of technical change on telecommunication

The main technical changes in the telecommunication sector are shown in table 5. They fall into two main categories: public network switching and transmission technologies; and customer premises equipment.

For the PTOs, the aims are to achieve gains in efficiency and compete in the growing markets for new services. To this end, a number of structural changes are being undertaken. They include the separation of postal and telecommunication operations, the transformation of public corporations into limited companies, the spin-off of subsidiaries and the contracting out or franchising of certain activities. Where privatization has occurred, governments have moved to introduce policies and regulations aimed at stimulating competition and widening the segments of the market that are open to new entrants.

All over the world there are countries that have either privatized telecommunications or begun to consider the costs and benefits of privatization (see table 6).⁹

Table 5. Technical changes in telecommunication*Fixed public network technology*

- move towards integrated broadband communication (IBC) networks
- IBC networks linked with local area networks and wide-area networks movement away from plesiosynchronous digital hierarchy (PDH) to synchronous digital hierarchy (SDH) environments
- SDH linked with development of optical transmission methods
- movement to asynchronous transfer mode (ATM) switching fibre to the curb, office and/or home

Mobile public network technology

- digital cellular telephony with roaming capacity
- digital cordless telephony with access to fixed terminals within a confined radius
- personal communication networks
- wireless local loop applications

Customer premises equipment and private networks

- Enhanced PBX and local area networks integration
- Centrex services and virtual private networks
- Computer-telephony integration

Integrated fixed and mobile networks

- Universal personal telecommunication

Photonic technologies

- replacement of opto-electronic technologies by photonic architecture for transmission and switching

Source: R. Hawkins (1995).

According to the 1991 report by the ILO's Joint Committee for Postal and Telecommunications Services, these structural changes inevitably have had an impact on the workforce, "... as new organizations have tended to have greater financial autonomy and a corresponding incentive to introduce labour-saving technology as quickly as possible".¹⁰ The report went on to note that on the whole, employment-related changes resulting from structural reforms were subject to negotiation and ways were often found to safeguard the pensions of public sector employees. However, conditions of employment were perceived to be on the decline, with the hiring of temporary workers and contracting-out practices posing threats to job security.¹¹

Table 6. Details of telecommunication privatizations (selected countries), 1995 and 1996

Telecom operator	Stake %	Type of offer/ Existing free float		Amount US\$Bn	Date of issue
SPT Telecom (Czech Republic)	27		SS	1	3Q 1995
MATAV (Hungary)	40	I/D	IPO*	1	3Q 1995
Telefonica (Spain)	12	I/D	68%	1	3Q 1995
Belgacom	30	I/D	SS	1.8	4Q 1995
Bezeq (Israel)	25	I	24%	0.5	4Q 1995
STET (Italy)	61	I/D	35%	7	4Q 1995
PT Telecom (Indonesia)	n/a	I/D	IPO	2	4Q 1995
OTE (Greece)	8	D	IPO	0.5	4Q 1995
Deutsche Telekom	49	I/D	IPO	10	1H 1996
KPN (Netherlands)	30	I/D	30%	4	1H 1996
Telkom (South Africa)	30		SS	1	1996

Note: *30% strategic stake sold to Ameritech and Deutsche Telekom in 1993.

Bold figures = projections; IPO = initial public offering; I = international; D = domestic, Q = quarter; H = half; SS = strategic stake.

Source: Adapted from *Financial Times*, 12 June 1995.

5. Corporate responses to regulatory and technical changes

Since the main players in the global market for telecommunication products and services are multinational enterprises (MNEs), it is worthwhile to highlight the factors that influence the quality, level and location of jobs in MNEs operating worldwide (see tables 7 and 8).

Table 7. Potential effects of foreign direct investment on quantity, quality and location of employment

	Outward FDI			
	Inward FDI	Positive-direct	Negative-direct	Negative-indirect
Quantity	Positive-direct Adds to net capital and creates jobs in expanding industries	Positive-indirect Creates jobs through forward and backward linkages and multiplier effects	Negative-direct May result in rationalization and job loss	Negative-indirect Reliance on imports or displacement of existing firms results in job loss
Quality	Pays higher wages and has higher productivity	Hiring and promotion practices that are considered undesirable	Erodes wage levels as domestic firms try to compete	Relocation if foreign affiliates substitute for production at home
Location	Adds new and perhaps better jobs to areas with higher employment	Migration of supplier firms to areas with available labour supply	Displaces local regional unemployment, if foreign affiliates substitute for local production or rely on imports	Relocation if foreign affiliates substitute for production at home
				Creates or preserves jobs in home location
				Skills upgraded with higher value production
				Jobs may depart but may be replaced by higher skilled jobs and upgrading of local labour market
				Export of jobs can aggravate regional/local labour market
				Loss of "blue collar" jobs offset by greater demand in local labour market for high value added jobs
				Boosts sophisticated industries
				Downward pressure on wages and standards flows to suppliers
				Demand spiral in local market triggered by lay-offs leading to employment reduction in home country
				Creates or preserves jobs in supplier/service industries catering to foreign affiliates
				Loss of jobs linked to production activities that are relocated

Source: Adapted from UNCTAD, 1994, p. 167.

Table 8. Relating corporate strategies to employment effects

Item	Stand-alone strategy	Simple integration strategy	Complex or deep integration strategy
Employment quality	Higher firm-wide level of employment as structure is replicated in local markets. Indirect employment through local linkages	Employment is export-oriented with some direct employment creation, but some jobs lost in home country units, others may gain. Minimal indirect employment creation	Overall employment may decline as value activities are not replicated but rationalized
Employment quantity	Replication of parent firm occupational structure with exception of highest value added jobs; industrial relations follow national pattern	International division of labour, low-skilled, low value added predominant in foreign affiliate. Avoidance of trade unions possible	Convergence of elements of employment package to maximize worldwide efficiencies; some labour market specialization in affiliates
Location	Activities in major market areas	Location decision may be more dispersed than stand-alone strategy	Possible separation of location of production from consumption, activities do not all need to be performed close to final market

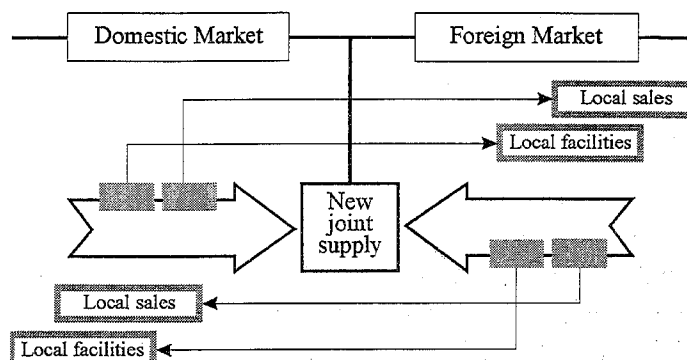
Source: Adapted from UNCTAD, 1994, p. 173.

5.1 Foreign direct investment and telecommunication

Among the 100 largest multinational enterprises (MNEs) ranked by foreign assets, only three telecommunication companies are represented: Alcatel Asthom, Ericsson, and GTE.¹² Nevertheless, many of the network, service and equipment suppliers in the telecommunication sector — broadly defined to include firms in related sectors — are active outside their home markets. The activities of MNEs have been found to stimulate moderate employment growth in the service sector. Robust economic performance, liberalization of investment regulations and privatization programmes open to foreign participation generally serve as “pull factors” for foreign direct investment.¹³ The locational choices for the R&D, manufacturing and/or service operations are “somewhere between art and science and [this area] is far too mercurial for packaging into a rigid structure with universal application”.¹⁴

The impact of the operations of MNEs on employment in the telecommunication sector depends on the segment of the market which is targeted. Figure 2 shows the strategies being adopted by PTOs as they expand their operations beyond domestic markets.

Figure 2. Complex communication supply markets



Source: Adapted from R. Mansell (1993).

The options for these firms include the relatively simple locating of sales offices in a country outside the home market and the more complex establishment of all aspects of network facility operations outside the domestic market, through acquisitions, mergers or stand-alone enterprises. The effects on employment will depend on the skill levels of the workforce, the characteristics of the existing telecommunication network in a local market and the penetration levels for basic and more advanced services.

Foreign investors in telecommunication markets may introduce new production and organizational systems such as "lean" or "just-in-time" production methods and flexible manufacturing systems. Corporate restructuring and re-engineering may result in outsourcing as more tasks are allocated to external suppliers and subcontractors. Telecommuting schemes may be introduced which may alter the structure of employment and have an impact on senior management as well as the workforce as a whole.¹⁵

As boundaries between the telecommunication, computing, software and audio-visual sectors are eroded, alliances between new and existing players in distant markets may result in the non-recognition of union representation.¹⁶ This is especially evident in countries such as the United Kingdom, where cable franchisees have achieved a relatively high degree of penetration and are permitted to offer voice telephone service in competition with PTOs.

These developments are part of a wider process of globalization which the OECD has defined as a "process of broadening geographical inter-linkages of products, markets, firms and production factors, with a growing component of each derived, generated or available in more countries and regions".¹⁷ Globalization and the growing interconnection between national economies is visible in the proliferation of networks for business users.

Attention has focused on Central and Eastern Europe in recent years as these countries attract private foreign investment for the upgrading and extension of infrastructure and services. The acquisition in July 1995 of a 27 per cent stake in SPT Telecom of the Czech Republic by a Dutch-Swiss consortium is one example of this. Another is the acquisition by Deutsche Telekom and Ameritech of about 30 per cent of MATAV, the Hungarian PTO. Foreign investors have also been active in developing new mobile networks and offering technical assistance to operators in the transitional countries.

These investments sometimes bring the promise of retention of monopoly status for an extended period such as in the Czech Republic, where SPT Telecom's voice monopoly is to remain in place until the end of the decade.¹⁸ Although many other countries in Central and Eastern Europe are seeking foreign capital, their reluctance to privatize quickly is regarded as creating substantial barriers for foreign investors.

The magnitude of investment in telecommunication infrastructure forecast to take place in other regions of the world is also substantial. The target increases in telecommunication penetration rates in the Asia-Pacific region and the estimated investment requirements to the year 2000, are shown in table 9.

Current investment trends suggest that the PTOs of the future will be leaner and their core businesses likely to cover new areas of activity. Increasing bandwidth availability may transform the market for infrastructure into one in which service retailers will be able to choose the least expensive infrastructural network from a range of competing suppliers in different national markets.¹⁹ In 1982 the revenues of PTOs in OECD countries totalled US\$159.6 billion. Of that amount, 85 per cent (US\$135.03 billion) was generated by basic telecommunication services. By 1992 there was evidence that these services were gradually losing their importance as a source of core revenue, in that their share of total revenues (US\$392.7 billion) had fallen to 74 per cent (or US\$291.6 billion).²⁰ Mobile services and leased lines have emerged as important sources of revenue. The opportunities for spin-off companies and new corporate divisions to derive sizeable profits from information and communication services, are expected to grow rapidly. PTOs that succeed in making the transition from traditional core businesses to new value added services are likely to become involved in the provision of credit card services, electronic funds transfer and entertainment services. Some may even move into specialized areas such as health care, financial and educational services.

While these opportunities are opening up most rapidly in North America, Europe and the newly industrializing countries (NICs) of Asia, the primary challenge for many of the PTOs in developing countries is to increase penetration rates for basic telephony and simple data transmission services. It is still unclear whether they would be able to meet the targets set to date and at the same time acquire the competence to supply a wide range of non-core business services.

Table 9. Asia-Pacific telecommunication investment requirements

Country Territory Subregion	Main lines per 100 inhabitants		Est. Inv. 1991-2000 US\$Bn	Country Territory Subregion	Main lines per 100 inhabitants		Est. Inv. 1991-2000 US\$Bn
	1990	2000 (Est.)			1990	2000 (Est.)	
East Asia	6.21	9.41	52.00	Indonesia	0.60	1.39	2.84
China	0.60	0.85	5.90	Lao PDR	0.15	0.11	0.00
North Korea	3.67	8.85	2.09	Malaysia	8.88	26.72	6.42
Hong Kong	41.76	53.54	1.40	Myanmar	0.17	0.39	0.19
Japan	43.82	56.97	28.80	Philippines	0.99	1.16	0.39
South Korea	31.52	39.95	7.83	Singapore	38.67	48.02	0.60
Macau	20.17	23.52	0.05	Thailand	2.32	8.26	5.92
Mongolia	3.48	7.46	0.20	Vietnam	0.15	0.32	0.25
Taiwan	32.54	53.01	6.21	Pacific	36.99	50.24	6.00
South Asia	0.68	1.33	16.00	Australia	47.32	56.98	4.60
Afghanistan	0.16	0.26	0.07	Fiji	5.89	8.62	0.04
Bangladesh	0.17	0.38	0.52	French Polynesia	19.52	56.64	0.16
Bhutan	0.13	0.30	0.01	Guam	32.53	44.94	0.02
India	0.55	1.06	9.10	Kiribati	1.61	4.05	0.00
Iran	3.90	7.71	4.74	Micronesia	2.40	6.54	0.01
Maldives	2.31	9.88	0.03	Caledonia	17.29	33.82	0.05
Nepal	0.30	1.28	0.38	New Zealand	42.86	55.02	0.63
Pakistan	0.62	1.06	1.40	Papua New Guinea	0.81	0.75	0.01
Sri Lanka	0.71	1.27	0.18	Samoa	2.50	5.92	0.01
South-East Asia	1.33	3.08	17.00	Solomon Islands	1.25	2.38	0.01
Brunei	12.96	29.34	0.09	Tonga	4.44	9.30	0.01
Cambodia	0.06	0.13	0.01	Vanuatu	2.67	6.03	0.01
				Asia-Pacific	3.61	5.37	91.00

Note: Not including countries or areas with population less than 50,000. Based on current growth rates and projected population increases. US\$1,500 per main line used for investment requirements.

Source: W. Melody et al., 1993, p. 32, data from ITU, *Asia Telecom News*, Vol. 1, No. 2, Jan. 1993.

5.2 Joint ventures, strategic alliances and outsourcing

Some of the key strategic investors in the international telecommunication market are shown in table 10.

Table 10. Key strategic investors

Bell Atlantic/Ameritech	==>	New Zealand TCNZ
Bell South/Cable & Wireless	==>	Australia AUSSAT
GTE/AT&T/Telefónica	==>	Venezuela CANTV
Southwestern Bell/France Télécom	==>	Mexico TELMEX
STET/France Télécom	==>	Argentina Telecom
Telefónica	==>	Argentina Telefónica
Telefónica	==>	Chile CTC/ENTEL

Source: Various notes on investors.

These enterprises are driven by an interest in boosting the growth of access lines in less mature overseas markets, competing for larger market shares in deregulated operating environments, maximizing productivity gains and using skilled personnel released by the downsizing of companies in their respective home countries.²¹

As the PTOs seek alliances to strengthen their global coverage and to respond to the requirements of large business customers, they are forging various kinds of horizontal and vertical corporate linkages. Some of the overlapping alliances already taking place are illustrated in table 11.

While the strategic alliances between major operators are impressive, the ambitions of these players have yet to be fulfilled. Many claim to have numerous "trial" customers, but some of these have been in the "trial stage" for several years. While multinational enterprises often accept that there are benefits associated with using a single supplier for all their communication needs, they are sceptical of the ability of transnational operators to meet requirements that are essential for achieving the "seamless" connections which they promise to provide.²²

There are six facets to strategic alliances that are crucial for their success. These are: their structure; the technology platform upon which services are provided; geographical coverage; the strength of the systems' integration capabilities; the ability to serve markets other than the top 500 multinational enterprises and the effects of regulatory restrictions.

The **structure of an alliance** is important because it establishes a set of relationships between the members which is reflected in the interests of the group and its operational activities. It also affects the quality of customer service and determines which operator becomes the lead contractor. Since there is considerable overlap in the activities carried out by the major partners, and **different technical platforms** are being used, these have given rise to inter-operability problems. Attempts to upgrade and standardize facilities may not be fully pursued because of the need to respect guaranteed reliability targets. The network outage caused by Concert (the joint venture between BT and MCI) in early 1995,²³ is one example of the kind of problems that could arise.

Table 11. Alliances and major operator affiliations

Operator	Atlas	Concert	Eunetcom	FNA	Infonet	Phoenix	Uniworld	World partners
AT&T							x	x
BT		x						
Deutsche Telekom	x			x	x	x		
France Télécom	x			x	x	x		
Hong Kong Telecom					x			x
KDD					x	x		x
MCI		x						
Singapore Telecom					x			x
Telstra Australia					x	x		x

Source: *Communications Week International*, 24 Apr. 1995, p. 6.

The **geographical reach** of the alliance's activities is an important factor for gaining the largest share of new contracts. The **strength of the alliance** is primordial, particularly since there are no guarantees that the strengths of each partner will coalesce into a solidly integrated system and give rise to a strong network management capability. The success of an alliance will also depend on its **capacity to be flexible and versatile in order to serve new markets** in addition to the leading MNEs. Also of great importance is the extent to which regulatory restrictions prevent global carriers from offering "truly" global, virtual, private networks.

Despite the scepticism of large business users, many see advantages in the growth of activities by transnational operators through joint ventures and alliances. One major advantage is the flexibility and reach that these operators provide, while the customer, in most cases, continues to deal with the same local operator. The outsourcing of corporate telecommunication networks, generally justified as a cost-saving measure, is also a reflection of the increasingly sophisticated needs of international business, and the shortage of skills within a single information technology department to cope with the full range of systems resulting from advances in technology. The cost of internally managing a network or networks is becoming prohibitive and a large number of MNEs are therefore outsourcing parts of their networks and service requirements. This course of action has become necessary²⁴ because of uncertainty over the stability of global alliances and the lack of understanding by outsourcing companies of the particular needs of the client. The hidden costs of outsourcing, reliability and the cost implications of the length of contracts because of possible over-pricing of services, all constitute other major considerations.

Popular "candidates" for outsourcing include the maintenance of non-strategic systems, one-time projects and applications developments which are short-term investments. The

success of global operators in providing a full and reliable range of services is an important determinant of the long-term prospects for outsourcing entire network and service requirements. These factors have a considerable impact on the creation of new jobs both within and outside the largest corporate players that have joined forces to offer worldwide telecommunication services.

6. Convergence in the “telecommunication” market

6.1 Telecommunication services

Technical convergence is blurring the boundaries of the once distinct segments of the telecommunication market. The convergent “telecommunication” market comprises telephony services, computing services (enhanced telecommunication services), broadcasting and related media, and equipment.

Public telecommunication services include telephony, telex/telegram, data transmission and rental/connection. In the light of the increasing use of fax machines (and computer-to-computer facsimile), public telecommunication service revenues now include fax services and other value added services such as call-forwarding, call-waiting and caller identification. In 1992 the diffusion of fax machines in OECD countries reached 21,684 million, representing a penetration rate of 5.30 machines per 100 mainlines.²⁵

A key service segment consists of value added services which include a variety of sophisticated integrated voice and data communication and network management services. These are mainly supplied by private providers and increasingly by the PTOs.

Electronic data interchange, for example, is forecast to grow rapidly throughout Europe and other parts of the world. Electronic mail, which is displaying a strong growth rate, is generally delivered over leased lines rather than via the public switched telephone network. The demand for video conferencing and enhanced fax services — viz., fax delivery to multiple destinations and deferred delivery — is also on the rise.²⁶

Digital mobile telephony, paging networks and satellite systems which form the core of mobile communication, have been growing at an impressive rate in many regions. Subscription to mobile services in many parts of the world, including the economies in transition in Central and Eastern Europe, is increasing rapidly. Mobile communication also includes a wide range of value added services such as messaging and data transmission and these contribute significantly to overall telecommunication revenues. At present, most mobile calls terminate on the fixed telecommunication network but this is expected to change in the coming years.

Broadcasting and the entertainment firms are beginning to “pipe” their information products through telephone lines. Cable operators are also offering voice telephony services. Some telephone companies, such as British Telecom (BT) in the United Kingdom and the Regional Bell Operating Companies (RBOCs) in the United States, are introducing video-on-demand services on a commercial basis. Software-driven “intelligence” embedded within the telecommunication network and in peripheral “set-top box” equipment will be used to switch information services. In some cases, the greater data transmission capacity offered by some of the networks operated by cable companies will complement the telephone operators’ infrastructure. In others, there may be a move toward the use of a common or shared

“substructure” or infrastructure (fixed and wireless). The convergence of different segments of the industry is expected to lead to the growth of a wide range of interactive multimedia services, which are generally considered to be the leading emergent sector in the telecommunication market.

Although the employment consequences of these developments in various segments of the “telecommunication” industry are frequently discussed, measurement of the impact on employment lags far behind the development of new services. Data on the growth of value added services vary according to the services selected for analysis and there are substantial inconsistencies in published reports. Furthermore, since multimedia services are still in their infancy, few providers publish reliable accounts of usage, employment or revenues. Bearing in mind these observations, the following data do none the less give an indication of the size of the market.

World telecommunication revenues for 1992 were US\$413,671 million, with Canada and the United States accounting for US\$174,157 million or 42 per cent of that total. Mexico’s telecommunication revenues amounted to US\$6,184 million, bringing the total for these three countries to US\$180,341 million.²⁷ For Western Europe the revenues were US\$87,800 million in 1992.²⁸ Total telecommunication revenues for South America in 1992 were US\$21,300 million.²⁹ Data for all the Central and Eastern European countries were unavailable. However, Hungary and Poland, two of the most advanced countries in telecommunication penetration, generated revenues of US\$617 million and US\$1,400 million, respectively.³⁰

The number of mobile telephone subscribers worldwide, in 1992, was 23 million. Of these, Europe had 6 million subscribers, North America (i.e. Canada and the United States) 12 million and South America, 202,200.³¹ For Hungary and Poland the combined number was approximately 52,000. Table 12 shows the top 20 cellular telephony markets by penetration rate at the beginning of 1995.

The total value of the world telecommunication market in 1993 (excluding audio-visual) was approximately 620 billion ECU (US\$806 billion, November 1995 exchange rate). The combined total for telecommunication services and other related services was 457 billion ECU (US\$594 billion), with equipment, software products and data communication hardware comprising the balance.³²

6.2 Telecommunication equipment

The multimillion dollar telecommunication equipment market is dominated by a relatively small number of multinational enterprises from OECD member States. In 1991 Asia (mainly Japan) exported equipment worth US\$30 billion, making it the world’s major regional exporter of these products. In second and third places were Western Europe (US\$21 billion) and North America (US\$12 billion).³³ Europe was a more competitive exporter of equipment than software, whereas in the case of North America it was the reverse. The United States, in particular, continues to have a strong advantage in software capabilities, while Japan’s is in network transmission equipment.

Table 12. Top 20 world cellular markets (by penetration rates), 1995

Country or territory	System	Launch	Subscribers		Yearly growth %	Penetration 01/01/95 %
			01/01/95	01/01/94		
Sweden	Various	1981	1 387 260	844 455	64.28	15.93
Norway	Various	1981	590 810	527 810	11.94	13.80
Finland	Various	1982	651 551	480 233	35.67	12.87
Denmark	Various	1982	509 396	316 261	61.07	9.86
Australia	AMPS/GSM	1986	1 697 000	903 300	87.87	9.68
United States	AMPS	1983	24 100 000	16 009 461	50.54	9.44
Singapore	Various	1988	237 000	146 000	62.33	8.42
Bermuda	AMPS/TDMA	1987	4 379	2 652	65.12	8.42
Iceland	NMT-405/GSM	1986	21 845	17 409	25.48	8.37
Hong Kong	Various	1985	445 000	291 000	52.92	7.67
New Zealand	AMPS	1987	217 200	120 900	79.65	6.36
Cayman Is.	AMPS	1987	1 591	1 146	38.83	6.27
Canada	AMPS	1985	1 714 000	1 285 000	33.39	6.16
United Kingdom	Various	1985	3 524 000	1 999 900	76.21	6.11
Guam	AMPS	1990	8 800	n/a	n/a	5.87
Kuwait	TACS	1986	76 900	62 200	23.63	5.49
Macao	TACS	1988	26 000	16 000	62.50	5.34
Antilles, Aruba	AMPS	1988	12 846	7 152	79.61	5.04
Switzerland	NMT-900/GSM	1987	329 293	258 227	27.52	4.80
Puerto Rico	AMPS	1991	170 000	105 500	61.14	4.76

Note: Number of subscribers per 100 inhabitants.

Source: Adapted from "Mobile communications", in *Financial Times*, 3 Oct. 1995.

In 1992, OECD countries exported equipment valued at US\$27 billion — an increase of 15.6 per cent over 1991. The main exports comprised line and transmission equipment that made up 29.6 and 25.4 per cent, respectively. This concentration is explained largely by the investment in network development in non-OECD countries in different regions of the world.³⁴ In Asia and the Pacific, South-East Asia accounted for the bulk of exports to this region which amounted to approximately US\$5 billion. Central Europe purchased about US\$917 million and Africa some US\$1.1 billion-worth of equipment.³⁵ During 1991, Latin America (excluding Dominican Republic, Peru, Bolivia, Uruguay and Guyana) purchased telecommunication equipment worth about US\$1.1 billion.³⁶

In 1992, seven equipment manufacturers accounted for 70 per cent of the revenues (US\$96 billion) generated by the 16 largest producers. Of the seven enterprises, three from Western Europe (Alcatel, Siemens and Ericsson) generated 52 per cent of the total, three from North America (AT&T, Motorola (United States) and NORTEL (Canada)) accounted for 37 per cent and Japan's NEC, for 11 per cent.³⁷

The share of revenues for 1994 were roughly the same and these seven aforementioned MNEs, together with Fujitsu (Japan), Bosch (Germany) and Nokia (Finland) accounted for 75.7 per cent of telecommunication equipment sales worldwide (see table 13).

Table 13. Top ten telecommunication equipment vendors (by sales), 1994

Company	Country	Sales US\$ M	% change 1993-94	Export sales (%)	Market share (%)
Alcatel	France	20 401	6.8	72.0	15.8
Motorola	United States	14 389	42.9	44.0	10.8
AT&T	United States	14 279	21.2	9.8	10.7
Siemens	Germany	12 779	-3.1	58.0	9.6
Ericsson	Sweden	10 699	35.8	90.0	7.4
NEC	Japan	9 481	0.8	16.0	7.1
NORTEL	Canada	8 223	4.6	87.0	6.2
Fujitsu	Japan	4 774	3.1	30.0	3.6
Bosch	Germany	3 413	-29.2	54.0	2.6
Nokia	Finland	2 531	21.4	85.0	1.9
Total		100 969	12.3	40.0	75.7
Others		32 571			24.3
Global total		133 540			100.0

Source: Adapted from the Financial Times Survey (based on ITU/Company Reports/MarketLine International Database), in *Financial Times*, 3 Oct. 1995, p. 23.

Some industry analysts expect the demand for "conventional" telecommunication equipment in advanced industrial countries to slow down. However, the decrease in demand for this type of equipment will be offset by rising demand in the newly industrializing countries (NICs). For example, central office switching equipment sales are expected to grow at around 4 to 5 per cent per year. These growth projections assume strong demand for equipment to introduce broadband switching capabilities.³⁸

7. Employment consequences

In the future, people will need portable career assets — skills and reputation that can be applied anywhere ... The network-providing career opportunity in the future will extend outside the company to its customers, suppliers, and venture partners. (R. Moss Kanter cited in Northern Telecom's *Annual Report* 1994).

Experience in the United States market suggests that the changes in technologies and developments taking place in other markets will have major implications for the occupations and skills that will be in demand. While the patterns of change are likely to vary depending on specific social, economic and political conditions, there are a number of reasonably predictable outcomes (see table 14).

Table 14. Telecommunication equipment, services and employment

Transmission

Fibre optic cables have significantly lower labour requirements for installation and repairs. Employment depends on a high rate of replacement of copper wire.

Expansion of new satellite systems is increasing employment opportunities for technical R&D staff, as well as those involved in earth station construction, operation and maintenance. However, there is falling demand for maintenance jobs because of the newer technologies.

Mobile communication is in an expansion phase stimulating employment in all areas including manufacturing, installation, maintenance, management, office workers, sales and specialist technical skills.

Digital transmission reduces unit labour requirements in line and cable jobs, but is increasing demand for central office installation staff and software engineers.

Switching

Advanced digital electronic switching systems require a higher level of technical knowledge, particularly software skills, but significantly fewer people for central office equipment installation and repair.

PABXs reduce demand for installation, repair and other telecommunication staff, while increasing similar jobs in user organizations, but in smaller volume.

Applications

Computer networks lower unit labour requirements, automate major duties in selected occupations, and alter the mix of jobs, skills and responsibilities. These include supervisors and managers, operators, clerical and related workers, installers, maintenance workers, testers, engineers and central office technicians.

Office automation reduces jobs for clerical, secretarial, accounting and record management activities. Job content is changing, requiring higher levels of PC-based skills. Entire layers of management and administrative staff are being eliminated in many large organisations, including telephone companies.

Source: W. Melody et al., 1993, pp. 40-41.

7.1 Occupations and skills: Overall trends

The increasing use of digital telecommunication systems, the availability of alternative means of communication and the continuing development of sophisticated services, especially in advanced industrialized economies, have led to a noticeable downward employment trend in the telecommunication sector. Observers forecast a marked decrease in demand for labour for the building, installation, repair and maintenance of central office switching equipment, as well as for cable and line jobs — all of which accounted for the relatively high levels of employment in the traditional telecommunication sector.

A 1995 study by the United States Office of Technology Assessment on selected telecommunication-related employment in the US showed that between 1988 and 1992 there was a decrease of 34,298 traditional jobs for those employed in the communication equipment (SIC Code 366) sector. In contrast, over the same period, there was a noticeable increase of 154,829 jobs in non-traditional or "non-core" activities, such as those associated with computer, networking and data processing services (SIC Code 737).³⁹ That was in line with the findings of an earlier study undertaken by the US Bureau of Labor Statistics (Department of Labor) in 1990. Research has shown that there is a strong potential for growth in employment for software applications engineers and technicians (staff professionals), managers and administrative, and marketing personnel (see table 15 and figure 3).

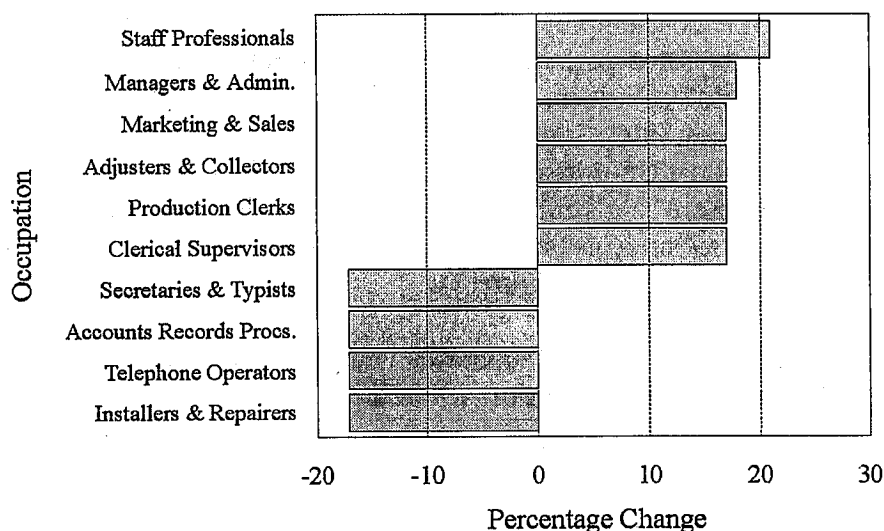
Table 15. Occupational trends in United States telephone communication, selected occupations: Projection 1988-2000

	1988	2000	% change (1988-2000)
Installers and repairers:			
— Phone and cable TV	91 150	72 290	-20
— Central office and PABX	72 500	57 580	-20
Telephone operators	83 320	71 230	-14
Central office clerks	60 160	67 610	+12
Managers and administrators	63 650	75 909	+18
Computer systems and analysts	3 950	7 900	+50

Source: *Outlook for technology and labor in telephone communications*, United States Department of Labor, Bureau of Labor Statistics, Bulletin 2357, July 1990, as cited in W. Melody et al., 1993, p. 39.

Trends in the United States can be compared with those in Japan by examining the changes experienced by NTT, after the liberalization of the Japanese market in 1985 and the subsequent acceleration of investment in telecommunication infrastructure (see table 16). Although the data are less detailed than those provided by the United States studies, there is a common pattern as evidenced by the fall in demand for maintenance and operations personnel.

Figure 3. Outlook for telephone communications employment in selected occupations: United States, 1988-2000



Source: *Outlook for technology and labor in telephone communications*, United States Department of Labor, Bureau of Labor Statistics, Bulletin 2537, July 1990, as cited in W. Melody et al., 1993, p. 40.

Table 16. NTT Japan: Changes in personnel by division, 1984-88

	1984	%	1988	%	% change (1984-88)
Maintenance	112	36	84	30	-25
Operations	53	16	33	12	-38
Sales	38	12	73	26	+92
Other	111	36	87	32	-22
Total	314	100	277	100	-12

Source: *World Bank Discussion Papers*, 179, NTT privatization study: Experience of Japan and lessons in developing countries, 1992, as cited in W. Melody et al., 1993, p. 39.

In the case of the United Kingdom, the shift in the skills structure following the liberalization of the market and the privatization of BT, has been along the same lines as those in the United States and Japan (see table 17).

Table 17. Telecommunication employment in the United Kingdom, 1981-92

	1981	1987	1992
Unskilled workers	6.2	4.9	3.7
Skilled workers	48.9	48.2	49.6
Clerical workers	32.9	29.6	28.2
Middle management	11.0	16.4	17.6
Upper management	1.0	0.9	0.9
Total	100.0	100.0	100.0

Source: Eurostrategic-Planet-TURU, 1991, as cited in W.H. Melody et al., 1993, p. 48.

Taken together, these data show an overall decline in jobs in traditional telecommunication activities, a progressive rise in demand for skilled labour and increased job opportunities in telecommunication-related industries. Mobile communication, computing and information processing services, and related activities such as network management and sales, have emerged as the main generators of employment, providing clear evidence that the "convergence" of information and telecommunication technologies is giving an impetus to the growth of this sector.

7.2 New developments: Quantitative effects on employment

Between 1980 and 1990, almost 96,000 jobs were lost in the PTOs in the original 24 member countries of the OECD. In percentage terms, the hardest hit were New Zealand (32 per cent) and Ireland (31 per cent) — the only countries where the workforce in the PTOs constituted more than 1 per cent of total employment. The other seriously affected countries were Japan (18 per cent), Norway (16 per cent), Belgium (9 per cent), Greece (7 per cent) and the United States (6.9 per cent). As table 18 shows, the number of redundancies was particularly pronounced between 1989 and 1990.

Table 18. Employment by public telecommunication operators in OECD countries, 1980-90

Country	Telecommunication employment ('000)		As % of total employment 1990	Change	
	1980	1990		No. 1989-90	% 1980-90
Australia*	87.3	83.8	0.99	-3 461	-3.96
Australia	17.0	18.4	0.52	1 415	8.32
Belgium	28.9	26.3	0.64	-2 605	-9.01
Canada*	108.1	104.3	0.76	-3 765	-3.48
Denmark	15.9	17.7	0.62	1 800	11.32
Finland	20.4	20.2	0.79	-202	-0.99
France	161.0	156.6	0.65	-4 385	-2.72
Germany	195.0	212.2	0.71	17 205	8.82
Greece	30.2	28.1	0.71	-2 114	-7.00
Iceland	1.1	1.1	0.82	-21	-1.96
Ireland	19.7	13.5	1.04	-6 178	-31.44
Italy	104.0	118.0	0.50	13 986	13.45
Japan*	333.0	272.2	0.43	-60 800	-18.26
Luxembourg	0.6	0.7	0.37	74	11.76
Netherlands	27.9	31.8	0.47	3 868	13.86
New Zealand*	25.2	17.1	1.07	-8 067	-32.01
Norway	18.3	15.3	0.73	-2 971	-16.23
Portugal	22.8	23.0	0.49	169	0.74
Spain	70.6	75.4	0.50	4 740	6.71
Sweden*	40.0	42.3	0.92	2 263	5.66
Switzerland	16.3	21.3	0.59	4 927	30.18
Turkey	64.1	90.1	0.44	26 003	40.58
United Kingdom*	240.7	226.9	0.81	-13 800	-5.73

Country	Telecommunication employment ('000)		As % of total employment 1990	Change	
	1980	1990		No. 1989-90	% 1980-90
United States*	956.6	892.6	0.72	-64 000	-6.96
OECD	2 604.7	2 508.9	0.68	-95 919	-3.68

Note: These comparisons are affected by the different revenue and cost structures of PTOs. *Only the major operators have been included in these countries.

Source: OECD, 1994, p. 42.

Between 1982 and 1992, the size of the workforce in PTOs in OECD countries shrank by 7.5 per cent — from 2.7 million to 2.5 million.⁴⁰ These data do not include jobs generated by outsourcing and value added services, telecommunication jobs in other sectors of the economy or employment in converging industries. The largest PTOs have been experiencing falling revenues per mainline in real terms and this has stimulated interest in improving efficiency and generating revenues from new services and non-traditional lines of business. To this end, network modernization and digitalization have been undertaken because they reduce costs per mainline, provide an “intelligent” platform for the development of new, profitable services and make it possible to maximize efficiency.

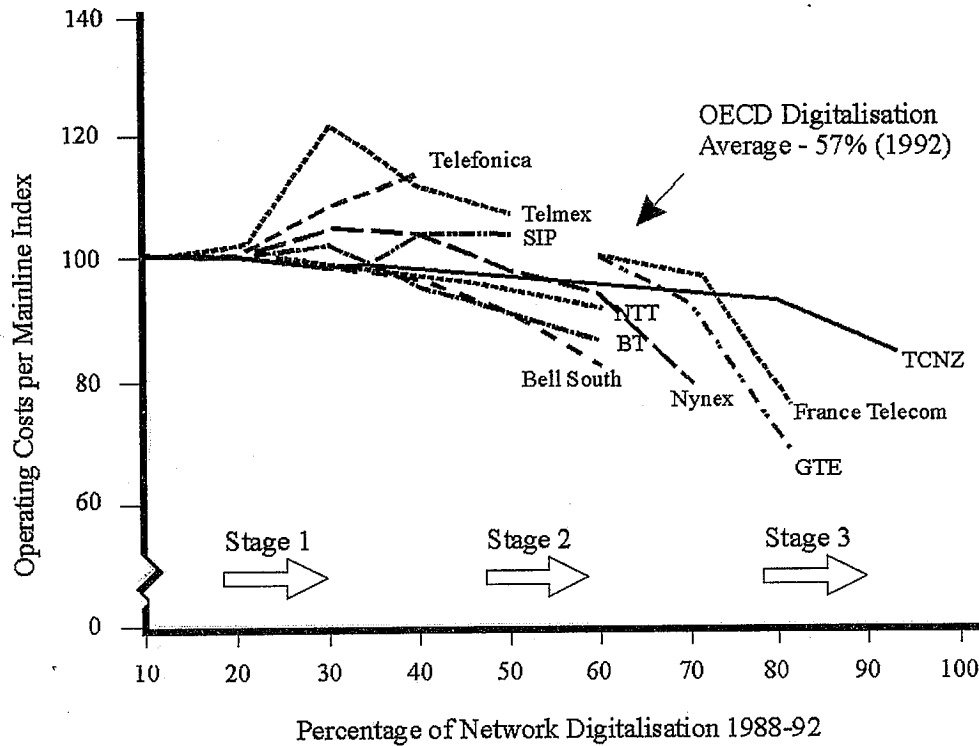
The relationship between operating costs and the degree of network digitalization is clearly illustrated in figure 4 which shows the operating costs per mainline index calculated for ten OECD public telecommunication operators.

Employment in the mobile telecommunication market is closely linked to the structure of the market and the degree of liberalization. For example, in the case of the United Kingdom, the rapid surge in the number of subscribers had a positive effect on employment, after the duopoly supply arrangements were abandoned in 1993 to allow more new entrants into the market (figure 5).

Detailed analysis of the implications of changes in the telecommunication industry for employment, taking into account developments in related areas such as broadcasting and computer services, is in the early stages, with major initiatives in this regard being undertaken within the OECD.

A major barrier to the carrying out of such analysis, is the lack of appropriate data sets.⁴¹ One of the few in-depth studies undertaken, has focused on **Canada**. Combining employment in the broadcasting, telecommunication operator, other telecommunication industries, and computer and related services categories, the data shown in table 19 indicate that jobs in this aggregate category grew at a rate of twice that of the average for the economy as a whole, between 1984 and 1994.⁴² A significant proportion of the growth in the former is accounted for by computer and business services. It is of interest to note that in these activities, the incidence of self-employment is high with almost one in four workers being self-employed.

Figure 4. Operating costs per mainline index for ten PTOs in the OECD

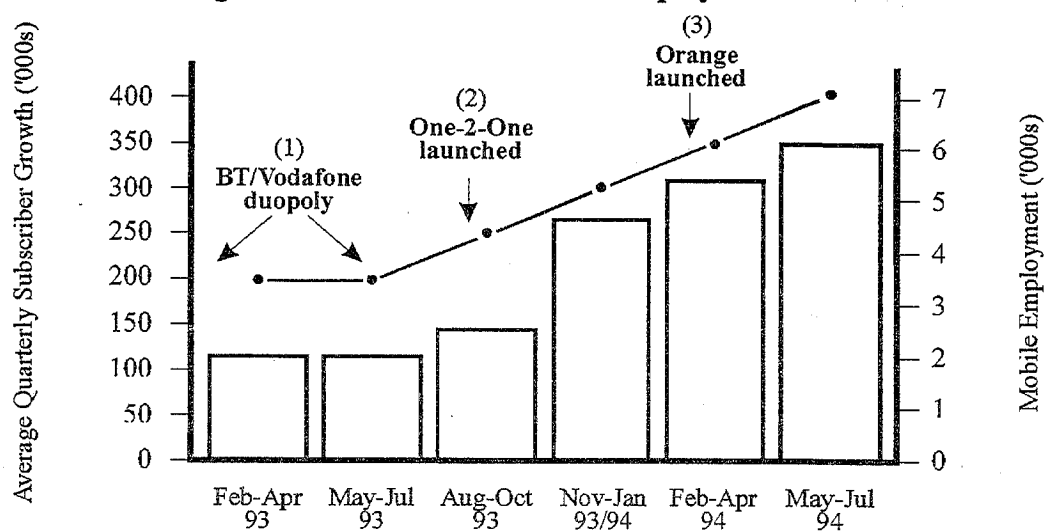


Note: Stage 1: low network digitalization correlates with higher operating costs per mainline; Stage 2: medium network digitalization correlates with steadily reducing operating costs per mainline; restructuring charges have an impact on mid-range cost reductions; Stage 3: high network digitalization correlates with sharper falls in operating costs per mainline.

Source: S. Paltridge, OECD, Paris, 1995.

Within the **European Union** (excluding the United Kingdom), employment in telecommunication services has been growing at a much quicker pace than in the equipment manufacturing segment. Between 1980 and 1992, jobs in the former sector rose from 928,000 to an estimated 1,033,000, whereas in the latter, they fell steadily from 381,000 in 1980, to 322,000 in 1987 and approximately 321,000, in 1992.⁴³ In the absence of more recent, reliable data, there is nothing to suggest that that tendency has been reversed. It is also worth noting that within the European Union, there have been, as in other OECD countries, more job opportunities for those with skills in the fields of software engineering and electronics, as opposed to positions in the traditional telecommunication services.

The **United Kingdom** stands out as the first EU Member State to liberalize its telecommunication sector. As in the United States, there has been a decline in employment, from about 235,000 in 1984 to some 180,000 in 1994.⁴⁴ Moreover, since 1995, BT and Mercury Communications, the two largest telecommunication services providers, have made further reductions in the workforce. Table 20 shows the trends in employment in the United Kingdom industry during the decade following the privatization of British Telecom.

Figure 5. United Kingdom mobile subscriber and employment trends after the duopoly

Note: Employment in mobile facilities providers in the United Kingdom more than doubles after increasing competition.

Source: S. Paltridge, OECD, Paris, 1995.

Table 19. Employment in Canadian business telecommunication and computer services, 1984-94

Year	Employment ('000)	ITT services	Total economy	Employment share %
1984	207	100.0	100.0	1.8
1985	222	107.6	103.0	1.9
1986	234	113.2	106.1	1.9
1987	249	120.6	108.9	2.0
1988	249	120.5	112.4	1.9
1989	268	129.5	114.8	2.0
1990	268	129.6	115.5	2.0
1991	270	130.8	113.3	2.1
1992	244	118.2	112.6	1.9
1993	257	124.6	114.1	2.0
1994	278	134.3	116.6	2.1

Note: Rates of growth (%), 1984-94; total growth for ITT services = 34.3%; total economy = 16.6%. Average annual compound growth rates: ITT services = 3%; total economy = 1.5%.

Source: Sciada and Sussman, 1995, p. 3, based on Statistics Canada data.

Table 20. Employment in the United Kingdom telecommunication industry, 1984-94

	1984	1986	1988	1990	1992	1994
Telecom. equipment	180 000	170 000	165 000	155 000	140 000	135 000
Telecom. services	235 000	230 000	245 000	240 000	215 000	180 000

Source: Adapted from the Parliamentary Office for Science and Technology (1995), p. 6.

As regards the **United States**, the industry has been undergoing extensive downsizing in the traditional or "core" operations. In 1994, the RBOCs cut a total of about 104,000 jobs. This figure does not take into account several major reductions in 1993, such as the 10,000 redundancies by NYNEX and 8,000 by Bell South.⁴⁵ The break up of AT&T into three separate companies is expected to result in the loss of 8,500 jobs, in addition to the 15,000 that were cut in 1994. Indeed, since its divestiture, AT&T has reduced its workforce by more than 100,000 and, according to a 1996 source, by 1999 it would have laid off 13 per cent of its 303,000 workers.⁴⁶ The trend in the United States is consistent with changes taking place in Canada and also in Mexico, with the privatization of TELMEX. Table 21 provides an overview of the situation with respect to employment in the telecommunication industry in the United States, over the period 1988-93.

Table 21. Employment in United States telecommunication services, 1988-93 (in thousands)

	1988	1989	1990	1991	1992*	1993*	% change (1989-93)
Total employment	917.7	900.5	925.5	914.8	881.4	868.0	-5.42
Production workers	654.9	646.3	666.6	670.9	655.7	647.0	-1.21

* Estimated.

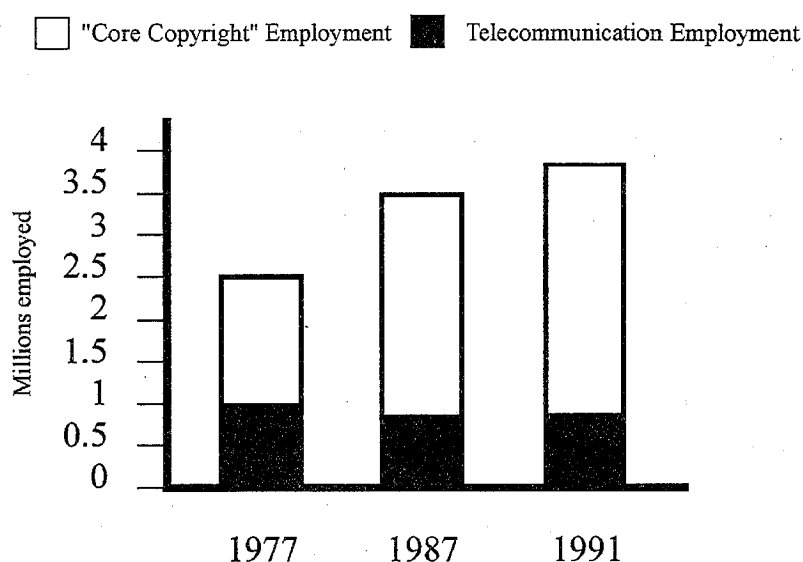
Source: *US Industrial Outlook*, United States Department of Commerce, 1993, as cited in W. Melody et al., 1993, p. 37.

When trends in employment in the telecommunication industry are compared with those in related industries, there appears to be considerable potential for creating new jobs in countries like the United States. Figure 6 compares employment in telecommunication between 1977 and 1991 and the situation in what is referred to as the "core copyright" industry which includes computer software, motion pictures, television and video, music and recording, book and journal publishing and on-line information. Over the aforementioned period the number of jobs in the latter grew from 2.5 to 3.8 million.⁴⁷

Although the introduction of new labour-saving technologies generally results in the loss of jobs, job opportunities are expected to expand as advanced information and communication technologies become more diffused throughout the world. While traditional telecommunication

operators are downsizing, other operators such as re-sellers, and cellular and personal communication service suppliers are creating new jobs. Unfortunately, there is not enough evidence across countries to make an accurate assessment of net gains and losses. Moreover, it is difficult to assess the number of indirect jobs that are generated by the increasing use of information and communication technologies in different sectors of the economy. However all indications are that employment is likely to grow in areas such as call centres for order processing, market research, product testing and telemarketing.⁴⁸ In countries such as the United States and the United Kingdom, the introduction of call centres is closely associated with job relocation, telework and home work.⁴⁹

Figure 6. United States employment trends in the telecommunication and information industries



Note: (1) Telecommunication (itself increasingly software driven) is converging with other information industries; (2) "core copyright" — examples include computer software, motion picture, television and video; music and recording, book and journal publishing, on-line information; (3) defined this way the sector is the fastest growing employment generator (2.5 to 3.8 million jobs).

Source: S. Paltridge, OECD, Paris, 1995.

In the context of **Japan**, the trends with regard to employment in the industry are largely determined by developments that have taken place in NTT, which is the dominant operator. Although new jobs were created with the coming on stream of hundreds of new service providers following legislation in 1985 to liberalize the domestic market, reductions in NTT's workforce have none the less been considerable. Between 1984 and 1992 it shrank by 18 per cent. By 1993 there were 194,700 workers as opposed to some 313,600 in 1984.⁵⁰

Given the trend worldwide, one can expect that once the privatization of PTOs in **Central and Eastern Europe** gathers momentum, there will be redundancies as enterprises are restructured to make their operations efficient. The data concerning the CEECs in table 22 must be read with caution, since the total for 1983 does not include figures for seven countries. Recent statistics for the Czech Republic, Hungary and Poland, which are furthest along the path of market-oriented reforms, are worth citing, since they can be compared with data collected at a later stage when the employment effects of advanced disinvestment become

clearer. In 1993, SPT Telecom a.s. Praha (Czech Republic) employed 24,742 persons and Telekomunikacja Polska SA Warszawa had a staff of 73,000. In the case of Hungary, a reduction of personnel was registered between 1993 and the end of 1995, when the number of employees fell from 20,458 to 19,288.⁵¹

Table 22. Telecommunication employment in South America and Central and Eastern Europe, 1983, 1992

Region	1983	1992
South America	286 000	241 600
Central and Eastern European countries	191 500*	254 200

* Does not include data for Albania, Bulgaria, Czech Republic, Latvia, Lithuania, Slovakia and Slovenia.
Source: Calculated from International Telecommunication Union, 1994, pp. A40-A42.

Statistics on employment in the telecommunication industry in South America are not readily available. However, estimates for 1983 and 1992 can be derived on the basis of data collected by the International Telecommunication Union (table 22). The decline in telecommunication employment in both regions may be explained by the impact of reforms in the industry and market liberalization. It would seem reasonable to argue that in Latin America, the privatization of ENTEL in Chile, TELEBRAS in Brazil and Telefónica in Argentina was largely responsible for the reductions in employment from about 286,000 in 1983 to 241,000 in 1992.

In conclusion, research on the relationship between technical change and market liberalization in some OECD countries suggests that a primary factor accounting for declining employment in the traditional telecommunication sector is technical change. The employment effects of investment in new digital technologies are similar across countries even when the structure of the market differs considerably. Public telecommunication operators in both OECD and other countries that continue to experience low productivity levels but fail to make the necessary structural changes, are likely to face greater problems when they attempt to reduce the size of their workforce later on, as opposed to those taking action early and spreading it over a longer period.⁵² The major factors leading to job reductions in the traditional PTOs are:

- technical progress and increasing network digitalization;
- regulatory reforms which have stimulated PTOs to improve efficiency; and
- structural changes in domestic and international telecommunication markets.

7.3 Employment trends in equipment manufacturing

Concentration of the transmission and switching equipment market is continuing and this is expected to bring about the increasing dominance of major equipment manufacturers such as Alcatel, Siemens, Ericsson and NORTEL (Northern Telecom). Cross-industry mergers, alliances and acquisitions in recent years (e.g. Siemens and GEC Plessey, Alcatel and Teletra,

and NORTEL and Matra), have enhanced the strengths of the major suppliers. The equipment manufacturers are entering into alliances with service producers and these restructuring activities have, in some cases, resulted in job losses. For example, the acquisition by AT&T of Philips' mobile equipment division resulted in the loss of about 5,000 jobs for the latter and a gain of 3,000 jobs for AT&T.⁵³

The increasing penetration of asynchronous transfer mode (ATM) technology into local networks is likely to generate new products and employment in the local area network market, while the growth of subscribers to integrated services digital networks (ISDN) is also likely to stimulate greater demand for ISDN terminal adaptors. The forecast is that very fast switching broadband equipment will grow by 4 to 5 per cent per annum and skilled personnel will be needed to develop and maintain it. This market segment, together with mobile communication equipment, is where the manufacturers are focusing their major development and production activities.

In short, just as the number of traditional telecommunication service jobs is falling so too is the demand for workers involved in the manufacture of "traditional" switching equipment. However, since buoyant growth in other telecommunication-related jobs such as computing and media services is expected, this will spur job-creation for the production of very high-speed broadband switching equipment.

8. Regional experiences, employment and working conditions

8.1 Introduction

A 1995 study by the London-based enterprise, Mercer Management Consulting, suggests that changes in productivity and staff reductions have taken place at very different rates across countries. The differences in the length of time taken by PTOs to implement efficiency measures, undertake major investment programmes, or to introduce digital equipment, account for some of the variation. It has been found however that new investment programmes can offset workforce reductions by stimulating the need for additional employees. This is particularly evident in countries where considerable work is required to upgrade and expand telecommunication infrastructure and voice telephony services.⁵⁴

The relationship between the liberalization of telecommunication markets and employment has been a subject of considerable interest. For example, a study of the differences in labour productivity in France, Germany, Japan, the United States and the United Kingdom over the period 1984-90 found that the following constituted some of the major explanatory factors: demand; competition and market concentration rules; government ownership; management behaviour and the organization of labour (see table 23).⁵⁵

Table 23. Causes of differences in labour productivity in telecommunication

External factors	
Market conditions	
— Demand Factors	XXX*
— Relative input prices/factor availability	XX
Policy and regulation	
— Competition rules and concentration rules	XXX
— Government ownership	XXX
— Labour rules and unionism	XX
Management behaviour	XXX
Production process	
Output mix, variety, quality	X
Economies of scale	X
Capital (intensity and vintage)	XX*
Skill of labour	X
Organization of labour	XXX
Labour productivity	
Note: xxx = important; xx = secondary; x = undifferentiating.	
* Affects only capital productivity and total factor productivity.	
Source: Adapted from McKinsey Global Institute, 1992, Exhibit 2E-33.	

The experiences of selected countries and MNEs with regard to technical and organizational change, are reviewed in this section. The aim is to gain some insight into the qualitative effects of technological change and regulatory reform and the implications for employment and working conditions.

- In the *North American region*, NORTEL, the Canadian-owned multinational telecommunication equipment manufacturer and American Telephone and Telegraph (AT&T) are examined, together with recent developments in the Mexican market.⁵⁶
- In the *South American region*, there is an analysis of NEC which has a substantial share of the equipment market in Brazil and TELEBRAS, the public telecommunication operator which is facing the pressures of privatization and market liberalization.
- In the *European Union*, the focus is on Ericsson, the Swedish-owned telecommunication equipment manufacturer and British Telecom, both of which are leaders in the international market.
- In *Central and Eastern Europe*, developments in Hungary are considered, focusing on MATAV, the public telecommunication operator and Siemens, the main supplier of central office switching equipment to MATAV.

The discussion in the following sections is based on interviews with management representatives, government officials and trade union representatives and on information obtained from documentation.

8.2 The North American region

8.2.1 Introduction

The United States

The telecommunication industry in the United States has been transformed since 1984, with the divestiture of AT&T into a long-distance operator and the creation of seven RBOCs. The 1982 Consent Decree negotiated between AT&T and the Department of Justice prohibited the company from providing local services. The RBOCs were not permitted to provide long-distance telephone services or information services, without a waiver from the court. The supply of manufacturing equipment was also excluded.

One consequence of the Consent Decree was the entry of many of the RBOCs into unregulated markets, including the cellular market and information processing services. AT&T continued to dominate the inter-exchange long-distance market, Sprint acquired several inter-exchange carriers, and MCI continued to strengthen its share of the long-distance market.⁵⁷ The regulatory environment in the domestic market created an incentive for the RBOCs to pursue investment opportunities overseas — a trend that is likely to continue as countries remove restrictions on foreign ownership of domestic telecommunication and cable infrastructure.

The vision of an “information superhighway” has provided an important stimulus for regulatory reform in the 1990s. This “superhighway” is expected to enable the supply of a growing range of services to business and residential customers. The implementation of this vision will require considerable investment in advanced technologies by the private sector at a time when demand is very uncertain. In order to stimulate investment, the RBOCs have called for the removal of restrictions imposed by the Consent Decree and the introduction of new telecommunication legislation to replace the Communications Act of 1934. Similarly, the cable television companies have called for measures which would allow them to compete directly with the RBOCs in their respective local markets. The overall aim is to facilitate the development of the “superhighway” and to maintain technological leadership.

Some of the new legislative measures include the removal of barriers to entry in local service markets, the lifting of restrictions on cross-media ownership and a review of the limits with regard to ownership of television broadcasting stations. In August 1995 the House of Representatives and the Senate approved bills that would increase competitive entry opportunities in long distance and local telecommunication markets as well as in the cable market. The bills proposed the removal of many of the restrictions on cross-ownership in the media and entertainment industries.⁵⁸ The bills were consolidated and enacted as the US Telecommunications Act of 1996, thereby increasing opportunities for cross-industry entry and the development of competitive markets. Table 24 presents a synopsis of some of the major elements of transformation since divestiture.

Table 24. Transformation in the United States telecommunication industry

Component	Previous system	New system
Capital market	Regulated FCC and states	Partially regulated; sensitive to stock market
Pricing mechanism	Regulated; cross subsidized	Partially regulated; cost-based
Product market	Standard; mainly voice	Highly differentiated
Technology	Coaxial cable; microwave; analogue switching	Fibre optic cable; digital switching; convergence of telecommunication, computing and broadcasting
Competitive advantage	Scale economies and cost	Quality, scope, service; cost
Business strategy	Universal service; engineering-driven	Segmented markets; market-driven; some "technology push"
Regulation	Separation of long-distance and local services	Competition in long-distance and local services?

Source: Adapted from Office of Technology Assessment, 1995, p. 49.

Canada

The telecommunication industry in Canada has evolved together with the United States network, using similar equipment and standards, and a numbering system linked to the allocation system for the United States. Liberalization of the domestic market has followed moves in the US to introduce competition. It was not until 1995 that the Government of Canada removed the remaining barriers to foreign entry, allowing full competition by US-owned operators.

The Canadian economy is closely linked to that of the United States, by virtue of the proximity of these two countries. The telecommunication industry is no exception. For example, GTE (US) owns 51 per cent of BCTel, British Columbia's PTO, and one of the largest in Canada. In the past decade there also has been a growing market for service providers who route telecommunication traffic originating and terminating in Canada, through the United States.

NORTEL (formerly Northern Telecom), the world's fifth largest telecommunication equipment manufacturer, has its biggest market in the United States. Other Canadian equipment manufacturers also have successfully entered the US market since the mid-1980s. With the liberalization of the Canadian telecommunication market, US-owned operators are making inroads into the telecommunication service sector, and the North American Free Trade Agreement (NAFTA) is likely to have a major impact on the equipment business, with new entrants challenging the dominant status of NORTEL in the Canadian equipment market.

Mexico

Whereas telecommunication infrastructure in Canada is modelled on that of the United States, infrastructure in Mexico is based mainly on European equipment and standards. Pressures toward greater economic integration as a result of the NAFTA are likely to bring changes in this regard. The growth of United States manufacturing operations in Mexico, especially in the “*maquiladoras*”, coupled with the growth in private networks using equipment and systems supplied by US-owned manufacturers, will link the Mexican infrastructure more closely to the continental network. TELMEX, the Mexican PTO, is likely to use US equipment and systems, partly because of a NAFTA clause which prohibits discrimination in the procurement of equipment. Moreover, the “rescue package” that was put together in response to the 1995 fiscal crisis in Mexico will tie Mexican procurement more closely to US-owned suppliers.

8.2.2 Employment and working conditions

Between 1989 and 1993 the revenue per telecommunication employee in the United States grew from US\$147,600 to US\$187,000. During the same period, profitability per employee increased a full 41.4 per cent and the net income of the industry rose by 23.5 per cent.⁵⁹

In the United States, the growth of employment opportunities in the computer and data processing services market has been matched by a decline in employment in the more traditional communication equipment markets.⁶⁰ Table 25 shows an increase of 154,829 jobs in activities falling within SIC category 737, while in the case of activities in SIC category 366 there was a reduction of 34,298 jobs between 1988 and 1992. On the whole, however, employment in the telecommunication sector has declined over the period 1983-94 (see table 26).⁶¹

Table 25. Employment in United States selected telecommunication-related activities (by SIC Code), 1988 and 1992

SIC code	Group	1988 total employment	1992 total employment	Change
366	Communications equipment	258 986	224 688	-34 298
3661	Telephone and telegraph apparatus	111 855	81 284	
3663	Radio and television communication equipment	123 662	120 064	
3669	Comm. equip. not elsewhere classified	22 692	22 725	
737	Computer and data processing equipment	678 877	833 706	+154 829
7373	Computer-integrated systems design	64 432	94 403	
7375	Information retrieval services	13 944	22 399	

Note: Data represent mid-March employment for firms covered by the Federal Insurance Contributions Act, collected through various records and surveys. All data reflect the 1987 changes in SIC code definitions.

Source: Office of Technology Assessment, 1995, p. 11, drawing on US Government sources.

**Table 26. Employment in selected activities in United States telecommunication, 1983-94
(in thousands)**

Year	Total employment (SIC code 48)	SIC code 481	SIC code 4813	SIC code 4832	SIC code 4833	SIC code 484
1983	1 324.3	956.0		110.3	115.3	
1984	1 341.1	953.6		111.7	121.4	
1985	1 319.9	920.9		113.3	125.1	
1986	1 276.3	883.6		113.5	124.2	
1987	1 283.7	902.3		116.0	118.4	
1988	1 281.2	897.5		119.0	120.0	
1989	1 275.9	886.5		119.8	112.6	118.7
1990	1 312.0	913.5		119.9	112.6	126.9
1991	1 297.2	904.6		117.2	112.7	128.5
1992	1 262.3	872.5		114.4	111.3	130.2
1993	1 252.0	872.1	813.4	111.1	114.2	129.6
1994	1 255.1	858.3	785.3	113.1	120.0	139.8

Note: All data are annual averages. The data from 1983-88 are corrected according to the 1988 benchmark. The 1989-91 data are corrected according to the 1991 benchmark and reflect the revised SIC code definitions of 1987.

Source: Office of Technology Assessment, 1995, p. 13, drawing on United States Government sources.

It is of interest to note that jobs in telecommunication-related activities such as computer and data-processing equipment, data processing and information retrieval grew over the same time period, as shown in table 27. Although much potential is expected for job creation in areas such as Internet access provision, on-line and multimedia services and interactive television, a 1995 Office of Technology Assessment report cautions that many of the new enterprises operating in these fields are capital-intensive and employ relatively few workers.⁶²

Table 27. Employment in United States selected telecommunication-related activities, 1983-94 (in thousands)

Year	Total employment (SIC code 366)	SIC code 3661	SIC code 3662	SIC code 737	SIC code 7373	SIC code 7375
1983	573.1	139.0	434.1	415.9		
1984	615.5	145.3	470.3	475.1		
1985	652.7	144.1	508.6	542.4		
1986	629.5	127.6	501.9	589.4		
1987	597.5	116.6	480.9	630.5		
1988	566.9	111.1	455.8	678.4	92.7	39.4
1989	272.5	139.1		739.6	98.5	46.0
1990	264.1	126.6		774.6	97.9	47.8
1991	251.5	118.0		792.2	99.5	45.8
1992	238.1	112.6		816.6	105.1	47.5
1993	231.1	105.7		882.3	110.3	49.5
1994	235.1	106.9		989.4	121.5	56.7

Note: All data are annual averages. The data from 1983-88 are corrected according to the 1988 benchmark. The 1989-91 data are corrected according to the 1991 benchmark and reflect the revised SIC code definitions of 1987. The 1992-94 data are uncorrected. The new 1987 reclassification removed teletypewriters from SIC 3661; modems, search and navigation equipment, various meteorological and other measuring and controlling devices and other equipment from 3662; split up SIC 7372 (computer programming and software) into three new classifications including 7374 (data processing services); split up 7374 (data processing services) into three new classifications including 7375 (information retrieval services); and split up 7379 (computer-related services, not elsewhere classified) into three new services. SIC Code 366 covers communication equipment but excludes computer programming services, pre-packaged software, data processing and preparation services, computer maintenance and repair and the individual components needed to assemble communication equipment.

Source: Office of Technology Assessment, 1995, p. 14, drawing on United States Government sources.

While there is no consensus on the methodological basis for calculating labour productivity, an attempt has been made to present in table 28 data that give some indication of the relative performance of United States industry compared to that of other OECD countries.⁶³

Table 28. Productivity in the telecommunication sector by country, 1989

Country	Labour productivity	Capital productivity	Overall productivity
United States	100	100	100
Japan	97	52	77
France	101	26	62
United Kingdom	58	48	54
Germany	81	24	52

Note: United States = 100.

Source: McKinsey Global Institute, 1992, Appendix E cited in Office of Technology Assessment, 1995.

The changing landscape of employment in the telecommunication sector in the United States is marked by demands for improved conditions of employment by the Communications Workers of America (CWA). The discussions focus on a number of issues, including the following:⁶⁴

- employment security, employment guarantees, transfer rights and union recognition;
- the elimination of subcontracting and improved training in the field of software;
- access to unorganized workers;
- education and training;
- improved pension benefits;
- increases in wages and benefits; and
- better working conditions.

In a recent statement the president of the CWA commented that by the year 2001 “the industry that we see today is likely to be so vastly changed that it will have little resemblance to the companies of 1994”.⁶⁵ One of the main concerns has to do with access to jobs in the cable/broadband and wireless network and service markets. Organized labour sees the following as major causes for concern.⁶⁶ Subcontracting arrangements are on the rise and so too is the use of contingent workers for regular jobs. Access to a growing number of jobs in new and existing subsidiaries is difficult. Company re-engineering schemes often have the effect of reducing the workforce and cutting services. Consolidation and re-engineering activities are being carried out without regard to the impact on union members.

As regards subcontracting, the following example is illustrative. In 1993, New York Telephone spent US\$181 million on outside contractors or 7.5 per cent of the US\$2.2 billion in wages paid to its own employees. The contractors provided services such as advertising, accounting, clerical work, courier services, data processing, consulting, financial, legal, personnel, printing and security services.⁶⁷

Declining employment in enterprises engaged in long-distance telecommunication has been matched by decreases in employment by the RBOCs (from 525,007 in 1985 to 408,453 in 1992), and also by independent telephone companies (from 169,980 in 1985 to 151,964 in 1991). In contrast, employment in the cellular telecommunication market soared from 4,334 in 1993 to 39,775 in 1996,⁶⁸ and jobs in unregulated segments of the

telecommunication market — i.e. subsidiaries of the RBOCs grew by over 400 per cent between 1984 and 1992 — from 23,999 to 98,984.⁶⁹

Forecasts to the year 2000 envisage continuing reductions in employment in regulated segments of the industry and growth in non-regulated enterprises. Most of the cuts have been in jobs held by unionized workers and a considerable proportion of the employment growth has been in jobs held by workers who do not belong to unions. The non-regulated businesses are perceived as the high growth areas in terms of revenues despite the fact that revenues from local and long-distance telephone services continue to account for the highest proportion of total revenues (i.e. about 80 per cent of US\$144.7 billion in 1991). Business users report that data services made up about 40 per cent of their 1994 expenditure on telecommunication services.⁷⁰

8.2.3 NORTEL

NORTEL (formerly Northern Telecom) is a major supplier of telecommunication equipment which integrates enterprises with their partners, suppliers and customers. The company's strategy is to support the development of "global enterprise networks" for multimedia applications, high-speed data connections, integrated computer-telephony solutions and wireless mobility. The principal product lines include central office switching, multimedia communication systems, transmission, wireless, and cable and other equipment. A range of wireless, broadband, switching and customer terminal equipment is produced by this company. Operating under a new logo — NORTEL — since early 1995, the company is known as NORTEL North America in Canada and the United States, and as NORTEL World Trade in Europe, the Middle East, the Caribbean, South and Central America, Africa, and the Asia-Pacific region.

NORTEL's revenues reached US\$8.9 billion in 1994, with expenditure on research and development (R&D) amounting to 13 per cent of that total. Central office switching equipment accounted for some 44 per cent of the company's revenues and multimedia for approximately 28 per cent. The latter showed an increase from 24 per cent in 1989. Gross corporate profits reached US\$3.3 billion in 1994. The company had 57,054 employees in 1994, a reduction from 60,293 in the previous year when the workforce was at its highest level for the period 1985-94.⁷¹

The decline in the number of employees is not indicative of a slow-down in the company's entry into joint ventures and strategic alliances, which included ventures with Daimler-Benz Aerospace in Germany, Matra Communication in France and General Magic Alliance in the United States. The company assumed complete ownership of some previous joint ventures and divested certain holdings. These included a semiconductor facility in San Diego, California, which was sold to SGS-Thomson, and an optical fibre and fibre cable manufacturing facility in Saskatchewan, Canada. In the United Kingdom, the STC Submarine Systems business was sold and there were several other similar transactions.

The United States is NORTEL's largest single market, accounting for US\$4.9 billion or 55 per cent of total revenues in 1994. NORTEL US, with headquarters in Nashville, Tennessee, is the company's most important subsidiary and there are several other enterprises throughout the country. About 46.5 per cent of the company's worldwide assets are held in the United States, and 45 per cent in Canada. Among the subsidiaries, NORTEL US now has the largest workforce — about 20,000 — after the loss of some 2,000 jobs in the early 1990s.

The company also has several well-established R&D centres which employ about 1,200 research personnel. The largest is situated in the Research Triangle in Raleigh Durham, and

there is Bell Northern Research in Georgia. These centres, which developed several lines of NORTEL's advanced switching equipment, are increasingly focusing their activities on broadband, high-speed multimedia applications and network technologies. More than 90 per cent of NORTEL's equipment sold in the United States, is manufactured in that market.

NORTEL is participating with Cox Communications in the United States, in a broadband access technology trial, to deliver integrated telephony, data video, and energy management applications. Vigorously seeking its share of the vast market in China, it has concluded a major contract with the Shanghai Posts and Telecommunications Authority to provide signalling equipment, which would help to accelerate the construction of a Common Channel Signalling System No. 7 network to support advanced telephony.

NORTEL US offers employees a wide range of company benefits which include the following.⁷²

- medical insurance coverage for employees and their dependents;
- dental/optical/auditive care;
- a long-term investment plan enabling employees to save for retirement, and to some extent, for use in financial emergencies during their working years. Employee pre-tax contributions are eligible for matching company contributions and the funds are invested in a variety of options to meet employees' financial needs;
- a retirement plan;
- income protection which includes a short-term disability plan for up to 28 weeks of regular income and long-term disability for more than 28 weeks. These benefits are based on the level selected by the employee. Group life insurance is paid by the company at one time on the annual "flex" salary which is the base salary plus target sales incentives, if appropriate. There are also accidental death and dismemberment insurance, and business travel accident insurance. These benefits are in addition to amounts payable from group life insurance;
- education assistance whereby tuition and books are paid for by the company, which has a policy of encouraging its employees to pursue tertiary or professional education;
- matching gifts programme in which the company matches personal cash gifts made by full-time employees to colleges or universities on a dollar-for-dollar basis, to a maximum of US\$5,000 per employee per year. This benefit is to encourage employees to contribute to colleges;
- flexible spending account which gives employees the opportunity to pay for certain health and dependent care expenses with pre-tax dollars;
- employee assistance programme which is a confidential, free 24-hour counselling programme for employees and their families;
- family care leave which is available for up to one year, with full medical, dental, optical and life insurance, albeit paid by the employee's contributions;
- adoption expenses which offers reimbursement for eligible expenses, limited to a maximum dollar amount.

NORTEL's employees in the United States are subject to several strict employment guidelines. These include assigning to the company all inventions, discoveries and technological innovations made on its premises and arising from the use of company equipment and apparatus, and ensuring that no employee is involved in any conflict of interest or anti-trust activities. In addition, NORTEL US has resisted attempts to unionize the

company's 20,000 workers, even though 43 per cent of workers in the parent company are unionized.⁷³

Switching equipment is NORTEL's major revenue earner and, in response to modest growth in the equipment market, the company is diversifying its activities. No major redundancies are expected in the United States in the foreseeable future. In Canada, however, several hundred jobs were lost as a result of a consolidation of switching equipment manufacturing plants which took place in early 1995.

8.2.4 AT&T

In September 1995 AT&T announced its break-up into three separate companies: telephone services, telephone equipment manufacturing and computing.⁷⁴ The company intends to concentrate on telephone services which industry analysts regard as the most lucrative part of the telecommunication market. Private network services required by large multinational enterprises are estimated at about US\$10 billion and this market is expected to grow to US\$25 billion by the year 2000.⁷⁵ AT&T's total revenues from services amounted to about US\$40 billion in 1994.

As PTOs around the world privatize and seek transnational alliances, global players such as BT, France Télécom and Deutsche Telekom are consolidating cross-border joint ventures. So too are MCI and Sprint. One of AT&T's responses to these developments is WorldPartners, a loose federation of PTOs with no capital commitment and various interests. It is also focusing on its mobile communications services, being the world's largest mobile operator and the third largest supplier of network equipment to the mobile communication industry after Ericsson and Motorola.⁷⁶ AT&T is also keeping its eyes on domestic competitors and especially on the RBOCs as regards entry into the domestic long-distance market from which they have been banned since 1984.

While the market for large switching equipment is growing at only about 3 or 4 per cent a year, there is strong demand for equipment with software-driven "intelligence" to support new "service capabilities". AT&T expects to take full advantage of the modernization of networks by PTOs around the world. Its strategy is to use the technical prowess of the Bell Laboratories (which is to be part of the equipment company) in order to provide leading-edge switching technology. The objective is to capture 20 per cent of the European market over the next ten years, up from a market share of about 4 per cent in 1995.⁷⁷

In mid-1995 AT&T purchased the Philips unit which specializes in Global System for Mobile Communications (GSM) products and the company is expected to gain about 3,000 jobs with this acquisition.⁷⁸ In addition to broadening its product line, this deal has paved the way for AT&T to enter the European market via Philips subsidiaries in France and Germany, in both of which it has major equity holdings.⁷⁹

Overall, the restructuring of AT&T is expected to result in a reduction of 8,500 jobs in the computing business. However, it is unclear how many of the company's 303,000 employees worldwide will lose their jobs as a result of redundancies. The employment opportunities would depend on two factors. The first is the extent to which management considers it necessary to employ staff who have not previously worked for AT&T, in order to develop a different and dynamic business culture. The second is the combination of skills required to make these enterprises competitive. The numbers of former staff to be rehired is certain to be low if there is the strong conviction that "new blood" is needed to build a different cooperative culture. However, if skill profiles are the determining factors, prospects for former employees being rehired will be better. Their numbers are likely to be significant

if one assumes that in a rapidly changing telecommunications environment where much importance is attached to retraining, many would have acquired the skills for assuming new positions. It must be pointed out however, that former employees are likely to be recruited not under the terms and conditions of the past, but under flexible contractual arrangements.

A number of the following strategic ventures, undertaken with the aim of expanding worldwide service operations, may also have the effect of creating jobs.

- The formation of WorldPartners Association in May 1993 initiated the process of building a consortium to implement AT&T's worldsource global communications project, which is to provide end-to-end services for between 2,000 to 3,000 large MNEs. Europe is the key target market. Until there is complete liberalization of voice telephony in Europe, the services will be made available to closed user groups.
- In June 1995, AT&T formed an alliance with the global data service provider Infonet Services Corp. The agreement entitles AT&T to include in its services, access to Infonet's dial-up packet switching services in 165 countries.⁸⁰
- Following a long process of negotiation, AT&T succeeded in its bid to enter the German market by concluding in February 1995, a deal with a German group, Communications Network International GmbH (CNI), led by RWE AG and Mannesmann AG.⁸¹ The CNI-AT&T alliance will compete with Deutsche Telekom and other emerging service operators such as BT-Viag; Cable & Wireless-Veba and Bell South-Thyssen AG.
- In the Mexican market, both AT&T's and GTE's plans to forge pan-American links through a 49 per cent buy-out of Telefónica's international arm, Telefónica Internacional SA, have been stalled. This is partly as a result of the devaluation of the Mexican peso.
- In 1994 the United Kingdom's Department of Trade and Industry granted AT&T a public telecommunication operator's licence. The company expects to launch a nationwide voice service in the United Kingdom in 1996 and there are plans to use wireless local loop technology to bypass BT and cable television operators.

The AT&T workforce was reduced by some 100,000 employees between 1984 and 1995.⁸² Although the 1994 divestiture had no impact on bargaining rights, the CWA now negotiates with AT&T and the regional companies.⁸³ In 1985, one year after the divestiture, two out of every three workers at AT&T were unionized. By 1995, only one in three workers was, and some analysts expect a decline to about one in ten by the year 2005.⁸⁴ There is a discernable drop in the number of organized workers as opposed to those who are not, particularly with companies such as AT&T Global Information Solutions (formerly NCR) and AT&T Transtech, a telemarketing company which is part of the AT&T family.⁸⁵

Up to 1989 collective agreements were negotiated for a period of three years. The CWA then represented about 80 per cent of workers in telephone services in the United States and wages were set as a result of negotiations rather than on a system of comparing them with those in other companies or sectors. Moreover, a 1995 job evaluation study by AT&T and seven of the RBOCs suggested that there was discrimination between pay for jobs done mainly by women and those done by men. According to the CWA the argument by companies that wages were being set according to market considerations provided a front for reducing wage rates for occupations held mainly by women.⁸⁶

As regards occupational safety and health (OSH), it is worth recalling that the Joint Committee for Postal and Telecommunication Services of the International Labour Organization, at its 1984 Session, stressed that OSH legislation of relevance to workers in the telecommunication sector should be elaborated. The Committee also called for periodic revision of such legislation on the basis of labour-management consultations. In AT&T and the RBOCs, safety and health at work has been one of the subjects of collective bargaining since 1974 and 1984 respectively. The main concerns have been the protection of workers against health hazards due to occupational exposure to asbestos and the use of visual display units. The impact of technological change at the workplace is a matter of continuing concern which merits further comparative country case-studies.

8.2.5 Summary

The telecommunication industry in the United States is undergoing extensive structural changes as AT&T implements its second major restructuring in a decade. Mergers in closely related sectors of the information and communication industry, such as Disney and Capital Cities/ABC or Time Warner's purchase of Turner Broadcasting, are changing the telecommunication landscape. The employment effects will be felt in segments of the industry both within and outside the US. Traditional jobs or "core" activities will continue to disappear and the modernization of the RBOC's networks in order to enter the long-distance market will exacerbate the situation. However, employment in the unregulated or "non-core" cellular market is expected to grow, and so too are jobs for skilled workers in software development and programming, electronics and media-related activities. The share of unionized workers in the workforce is on the decline, and those occupations in which union membership is highest will continue to be the hardest hit by redundancies.

In the case of NORTEL, the restructuring of business operations which began in 1993 is expected to be completed by mid-1996. In the first year of its restructuring, revenues rose as a result of increased sales of wireless, multimedia communication and transmission systems, and central office switching equipment. While downward pressure on the prices of switching equipment is likely to erode profit margins, there is the expectation that this will be offset by the robust sales of wireless systems. Consequently, the enterprise envisages an increase in the demand for employees with expertise in radio-based technologies and engineering. While some will be drawn from external sources, there will also be recruitment from among existing personnel who would have undergone retraining.

There are two seemingly contradictory facets to the effects of technical change, market liberalization and enterprise restructuring. While on the one hand competition stimulates job creation in certain segments of the industry, on the other, many find that job security, training possibilities and the standards of conditions of work are being undermined to varying degrees.

8.3 The South American region

8.3.1 Introduction

The telecommunication sectors in countries such as Argentina, Bolivia, Brazil, Chile and Venezuela are also being restructured. Pressure to privatize PTOs and liberalize markets is coming from international financial institutions such as the World Bank, and this has led to widespread reforms, facilitating foreign participation in this sector.

Argentina Telefónica and Telecom Argentina were privatized in 1993. Both were sold to consortia involving investors from Spain, France, Italy and the United States, local entrepreneurs, employees and the public. In the case of Bolivia, which has one of the least developed telecommunication systems in South America, attempts are being made to improve its efficiency and services and to attract foreign and domestic investment. To this end, the Government is undertaking several strategic reforms including the privatization of the PTO. Chile privatized its national PTOs in 1993. Compañía de Teléfonos de Chile was acquired by Telefónica de España. A consortium comprising Telefónica de España and Chase Manhattan, employees, pension funds and private investors bought ENTEL. In that same year, Venezuela's CANTV sold 40 per cent of its shares to Telefónica de España, GTE, AT&T and two Venezuelan investors.⁸⁷

The Government of Brazil has introduced several measures aimed at partial liberalization of the market. They include the privatization of TELEBRAS, the national PTO. TELEBRAS is a state holding comprising 28 operating companies and EMBRATEL is the inter-state and international long-distance company. The PTO owns and operates 94 per cent of all public exchanges, 91 per cent of Brazil's local telephone lines and provides other services, including telex, telegraph, mobile cellular radio and data transmission.

8.3.2 Regulatory developments in Brazil

Brazil has the second largest telecommunication system in the developing world after China, with some 11 million telephone lines in service. More than 22 per cent of these are digital.⁸⁸ Notwithstanding the resistance of trade unions, reforms, including the privatization of TELEBRAS are being introduced, albeit at a relatively slow pace.

Since 1990 the Government has taken several measures to liberalize the market. Users are now allowed to build and operate their own networks; suppliers of value added services can compete with TELEBRAS; and satellite, data services and paging services can be provided privately.⁸⁹ With nearly 580,000 cellular subscribers, the Brazilian cellular market is the largest in South America,⁹⁰ and observers expect increasing competition, especially for the provision of digital cellular services. Ericsson (Sweden) and AT&T plan to offer mobile services in Brazil.

A World Bank report has suggested that one consequence of the reforms has been the "over-regulation" of new network operators which has the effect of preserving the position of public operators rather than stimulating the development of new networks.⁹¹ In 1993, the Government introduced legislation to raise the maximum participation by foreign owners in privatized companies from 40 to 100 per cent. However, the centrepiece of Brazilian regulatory reforms is the removal of the constitutionally mandated monopoly status of TELEBRAS and EMBRATEL, which started in 1991 with a government decree. A new Telecommunication Law was presented to the Brazilian Congress in August 1995.

To meet some of the backlog in demand for telephone lines and to introduce competition in a market dominated by TELEBRAS, the Government has permitted telephone "condominiums" to construct private networks. Business and residential groups may finance and build their own internal systems which can be connected to the public network. Regional operators have responded enthusiastically, and more than 1.4 million lines have been introduced since 1993 as a result of joint ventures between Brazilian and foreign companies.⁹² Moreover, there are no restrictions on imported equipment.

There is growing support within TELEBRAS and EMBRATEL for competition and privatization. Many officials see the necessity for extensive reform, as the need for private

investment in the development and modernization of the telecommunication infrastructure becomes more urgent. Users are pressing for better, more efficient, and a wider choice of services. Nevertheless, liberalization measures continue to meet with resistance from within certain segments of the telecommunication monopolies and from the trade unions.

Although the Government is not yet contemplating the complete privatization of TELEBRAS, it is generally pursuing a policy of selling uncompetitive state companies and deregulating markets. It is still unclear whether these policies will apply to TELEBRAS as well. While the political risks associated with opening the Brazilian telecommunication market to foreign investors have led the Government to be rather vague about its plans, the reforms are expected to continue in the coming years.

8.3.3 Employment and other labour-related issues in Brazil

From 1991, wage negotiations for workers in state-owned enterprises began to take place annually. Settlements have been in line with government policy for all state enterprises although pay levels are based on surveys of other enterprises in the public and private sectors. Employers undertake to make any necessary information available to the unions.⁹³ With respect to occupational health and safety, telecommunication service workers are covered by the relevant national legislation and regulations which apply to enterprises in both the public and private sectors.⁹⁴

Data on employment in mobile communication were not available for this study. However, since 1992, with the abolition of the Brazilian Informatics Law and the lifting of restrictions on the import of electronic components, the mobile communication sector has grown significantly. Prior to 1992, two regional operators provided mobile telephone services — TELERJ (Telephone Company of Rio de Janeiro) and TELEBRASILIA (Telephone Company of Brasilia). Since subscription charges were prohibitively high, this, together with a high import tax on cellular handsets, resulted in a very low demand for these services in the early stages of their introduction. However, with the increase in mobile service operators, demand has been rising rapidly.

8.3.4 TELEBRAS

TELEBRAS is the single largest employer in the telecommunication sector in Brazil. Its workforce, which stood at 52,000 in 1975, reached 97,737 one decade later. With the elimination of some 10,000 jobs in 1991, the number of workers fell to 89,088 at the end of that year. Investment in infrastructure in 1991 was 200 per cent higher than in the previous year. Investment in this company rose steadily from US\$918 million in 1988, to US\$2.3 and US\$3.1 billion in 1991 and 1992 respectively;⁹⁵ 1991 was also the year in which the full impact of new government regulations and guidelines for streamlining and modernizing TELEBRAS, and improving the quality of its services became evident. At the end of 1994, the PTO employed 89,500 persons.

As regards EMBRATEL, in 1993 it had a workforce of 12,083 and there had only been about 190 redundancies in the preceding year. By 1994, it employed 12,113 persons. Although modernization of the network has resulted in some loss of jobs, the majority of the employees affected by technical changes have been redeployed to other areas of operation.

TELEBRAS has a training policy for its personnel. Its training activities are carried out at the National Training Centre in Brasilia, Regional Training Centres in Recife and São Paulo, and 20 centres located in the various regional telephone companies. The National Training Centre is equipped with research laboratories as well as a telecommunication system

similar to that used by the regional companies, so that "real" work situations could be simulated.

TELEBRAS has a policy of updating its training programme, from which more than 50 per cent of its workforce has benefited. It provides professional training both in Brazil and overseas. At the national level, it has several exchange programmes with federal technical schools and research institutions, and it also sponsors employees to pursue tertiary education. Through the United Nations Development Programme, technicians are sent on missions to Japan, the United States, Canada and France, and international specialists are frequently invited to provide training and consulting services.

Management development is actively encouraged and the company has set up a professional development laboratory. The company's view is that the dissemination of information is vital for the workforce and, to this end, it has created a computerized library network which is used for foreign language training and accessing information published in books and journals.

The benefits provided, include medical care and, since 1994, free vaccines and health lectures for employees and their families. Participation in company-managed retirement and pension funds is also possible.

Telecommunication workers belong either to the Central Unica de Trabalhadores or the Confederaçao Geral de Trabalhadores. Wages are determined through collective bargaining but must conform to ministerial guidelines. Trade unions wield significant power and they are strongly opposed to the privatization of TELEBRAS. Their stance, together with that of local politicians in the various regions, will most likely continue to retard the privatization process.

8.4 NEC at home and in Brazil

8.4.1 NEC in Japan

NEC, based in Tokyo, is owned by the Sumitomo group of companies and Nippon Life Insurance. As an equipment manufacturer it produces and markets communication systems and equipment, computers and industrial electronic systems, electronic devices and consumer electronic products. Among its more advanced technologies are the Personal Handyphone System targeted at the Japanese market and multimedia products aimed at worldwide markets. NEC is a leader in the development of ATM switching systems which are the core of high-speed communication systems.

The company's core business is "C&C" — that is, the integration of computers and communication. Net sales in 1995 reached US\$43.3 million and net income was US\$405,931 million. Employees worldwide in 1995 increased to 151,069 from 140,969 in 1993. R&D expenses accounted for approximately 7 per cent of net sales. The company's aim is to become a truly global company and to develop and manufacture products as close to its customers as possible. Mobile communication development centres have been established in the United Kingdom and the United States, as the company seeks to globalize its semiconductor business, including product design and manufacturing activities.

During the 1994 fiscal year, NEC's net sales were valued at US\$8,541 million. Foreign markets accounted for 24 per cent of those sales which had grown by 9 per cent over those of the previous fiscal year. The performance was even more impressive in the 1995 fiscal year when total sales amounted to US\$11,557 million, overseas sales grew by 15 per cent and

their share of total sales increased to 27 per cent.⁹⁶ NEC has 38 subsidiaries in 15 countries and a total of 40 manufacturing plants in 18 countries. R&D facilities are located in the United States and Germany. In South America, the company has experienced strong competition in the face of privatization of the communication sector and moves to upgrade infrastructure. None the less NEC obtained orders for SDH (synchronous digital hierarchy) transmission systems from Argentina, Brazil, Chile, Guatemala, Mexico and a number of other countries.

Within Japan, the workforce grew from 38,013 in 1989 to 41,078 in 1994.⁹⁷ The company's overall employment policy is to retain rather than lay-off staff, to emphasize the importance of high morale among employees and maintain good relations with trade unions. NEC abides by the Japanese Equal Opportunities Act which prohibits discrimination in employment on the basis of gender. Like other companies in Japan, the NEC Federation of Workers' Union, which has 57,000 members, is linked to the NEC Workers' Union, NEC Jyuayu Union and the NEC Software Workers' Union — with a total of 32,000 members. The Federation is known as an "enterprise union". Together with companies like Hitachi and Toshiba, it is part of the Japanese Electrical and Information Union, which belongs to the Japanese Trade Union Confederation. The Confederation's membership stood at 7.8 million in 1994. Of NEC's 38,013 employees in 1989, 30,000 (excluding managers and high-level personnel) belonged to the union.

There is an agreement covering hours of work, pensions and other conditions of employment. Collective bargaining between the union and management takes place between February and March of each year, and the average union member's wage increase in 1995 was 2.95 per cent. Between October and November another round of negotiation is undertaken to calculate bonus payments. In 1994, each member received an average bonus payment equivalent to 5.06 months of work. Central and local consultation meetings take place twice per year and they focus on budgetary questions, business planning and employment issues.

NEC's concept of human resources development is based on the principle that individuals are responsible for their self-development and that on-the-job experience is the best way to learn new tasks. Education and training programmes are organized by staff divisions within the workplace and the company maintains a "skills inventory system" which enables it to monitor the rotation of employees. The core of the company's policy is to marry personnel systems with educational systems through organizational development programmes.

Remuneration is based on several components. There is the basic salary. Then there are annual increments. The job grade, qualifications, competence and years of service are also important criteria for wage setting. There are allowances for spouse and children, overtime, holiday work and late night work. Benefits include an internal bank deposit account, housing insurance, health insurance, holiday resorts, pension plan and allowances for transfers.

For certain managerial staff the parent company and subsidiaries in Japan have either severance plans and non-contributory pension plans, or severance plans only. If employment is terminated, most employees are entitled to lump-sum severance and/or pension payments. There are also contributory pension plans which include the government welfare pension benefit. While the package of benefits varies from country to country, most overseas subsidiaries have retirement plans to which employees contribute.

8.4.2 NEC do Brasil SA

NEC do Brasil was established in 1968 with a head office in São Paulo. There are representative offices in Rio de Janeiro and Brasilia and a manufacturing plant in Guarulhos. The company also has another plant, SCOPUS Informatica SA. The factories produce cross-bar switching equipment, fibre distributed multiplex and microwave radio equipment, power transistors, and recently, digital switching equipment. In 1983, in accordance with a national law on foreign direct investment, NEC sold 51 per cent of its voting shares to Brasilinvest. Total revenues for 1994 were US\$505 million, with a forecast of US\$700 million for the fiscal year 1995.

NEC do Brasilia is the leading supplier of mobile systems. The company delivered a cellular mobile telephone system for TELESP (Telecomunicações de São Paulo) which became operational in 1994, creating the largest system with 80,000 lines in South America.⁹⁸ It also received orders for SDH (synchronous digital hierarchy) transmission systems.

The company had 2,596 employees in 1995 (see table 29). However, 1992 was the year in which the workforce was the largest since 1990. In that year there were 3,184 persons employed. Fourteen of its top executives were NEC Corporation (Japan) employees and included the directors for industrial activities, administration and finance. Men comprise 70 per cent of the workforce. Of the 400 managerial positions, five are held by women and 80 of the 800 engineers are female. Over the years there has been a shift toward hiring Brazilian personnel of Japanese extraction.

Table 29. Number of employees NEC do Brasil, 1990-95

Year	No. of employees
1990	2 911
1991	2 787
1992	3 184
1993	2 976
1994	2 545
1995	2 596

Source: Manager of Human Resources, NEC do Brasil.

There are three types of labour contracts in accordance with the labour legislation: undetermined term (i.e. contracts of unlimited duration); determined term (i.e. up to two years) and temporary and part-time contracts (i.e. up to five months). Ninety-five per cent of the employees have contracts of unlimited duration. The rest are temporary clerical and administrative workers, generally employed to fill in for staff on vacation or to carry out other unscheduled activities as the need arises.

The package of company benefits includes the following: full medical coverage for employees and their families; dental treatment for employees; an annual medical check-up for managers; subsidized lunches (80 per cent); free bus transport to plants; extra payment to cover additional expenses incurred by those working at head office; collective life insurance

(24 months of salary in the event of natural death; and 48 months in the event of accidental death); travel and subsistence allowances for business trips.

The company offers extensive in-house training for employees in all occupational categories, including managerial positions. Training may be provided at the NEC Corporation in Japan in certain circumstances.

Workers at NEC do Brasilia belong to the Union of the Electro-Electronic Equipment of the State of São Paulo, the Industrial Union of the State of São Paulo and the National Industrial Union. There are also employees who are members of one of the "Forca Sindical". Those who pay a contribution are entitled to vote and enjoy benefits such as access to discount stores. However, membership in this organization has fallen sharply over the years — from a peak of 600 in the mid-1980s to approximately 250 in the early 1990s.

As regards labour-management consultations, monthly meetings are held to discuss matters pertaining to personnel and human resources development policies and benefits. Industrial disputes are submitted to the Labour Court of Brazil. The process of settling disputes by means of arbitration involves several stages. First, employees and employers are brought together in the "Junta de Conciliacao" to seek a possible settlement. If no agreement is reached, a judge of the Labour Court examines the evidence and makes a judgement. In the event of appeal, the case is brought to the Regional Court of the State of São Paulo. Failing a satisfactory outcome, the plaintiff may appeal to the Labour Supreme Court in Brasilia.

8.4.3 Summary

The Brazilian Government has introduced measures to liberalize the telecommunication industry but there is uncertainty as to when and to what extent it will be able to open the market in the way that Chile and Argentina have done. Obstacles to reform are largely a reflection of the interests of the traditional monopolists, the reluctance of the trade unions, and concerns that the electorate may not support liberalization if it results in increasing tariffs for basic telephone services. These barriers are further exacerbated by the need for a constitutional amendment to remove the monopoly status of state-run entities.

8.5 European Union

8.5.1 Introduction

The European Commission's 1987 Green Paper on the development of the common market for telecommunication services and equipment called for the liberalization of the sector and the introduction of a gradual programme of reforms.⁹⁹ It endorsed liberalization with the exception of certain "reserved" or basic services. An open network provision (ONP) initiative encouraged harmonization among member States with respect to the terms and conditions of access to network-based services, tariffs and standards. ONP Directives for leased lines, public packet switched data services, and voice and mobile telephony were elaborated and there have been calls for competition for the supply of satellite services as well as the separation of operational and regulatory responsibilities of the PTOs.

In 1995, the Commission reached agreement on liberalization with regard to the supply of infrastructure and voice telephony services. Consequently, the monopoly enjoyed by the traditional PTOs for voice telephony services will end in 1998. However, certain countries (e.g. Spain and Portugal) have been given an additional five years to terminate this monopoly.

The European Union's *White Paper on growth, competitiveness and employment* stressed the importance of developing trans-European networks for strengthening cohesion among European Union Member States, while a 1994 report entitled *Europe and the global information society* (the Bangemann Report), emphasized the importance of building an information "superhighway" for promoting competitiveness and cohesion within the region.¹⁰⁰

In this context, developments in the United Kingdom are of special interest, because within the European Union, this country has the least restrictive entry requirements and its experiences are likely to hold useful lessons for other EU Member States which are taking steps to open their telecommunication markets.

8.5.2 Regulatory developments in the United Kingdom

In 1981, the Government of the United Kingdom, through the British Telecommunications Act, separated the postal service from telecommunication operations. In 1984, the Department of Trade and Industry undertook to license new, private telecommunication operators to introduce competition in the provision of services. A duopoly market structure was created with BT and Mercury Communications as the main players. Competition for the supply of cellular radio networks by Vodafone (Racal) and Cellnet (BT-Securicor) was introduced at a later stage. With the end of the duopoly in 1992, the market is regarded as one of the most open in the world. Cable operators are permitted to offer telephone services and licences have been offered to infrastructure and service providers.¹⁰¹

The 1984 Telecommunication Act abolished BT's monopoly status and established the Office of Telecommunication (OFTEL) to introduce and implement new regulations. The privatization of BT was accomplished by selling shares in three tranches: slightly more than 50 per cent in November 1984; approximately 25 per cent in December 1991 and approximately 24 per cent in July 1993. The Government holds the "golden share" of 1.06 per cent which gives it special powers.¹⁰²

In the domestic market there is competition in the supply of infrastructure and services although disputes over interconnection continue to arise between competing suppliers. In mid-1995, OFTEL released a discussion paper on competition and the regulatory framework, in which it called for the following:¹⁰³

- a transparent and flexible framework;
- agreement on the cost basis for interconnection charges from 1997;
- introduction of arrangements to share the costs of delivering universal services;
- removal of controls on exchange line rental prices and the introduction of a scheme for low-income, low-volume telephone users;
- abolition of access deficit charges;
- improvement of procedures for licence enforcement and dealing with anti-competitive behaviour;
- introduction of a general provision in BT's licence (and possibly those of other suppliers) to control anti-competitive behaviour;
- maintenance of restraints on flexible pricing schemes for large customers, offered mainly by BT.

The Director-General of Telecommunication is seeking to extend his powers in an endeavour to curb certain restrictive business practices that BT's monopoly power makes

possible.¹⁰⁴ Notwithstanding a decade of competition in the domestic market, BT continues to dominate, with some 95 per cent of all connections to business and residential premises. However, in several segments, including the City of London's business market, the company has seen its market share eroded significantly by new entrants and the growth rate of cable company telephony customers continues to be substantial.

8.5.3 Employment and working conditions in the telecommunication industry in the United Kingdom

The total number of employees in the telecommunication industry (equipment and services) in the UK was around 315,000 in 1994.¹⁰⁵ Between 1993 and 1994, BT eliminated 14,836 jobs. In 1994 and 1995, a total of 16,570 additional jobs were abolished. Various sources both within and outside the company expected another 15,000 employees to leave by the end of 1995, in what was to be the last big company-wide retrenchment exercise. Information in this regard was not available at the time of writing.

Mercury Communications also reduced its staff by more than 1,000 in 1995, and permanent staff are being replaced by contract labour. If the employment trend in equipment manufacturing continues on its downward trajectory, as it has since 1984, it is likely that there will be no significant job gains in this sector except in the field of mobile transmission equipment. The demand for data processing equipment is also experiencing a slow-down, and as a result the workforce in this sector has been declining since 1984. In 1992, it was approximately 60,000.¹⁰⁶

Data collected by the Cable Communications Association (CCA) forecast that growth in the number of cable television and cable-telephony subscribers coupled with the coming on stream of new networks, will create more than 24,000 jobs over a four-year period, starting from 1994. Of these, 14,000 will be involved in sales, marketing and customer relations. The CCA also forecasts that a further 10,000 indirect jobs will be created in the areas of programming and engineering.¹⁰⁷ Computing services are also expanding. Between 1984 and 1994 the number of workers in this field soared from 75,000 to approximately 150,000.¹⁰⁸ Market analysts expect this sector to be buoyant as more elaborate network and service applications are offered to users.

Conditions of employment vary across companies and segments of the industry. While some BT personnel are concerned about lack of job security and training facilities, employees in the computing services segment of the market regard their future with a degree of optimism. In the £4 billion broadcasting industry, a recent change in employment practice is visible in Yorkshire-Tyne Tees Television's decision to offer full status, including pension rights, to contract staff.¹⁰⁹ BECTU, the broadcasting staff union, has supported this move which sets a favourable precedent. For years, the unions have been calling attention to the growing "casualization" of employment in the broadcasting industry and the increasing reliance on short-term contract staff. Although it is too early to suggest that other broadcasting companies will follow suit, the BBC has made observations to the effect that contracts have become too short.

As regards collective bargaining, it is likely to continue to be difficult for those in traditional telecommunication jobs. On 26 January 1995, a new union, the Communications Workers' Union (CWU), representing almost 300,000 workers in the United Kingdom was established as the result of a merger between the National Communication Union and the Union of Communication Workers. The new organization will represent all those working in the communication industry. When it comes to occupational safety and health, the regulations

under the Health and Safety at Work Act in the United Kingdom apply to BT and other operators.¹¹⁰

8.5.4 British Telecom: Highlights of business developments

BT's responses to regulatory and technological changes are reflected in its investment and employment policies. Privatization and liberalization have given the company the freedom to pursue a strategic investment policy. BT is the world's fifth largest global operator. At the end of the 1994/95 financial year it had a staff of 133,804 — most of whom are in the home country. This enterprise is a significant player in world markets with more than 30 overseas branches employing some 2,600 persons.¹¹¹

Initial international ventures, such as the acquisition of Mitel, the Canadian equipment manufacturing company, and McCaw, the United States cellular operator, were unsuccessful and had to be abandoned. In the early 1990s, BT embarked on a globalization strategy which included the purchase in 1993 of a 20 per cent share of MCI, the second largest long-distance operator in the United States at a cost of £2.8 billion. This venture, called Concert (75 per cent owned by BT), is aimed at supplying end-to-end services to the top 2,000 MNEs.

With MCI delivering Concert services throughout North and South America, BT is concentrating on markets in continental Europe. In 1994, it bought a 50 per cent equity share in Spain's Banco Santandar national data transmission network, Meganet. In early 1995, it formed a joint venture in Germany with Viag AG, bringing it into direct competition with Deutsche Telekom. According to BT's chairman, Iain Vallance, that was "a step towards making BT Europe's leading alternative carrier".¹¹²

In April 1995, the company joined with the Rome-based Banca Nazionale di Lavoro SpA to offer closed user group voice and data services to large multi-site Italian customers. In May 1995, it was awarded a US\$10 million contract by the research organization DANTE to build and manage an 18-country European Internet access network — Euro-Internet.¹¹³ The rationale for this venture is that it will position the company to enter the commercial Internet-Protocol market in Europe. It is quite possible that eventually BT may seek to integrate the DANTE network into Concert.

Although BT is a relatively new entrant in the French market (operating since 1991), the revenues of BT France have risen steadily, averaging about 22 per cent in each year of operation since 1991.¹¹⁴ BT is also looking for a French partner to strengthen its position in that market. Its search is not restricted to companies with experience in the telecommunication business. The company is considering a bank, media group or public utility conglomerate as a potential partner.

BT has formed alliances with Norwegian Telecom, TeleDanmark and Finnish Telecom. In 1991, it entered into a collaborative agreement with AT&T, France Télécom and KDD (Japan) to provide global network services. BT's Martlesham Heath Laboratories, in collaboration with Hewlett Packard, France Télécom, Alcatel and Telecom Italia, have developed a means of increasing the transmission capacity of fibre optic links. The intention is to invest about £10 billion over the next five years to upgrade the network. Similarly, Motorola has signed an agreement whereby it will incorporate videocoding technology into BT's multimedia hardware, thereby enabling a desktop personal computer to handle real-time desktop video, sound and graphics simultaneously.¹¹⁵

Another aspect of BT's investment strategy has been to secure its base in the United Kingdom through the provision of multimedia interactive services, of which the company hopes to be the main provider in the next millennium. A number of trials for interactive

consumer and business services are in progress and BT has been arguing for the removal of government restrictions on its provision of broadcast entertainment services except through separate subsidiaries.

8.5.5 Employment

As regards the workforce, there has been discontent largely because of redundancies and resultant job insecurity. Continuous changes in senior management have also contributed to the uncertainty. Despite these difficulties, the company's turnover for the year ending March 1995 was £13,893 million — an increase of about £200 million over the previous year.¹¹⁶ Moreover, productivity has tripled in terms of telecommunication revenues per employee — from US\$45,200 in 1982 to US\$134,000 in 1994.¹¹⁷

With the beginning of market reforms in 1984, BT introduced retraining, redeployment and voluntary redundancy programmes. It also began to contract-out its cleaning, security, coin collection, computing and certain transport activities.¹¹⁸ In some cases, the training of staff was replaced by the recruitment of skilled labour from outside the company. Contract workers were substituted for permanent staff. In addition, in newly created subsidiaries, union recognition has not been achieved.¹¹⁹ Immediately after privatization, BT's workforce fell from 241,124 in the 1984-85 financial year to 223,084 in 1987-88. However, it rose again by 1989. Table 30 shows the changing distribution of the workforce between management and other staff, as the company adjusted to a liberalized market environment in the 1980s.

Table 30. Employment in British Telecom, 1984-89

Occupational category	1984	1985	1986	1987	1988	1989
Senior managers	470	585	797	875	896	975
Managerial and professional	33 047	33 709	35 531	37 095	37 943	41 021
Technical and engineering	116 174	110 256	106 334	103 576	106 554	108 802
Operators	34 037	32 874	30 096	27 734	26 838	28 094
Clerical	33 014	32 033	32 410	32 265	32 430	33 398
Catering, cleaning, motor transport, miscellaneous	24 352	25 721	25 016	21 539	20 471	19 692
Total	241 124	235 178	230 184	223 084	225 132	231 982

Source: International Labour Organization, 1991, p. 86.

More recent data show the changes over the full decade — 1985-95 (see table 31). Total employment declined from 235,178 to 132,351 between 1985 and 1995.

Table 31. BT changes in size of workforce by occupational category, 1985, 1995

Occupational category	1985	1995
Managers	34 294	30 136
Engineers	110 256	64 470
Operators	32 874	3 774
Office grades	32 033	27 261
Others	25 721	6 710
Total	235 178	132 351

Source: British Telecom seminar, Brussels, 21 Sep. 1995.

The significant changes in the numbers of operators and workers in the category "others" vividly illustrate the impact of adjustments undertaken by the company to face a changing technical environment and increased pressures to be competitive. Between 1990 and 1995 BT eliminated 97,719 jobs or 42 per cent of its total personnel. The yearly reductions are shown in table 32.¹²⁰

Table 32. Employment reductions by BT, 1990-95

Financial year	Staff in post at end of financial year	Change from last financial year
1990-91	215 366	-16 157
1991-92	199 325	-16 041
1992-93	165 210	-34 115
1993-94	150 374	-14 836
1994-95	133 804	-16 570

Source: Communications Workers' Union, 1995, p. 5.

8.5.6 Pay and hours of work

Since 1989 annual pay negotiations have been based on information prepared by management and the unions. The National Communications Union was able to acquire basic information, even though the representatives argued that information concerning BT's investment strategy was inadequate. Issues such as the comparability of the salaries of management with those of the management of other companies, were a source of considerable contention. The union also argued that one-sixth of the company's management posts were filled by temporary employees.¹²¹

BT, for its part, placed great emphasis on performance-related pay at the managerial level, and by implementing flexible recruitment and promotion policies, it was able to compete in the labour market for staff, with skills in areas for which there were shortages.

The union agreed that management could use its discretion to offer newly recruited staff at certain grades, attractive pay that exceeded the minimum pay levels. In 1989 incentives for managerial personnel were included in their contracts of employment. These included a company car, bonuses of between £1,000 and £1,500, free home telephone service and private health insurance for some staff.¹²² A 1994 survey conducted by the Society of Telecom Executives representing managers and professionals at BT reported that there was dissatisfaction over the lack of transparency with respect to wage settlements under individual job contracts and relatively high levels of work-related stress.¹²³

A recent revision of rules regarding working time is reflected in the Customer Service Improvement Programme (CSIP), which, between 1987 and 1992, sparked industrial disputes said to be the worst experienced since the 1987 industrial action concerning pay. Those disputes were caused by frustration over interruptions in the negotiations between management and the union, the content of the agreement and the way in which it was being applied once it had been concluded. The CSIP is part of BT's plan to improve its customer service, by giving some 27,000 customer service employees the choice either to adopt one of four working time arrangements or to retain that which they are used to.¹²⁴ While CSIP has enhanced the quality of customer services, the programme is said to have been poorly implemented and to have contributed to increased stress and discontent among the employees concerned.

8.5.7 Ericsson

L.M. Ericsson, the Swedish telecommunication equipment manufacturer, had net sales in 1994 of SEK82,554 million (US\$10,650 million, 1993 average exchange rate), which represented an increase of 31 per cent over 1993 sales. The company produces switching, radio and networking equipment, software, and microelectronics components. It is a world leader in cellular systems. Radio communication was the most important business area in 1994 amounting to more than 50 per cent of the total sales. More than one-fifth of the revenues from sales is spent on R&D.

With operations in more than 100 countries, its development activities are decentralized in 40 different centres in 20 countries. The domestic market accounts for only 10 per cent of Ericsson's sales. The European Union is the company's largest market by share of sales and China is the fastest growing market. There are two new joint ventures in that country — one in Beijing and another in Guangzhou.

Ericsson's strategy is to develop joint ventures with other leading manufacturers, such as Hewlett Packard, Raychem, Ascom, Microsoft, Novell, Intel and IBM. Worldwide there are 75,000 employees, more than two-thirds of whom are white collar employees, with a high percentage of university graduates. The number of software programmers has shown the fastest growth rate in recent years.¹²⁵ In September 1995, Ericsson announced a redeployment of its workforce with the aim of concentrating on its core mobile communication equipment market. Some 6,000 employees were to be laid off or moved from its public telecommunication network equipment unit. The company noted that customers had been slow to take up its broadband network products and that it was therefore going to focus on its most profitable business.¹²⁶ A general savings fund was introduced in 1984 and 1,267 employees invested in Ericsson shares. At the end of 1994, the fund held 190,000 shares.

Ericsson UK has one manufacturing plant in Scunthorpe which produces switching equipment as well as a number of business units throughout the south-east of England. The workforce is just over 2,000 (table 33). The slight decline in 1995 may be attributed largely to a reorganization being undertaken by the company. At the end of October 1995, there were some 2,202 permanent staff members, 150 on fixed-term contracts and six part-time (not included in table 32).

Table 33. Employment in Ericsson UK, October 1991-October 1995

	1991	1992	1993	1994	1995
No. of employees	2 376	2 118	2 202	2 440	2 352

Note: Data are for the month of October in each year; figures are rounded.

Source: L. Campbell, Human Resources Division, Ericsson UK Public Systems Division.

Contract workers are normally employed for assignments lasting up to about two months. On the whole, the need for such workers has been stable over the last five years, and they are recruited through 18 employment agencies.

Ericsson UK offers several, mainly in-house, technical training programmes. Management training and career development courses, generally of two to three days' duration and held off-site (mainly in hotels) and at other Ericsson locations. They are conducted by Ericsson staff and management consultants hired for this purpose.

Among the benefits are a pension scheme, company restaurant, access to a company doctor, a reduced rate for private medical insurance subscriptions (available only to senior members of staff), company cars (available only to senior members of staff) and a social club.

Employees (except senior staff and managers) are unionized and all non-management personnel can join unions.

8.5.8 Summary

Employment in activities relating to traditional telecommunication infrastructure and services and in the equipment manufacturing sector is declining. In contrast, jobs in related information and communication technology and service sectors are on the rise. However, comprehensive data on where these jobs are being created are not available.

In the United Kingdom, there is evidence of a time-lag of about five years between redundancies and the introduction of liberalization measures. While productivity and quality of service have improved, privatization has been accompanied by some discontent among BT's employees. This has led to tensions in industrial relations and trade unions have had to adapt rapidly to the competitive environment.

8.6 Central and Eastern European countries

8.6.1 Introduction

As the Central and Eastern European Countries (CEECs) move toward more market-oriented economies there has been a surge of industrial activity. The transition from the

command economies of the past is particularly visible in the telecommunication sector. Most CEEC governments are aiming to achieve telephony penetration rates of around 30 per 100 inhabitants by the year 2000.¹²⁷ Certain CEECs have signed association agreements with the European Union¹²⁸ and the interest in bringing their telecommunication sector into line with the Directives of the European Commission marks part of their efforts to prepare for full EU membership in the future. There are of course other major considerations that have helped to fuel the interest of these governments to upgrade this sector and liberalize markets. First, there is the need to modernize communication infrastructure which is indispensable for the efficient operation of both public and private enterprises in these emergent market economies. Secondly, market liberalization is imperative if foreign telecommunication enterprises are to participate in joint ventures and other arrangements, vital for bringing the much-needed technologies, finance and expertise.

Privatization, as part of ongoing economic reforms, in the Czech Republic, is at an advanced stage. In July 1995, a Dutch-Swiss consortium bought a 27 per cent stake in SPT Telecom for US\$11 billion. Private Czech telecommunication companies have not been permitted to tender for SPT shares. SPT's network has been described as one of the best in the region, despite a two-year waiting list for connection and a relatively low telephone density.¹²⁹ Until its modernization programme is substantially completed by the end of the decade, SPT will retain its monopoly of voice telephony. In the meantime, local licences will be awarded for selected areas which are under-served. Private telecommunication companies such as STET (Italy) and TeleDanmark, are showing keen interest in these initiatives as a means of gaining a foothold in the market.

In the case of Slovakia, the Government has opposed the privatization of Slovenska Telekomunicacie, the state-owned operator, but is committed to modernizing the infrastructure. According to officials in the Ministry of Posts, Telecommunication and Transport, detailed plans for the reform and liberalization of the telecommunication industry have been drawn up, but require consideration and approval. Poland, Romania and Bulgaria have yet to present any specific plans for the privatization of their PTOs.

Mobile telephony is a promising growth sector in this region, and there are several joint ventures between PTOs and foreign investors. Telecommunication regulatory arrangements are also being revamped. The Czech Republic, Hungary and Slovakia, for example, have carried out reforms to varying degrees, and there are clearer lines of separation between regulation and operation in these countries. As for Romania, it has yet to finalize its new telecommunication law and regulations, while in the case of Poland, potential investors are awaiting the implementation of the 1991 Telecommunication Act which is intended to promote liberalization.

8.6.2 The Hungarian market

Hungary is privatizing its PTO, MATAV. Towards the end of 1993, 30 per cent of its shares were acquired by a German-United States consortium for US\$875 million — one of the most impressive privatization deals in the CEECs. The Government is expected to release more shares for sale both in the domestic and international markets. In terms of regulatory reform, Hungary is well ahead of several of its neighbours.

In 1989 the Hungarian PTO, Magyar Posta, was split into three independent bodies: MATAV, the Hungarian Broadcasting Company (Antennia Hungary), and the Post Office. The Economic Cabinet began to treat the development of telecommunication as a priority in 1991, and in the following year, Parliament passed Law No. LXXII on Telecommunication.

Together with Ministerial Decrees, this law has set the framework for implementing telecommunication policies. The Ministry of Transportation, Communication and Water Management is the central authority which formulates telecommunication policy and related regulations, while administrative functions are carried out by the General Directorate of Communication. However, the extent to which the latter operates independently from the Ministry is not clear.¹³⁰

At present there are segments of the Hungarian telecommunication market operating under the following frameworks: monopoly; regulated competition; and competition. The Law on Telecommunication established specific areas which are candidates for liberalization. All public switched telecommunication services are provided under exclusive concession by companies. The development of local telephone companies is permitted and MATAV is expected to compete with them. MATAV retains its monopoly over long-distance and international public switched telecommunication services and other providers are obliged to interconnect with MATAV to supply services.¹³¹ An Interconnection Decree is pending. As regards tariffs, they are regulated by a Ministerial Decree that was issued on 23 November 1993. Hungary has adopted European standards for equipment and, in most cases, approval must be obtained before equipment can be connected to the national network.

Enterprises engaged in activities subject to regulated competition require a licence. These activities include national mobile telecommunication services and paging systems. Four licences have so far been awarded and Hungary was the first CEEC to introduce a national cellular network.

Competition is allowed in the following areas:¹³² all mobile communication except public mobile telephone services; value added services; public switched data transmission; satellite services; supply of terminal equipment; the resale of leased lines; and the development and operation of special and closed user group networks.

8.6.3 Employment and working conditions

No major upheavals in employment occurred with the liberalization of the telecommunication services market in 1991. There has none the less been a decline in the size of MATAV's workforce, from 20,458 at the end of 1993 to 19,288 at the end of 1995.¹³³ The creation of spin-off companies, such as WESTEL, the cellular radio telephone company, has had little impact on employment levels within the national PTO. MATAV has argued that it is necessary to maintain high levels of staffing because of the company's "technical backwardness".¹³⁴ However, despite relatively low wage costs as a proportion of total costs, MATAV is not expected to maintain the current level of employment, as the company becomes fully privatized.

The modernization of the network and organizational restructuring are likely to lead to a reduction of the workforce. However, a decline in the number of MATAV employees could be offset by the new telecommunication businesses that are mushrooming in Budapest. Suppliers of national paging systems, mobile communication, fax-based services, value added services and a host of other related activities are creating new jobs. Hungary has a highly literate and skilled labour force. The skills required of staff who fill the new occupations differ markedly from those required of workers in traditional telecommunication activities. Notwithstanding the creation of job opportunities, security of employment is likely to become a major concern, given the tradition of "lifelong employment". In the case of EMTEL, the separate but MATAV-owned network-building company, the workforce was reduced from 1,100 at the end of 1991 to 750 by the end of the following year.¹³⁵

Market reforms have led to competition in the equipment industry as well. The collapse of the market comprising the former Union of Soviet Socialist Republics (USSR), has had severe consequences for the viability of the indigenous telecommunication equipment industry. With domestic producers ill-prepared to meet the increasingly sophisticated requirements of MATAV and other network operators, employment in these enterprises is expected to continue to decline.

There is now competitive bidding for public procurement contracts, although only joint ventures with Hungarian partners are permitted to bid. Once state-owned and insulated from external price fluctuations, Hungarian telecommunication equipment manufacturers are being forced to restructure and lay off substantial numbers of workers. This has especially affected firms that have either been privatized or are preparing for privatization.¹³⁶ There is a strong demand for telecommunication equipment in Hungary but this is likely to be met in large part by joint ventures with foreign participation and the employment effects of such developments are not easy to forecast with accuracy.

The influence of trade unions in Hungary is on the decline, with legislative changes strengthening the position of employers and constraining the bargaining position of unions. In the growing number of joint ventures and foreign enterprises where skilled workers and salaried employees reportedly enjoy good pay and working conditions, the need for and role of trade unions are being called into question. In "green-field" (i.e. entirely new) enterprises, unionization is not encouraged.

8.6.4 MATAV

MATAV's expansion and development plans are funded by a combination of share offerings, foreign loans and bonds. INVESTEL, a joint venture between an Irish bank and MATAV, has been established to manage the operator's bond issues. Work on a digital overlay network began in 1991. By 1993 MATAV had nearly doubled the number of subscribers connected to the Budapest and countryside network — a 15 per cent improvement over the company's performance in 1990. By the end of 1994, there were 253,000 new subscribers.¹³⁷ MATAV, like other local telephone operators, is obliged by concession contract to eliminate customer waiting lists by 1997. Its target was to meet 98 per cent of the demand for telephone services by 1 July 1995 in Budapest and selected districts.¹³⁸ Telephone traffic increased by 19.8 per cent between 1992 and 1993 and by approximately 33 per cent between 1991 and 1993.¹³⁹

MATAV is one of the founder members of the Trans-European Line (TEL) optical fibre system which connects Budapest to Bratislava, Prague, Frankfurt and Warsaw, and creates direct links between Budapest and Zagreb. The operator has expanded its satellite services and Hungary is now a member of INTELSAT. With the cooperation of Sat-NEet Kft. and MTI of the MATAV group of companies, MATAV developed the first national satellite data transmission system. It also has a subsidiary which provides X.25 data communication services.

A joint venture between MATAV and US West, WESTEL, was concluded in 1990 to provide mobile communications. In 1993, the Ministry awarded WESTEL and Pannon GSM (a Nordic and Hungarian joint venture) licences to provide GSM services. MATAV also introduced "Hungary Direct" and a calling card service in 1992. It offers 800 numbers and several foreign operators, such as AT&T, Sprint and MCI, have signed contracts with MATAV to provide their own direct services.

One of the objectives of this enterprise is to provide broadband services and promote ISDN services. In order to attain this goal, it is actively seeking partners to develop new network management and supervision systems,¹⁴⁰ and making plans to assess the use of wireless local loops above 2 GHz based on Ericsson's technology which may become the standard for all regions served by MATAV. The strategy is to transform the enterprise into a customer-oriented business and to establish Hungary as an international hub. One of the key means of achieving these ambitions involves the development of human resources.

The company's training facilities can be used by all subsidiaries and subcontractors, and by its competitors, for a fee. Some US\$2 million have been spent on centres for training in the use of products made by Ericsson and Siemens.¹⁴¹ World Bank-financed technical assistance projects and the European Commission's PHARE programme also have components pertaining to the development of human resources. As regards wages, those paid by MATAV are considered to be among the highest of the operators in the CEECs. However, it remains to be seen whether these wage levels can be sustained in the face of reorganization.

It is quite likely that labour-management relations will become increasingly strained as unions attempt to enforce long-standing agreements with management, in what has become a privatized company. Already in 1989, greater emphasis was being placed on having performance-related pay for certain categories of workers and on upgrading salaries according to educational qualifications.¹⁴² The occupational health and safety regulations for telecommunication (and post) issued in 1983 still apply and there are standards with respect to noise, ventilation and lighting.¹⁴³

In 1989, the telecommunication administration envisaged the creation of 8,000 jobs in order to support its development programme and it was expected that the introduction of advanced technologies would lead to a 65 per cent increase in the number of highly qualified employees.¹⁴⁴ It is likely that there has since been some increase in job opportunities for employees with higher education. However, increases reported in the future should be examined closely, in order to determine whether they reflect substantial underlying changes in the demand for certain categories of personnel, as opposed to the reclassification of existing jobs or more comprehensive reporting that takes into account the skills and qualifications of workers.

8.6.5 Siemens

Siemens is the world's third largest telecommunication equipment manufacturer. In 1994 sales totalled DM58,254 million (US\$35,291 million, 1993 average exchange rate) — an increase of DM5,000 million (US\$3,024 million) over the previous year. It is a vertically integrated company comprising several groups, the most important of which is the communications group. This group is the largest revenue earner and its 1994 sales were DM20,738 million (US\$12,543 million). Other groups include industry, energy, information and defence electronics. The company has more than 70 subsidiaries around the world and has entered into a large number of joint ventures.

A decline in world prices and slow growth in the demand for telecommunication equipment have forced the company to engage in "corporate re-engineering" which has led to redundancies. The "top Siemens" programme was introduced in 1993 to simplify and accelerate the delivery of products. The company has been actively seeking to expand its presence in different regions. Sales in the Asia-Pacific region were 15 per cent higher in 1994 than in 1993. For the same period the increases in sales were 20 per cent for North and South America and 13 per cent in Central and Eastern Europe.

At the end of 1994 Siemens employed 382,000 people worldwide, 220,000 of whom worked in Germany. Since 1990 there have been 21,000 redundancies, with the largest cutback of approximately 17,000 employees in Germany. Heavy wage costs were said to have made redundancies at headquarters inevitable. Various programmes providing part-time job alternatives have been implemented and, as a result, the number of part-time workers in Germany increased by nearly 50 per cent between 1993 and 1994, at the end of which they were 21,000.¹⁴⁵ In contrast, employment in the company's international operations has grown from 143,000 in 1990 to 160,000 in 1994.¹⁴⁶ The "top Siemens" initiative established a goal of a minimum 30 per cent productivity gain.

8.6.6 Siemens Telefongyár: A presence in Hungary

Siemens Telefongyár is a subsidiary which was established in September 1991 when the parent company bought the oldest Hungarian telecommunication equipment factory for US\$41 million. This subsidiary manufactures the company's digital switching equipment and is the leading supplier of switching and other telecommunication equipment to MATAV. Siemens Telefongyár and Ericsson Technika won a major switching system tender in 1990. According to the conditions laid out in the agreement which was still in force up to the time of writing, MATAV and the local telephone operators must buy switching equipment from one of the two companies. In 1995 a new tender was to be issued, thereby exposing Siemens and Ericsson to competition from North American suppliers including NORTEL, which has a joint venture with BHG, a domestic equipment manufacturer, and AT&T. Siemens and Ericsson are also supplying a pilot ISDN overlay network for MATAV in Budapest. Siemens Telefongyár, Ericsson Technika and Alcatel constitute the leading suppliers of transmission cables and switching equipment.

Siemens has three business units in Hungary: Siemens Rt., which is the central office for Siemens' Hungarian operations and those of the private networks group; Hungarian Cable Works which manufactures cables; and Siemens Telefongyár Kft. which manages the public networks groups (together with Siemens Rt.), networks systems and defence electronics. Siemens Telefongyár has the largest turnover and is the principal manufacturing plant.

Before the restructuring of Telefongyár in 1994, there was a workforce of 1,066. In 1994 it was reduced to 433 when an old product group was divested and towards the end of 1995 there were 404 employees. Some 30 per cent of the workers belong to VASAS, the only union representing telecommunication workers. Training is provided and paid for by Siemens Telefongyár.¹⁴⁷ This includes graduate courses in business administration in Hungary and technical, language and professional training abroad.

Employees' benefits include pension schemes and life insurance, medical benefits, assistance for paying house mortgages and travel allowances. Access to the company's vacation facilities, the provision of sports facilities and a cafeteria are other advantages.

As regards occupational safety and health, no problems with respect to standards have been reported and, among other things, employees are provided with the necessary protective clothing.

8.6.7 Summary

The liberalization of the Hungarian telecommunication industry has involved an elaborate reform programme. It is unclear, however, whether the country will continue to attract private investors to finance its network and service development programme. Much will depend on the Government's capacity to introduce and enforce legislation and regulations

which will facilitate market entry and stimulate competition. MATAV's complex network of subsidiaries may deflect the company's attention away from its main objectives of modernizing the infrastructure, finding niche markets and supplying larger customers with advanced services.

Market reforms, including changes in the structure of ownership in the telecommunication sector, have inevitably brought about some changes in the employment landscape. However, with the exception of the equipment industry, there have been to date no severe reductions in the workforce.

9. Concluding observations

The significance of rapid technological advances in the field of telecommunication and the liberalization of markets in this sector can be considered from two perspectives. One approach is to focus primarily on the benefits of these developments in terms of lower prices for equipment and services, increases in the number of individual consumers with access to digitized telecommunication infrastructure and higher productivity among enterprises which make extensive use of telematics services. As long as these advantages outweigh the cost of adjustment, in terms of less direct employment in traditional PTOs, then the prospects for success in a competitive environment are considered to be favourable. Viewed from this angle, the arguments tend to emphasize that delays in introducing market reforms and boosting investment in this sector can result in higher prices for telecommunication products and services in the domestic economy, lower productivity gains on the part of information and communication service users and slower economic growth. Other major disadvantages are said to be the reduced competitiveness of PTOs and equipment manufacturers as well as the possible decline in inward foreign investment as some MNEs shy away from markets with deficient telecommunication infrastructure and services.

Another approach is to focus primarily on other dimensions of innovation and the opening up of telecommunication markets — namely, their effects on labour and society. The interest is not only in the number of jobs lost or created in different segments of the industry as a result of increased competition, corporate restructuring and the expansion of new activities, but also on the qualitative effects of these changes on labour. Conditions of work, security of employment, training and industrial relations practices become the areas of focus. In this working paper, an attempt has been made to draw on both approaches in order to highlight the technical and regulatory developments that are changing the face of telecommunication, their importance for the efficiency and profitability of enterprises operating at both the national and international levels and their repercussions on labour.

In this paper it has been shown that technological change and the emergence of a more market-oriented telecommunication sector have led to a greater participation of private enterprises, including major equipment manufacturing and service MNEs in these markets. With the progressive privatization of public monopolies and intense competition among enterprises to supply equipment and services that meet the demands of "a new breed of telecommunication users", there has been a restructuring of the sector, with a downward trend in employment in traditional PTOs. The new environment is marked by corporate "downsizing", growing demands for new skills, new systems of pay in many companies, and a declining role for trade unions in many enterprises. Union membership as a percentage of

the total workforce in telecommunications is shrinking, as the boundaries between previously strongly unionized and non-unionized segments of the industry become increasingly blurred.

9.1 Corporate initiatives and policy measures

As regards employment and training, the situation in enterprises operating in substantially liberalized markets, and those which have invested heavily in advanced telecommunication equipment, differs considerably from those which operate in less competitive environments and have yet to upgrade the communication infrastructure.

Enterprises with relatively large-scale operations have been found to offer training and retraining programmes in fields such as marketing and maintenance of software-based network management systems, which are gaining prominence in the sector. However, these initiatives do not address the needs of employees who have been made redundant in the wake of technical change and reorganization. While some workers are finding employment with new entrants, many are not, because their capabilities are not well-matched to those required in an era of rapid technical convergence.

The evidence suggests that union membership is not commonplace in the spin-off companies created by traditional PTOs, in a bid to respond to changing market conditions. Unionization is also not common in the many new enterprises that enter the telecommunication market from the computing and other industries. Whereas in the past unions negotiated for benefits and training schemes on behalf of a large proportion of the workforce, they are not likely to represent the majority of workers in this sector in future. In the light of this, it can be argued that initiatives taken by trade unions alone, will not suffice to respond to the training needs of workers. In short, jointly sponsored public and private sector initiatives will be required to tackle issues pertaining to employment, training and work organization in the telecommunication sector.

Problems relating to skill formation and development are likely to be exacerbated, as smaller firms enter niche markets within the communication sector. Small and medium-sized enterprises rarely have substantial resources to devote to training. This is especially so when their profit margins are reduced by the costs of entering and competing in markets where global players do not only dominate, but increasingly reinforce their position through strategic alliances and acquisitions.

It has been observed that there is about a five-year time-lag between the introduction of changes in the ownership, structure and the organization of telecommunication companies and the manifestation of the impact of those reforms on the workforce. During this period, when market liberalization is being debated and privatization initiatives are being arranged, training policies can be defined and skill development programmes introduced.

The dearth of skills in the technical, managerial and other fields is a problem faced by a number of developing, transitional countries and even OECD member States. This attests to the importance of not only on-the-job training and retraining at all levels to acquire expertise in new areas, but also the need for forward planning within the broader framework of a country's educational system. Since countries are proceeding with liberalization at different speeds, governments have the possibility of taking proactive measures, by observing and learning from developments that have taken place in the so-called "first-mover" countries, with respect to employment and human resources development.

9.2 Regional variations and experiences

A recapitulation of the main findings of research on selected telecommunication enterprises in different regions and countries will serve to illustrate the diversity of experiences. In the *North American region*, and particularly the United States, AT&T, the RBOCs and other telecommunication network operators, have been systematically reducing their workforces since the divestiture of AT&T in 1984. The trend is towards technological innovation, improved efficiency, higher productivity and a higher level of skills. Growth in employment has been recorded for mobile services and other telecommunication-related sectors such as computing services and other information-intensive segments of the industry.

In the *South American region*, Brazil is an example of a country in which market liberalization is being retarded because of politically motivated considerations. The privatization of the national PTO, TELEBRAS, is likely to be a protracted process. Nevertheless, because of pressure from international financial institutions and private investors privatization will no doubt remain a key item on the Government's agenda. The demands of service providers operating on a global scale and large users will also make the progressive opening up of markets for infrastructure and service irreversible.

In the *European Union*, particularly in the United Kingdom, there has been a reduction of nearly half of the workforce in telecommunication services since the privatization of BT. This enterprise is moving into other European Union countries and has entered into several joint ventures and strategic alliances. In the domestic market, BT is also positioning itself as a major interactive entertainment service supplier. However, the overall employment effects of the restructuring of the market are still unclear.

PTOs with relatively high operating costs, such as France Télécom and Deutsche Telekom, increasingly have to face "leaner" global operators such as BT and AT&T. They are also under pressure to improve efficiency and productivity. More flexible regulatory regimes in the United Kingdom and the United States provide operators based in these countries with opportunities to introduce tariff rebates and "one-stop-shopping" packages which are likely to pose a serious challenge to companies in other EU countries. All major operators are struggling with the need to coordinate the supply of services in foreign markets, according to required specifications. No single global operator has overcome these problems to the satisfaction of the largest multinational business users. Here again, the importance of training the workforce becomes evident given that skills and know-how are critical requirements for gaining and maintaining competitiveness in global markets.

In the *Central and Eastern European countries*, the Hungarian liberalization programme has retained monopoly status for MATAV in the markets for long-distance and international telecommunication services. Thirty per cent of the company's shares have been sold to Deutsche Telekom and Ameritech. Another tranche of shares is to be sold in the future. There are entry opportunities for operators of local networks and providers of value added services, but it is unclear whether the continuing dominance of MATAV will dampen investors' interest in the market. The way in which regulatory changes are being carried out and the question of transparency with regard to the regulations affecting MATAV and other operators, are issues that are likely to assume considerable significance and affect the course of market reforms.

While there have been no major job losses in MATAV so far, this situation is expected to change after it becomes a fully privatized company. Foreign investors are setting up subsidiaries and joint ventures which are contributing to the development of new skills.

As regards the role of trade unions, this is being weakened because of difficulties in enforcing negotiated agreements in the newly privatized segments of MATAV and because workers in new companies operating in this sector are not unionized.

At this stage, there is time to implement policies for enhancing skill formation and upgrading, particularly among workers in the equipment sector where restructuring is well under way. The challenge is to link new investment with adequate training and skills development programmes since the key issue is to ensure that there is a good match between the skills and capabilities of the workforce and those that will be in demand in the decades to come.

9.3 Communication network and service evolution and employment

This report began by highlighting two models along which communication networks and services can develop. In the *idealist* model, the fully competitive market is expected to ensure that permeable, seamless networks would come into operation in national, regional and global markets, and that the restructuring of the workforce would proceed smoothly. The assumption is that mismatches in the supply and demand for jobs and skills, if and when they do occur, would be short-term problems that would be resolved through the mobility of labour and/or investment capital.

In contrast, the *strategic* model focuses on the strategic behaviour of players in the market rather than on the theoretical behaviour of firms in perfectly competitive markets. The opportunities created by technical change in the telecommunication sector develop unevenly in this model. There are varying incentives to introduce advanced networks and services, not all of which may contribute to the development of the open and universal "information superhighway" which many envisage. The *strategic* model suggests that private as well as state-owned enterprises in the communication sector will be pressured into bringing about changes with respect to the workforce, in order to compete effectively in the new telecommunication environment.

Table 34 presents the main technical and organizational characteristics of the two models. The evolution of communication networks and services is set out in the upper half of the table, while the lower half shows the implications of these developments for labour.

Table 34. Communication network and service evolution and employment

Idealist model (the fully competitive scenario)		Strategic model (the dominant player(s) scenario)
Permeable seamless networks		Fragmented networks
Ubiquity (universal service diffusion)		Reduced ubiquity in service diffusion
Demand-led telecommunications industry		Supply-led industry, multinational user pressure
Open systems, common interface standards		Weak stimuli for competition
Cooperative partnerships, transparent network access		Monopolization and rivalry, non-transparent network access
Minimal regulation to achieve efficiency and equity		Increasing regulation
Labour-related issues		Strategic model
Trends in employment by network operators	Idealist model No overall job loss or losses compensated for by employment in other sectors	Considerable job loss
Trends in employment structure	Flexible contracting	Mix of permanent and temporary contracts with growth in latter category
Trends in management/labour relations	No requirement for unionization	Uneven and declining union membership and representation in key corporate decisions
Skills and training	No need for government policy measures	Growing need for proactive government policy initiatives
Regional differentiation in skills capabilities	Transitional variations	Continuing mismatches in local skills base and capabilities required by multinational operators and manufacturers

Source: Upper half of table adapted from R. Mansell (1993).

Depending on their positions within domestic and foreign markets, private and state-owned enterprises will adopt different strategies. These account for the variations in employment trends and determine the extent to which the "enormous potential for new services relating to production, consumption, culture and leisure activities will create large numbers of new jobs".¹⁴⁸ Since, as was mentioned earlier, experience has shown that there is generally a five-year lapse between the initial moves to introduce liberalization measures and the time that corporate downsizing takes place, countries at the relatively early stages of the reform process may draw lessons from the experiences of those that are further along that path. It also means that in principle, governments and representatives of both sides of industry would have the opportunity to hold tripartite consultations on matters pertaining to public policy and corporate objectives, and to assess the implications of impending organizational and technological changes for labour. During this period they can plan, negotiate and implement redeployment and training schemes that would help to mitigate the adverse effects of change and maximize the mutual gains of technical innovation and regulatory reforms in the telecommunication sector.

Notes

¹ For historical discussions see OECD (1973 and 1975).

² Industry Canada (1994).

³ Commission of the European Communities (1994).

⁴ Postal Telegraph and Telephone International (1995b).

⁵ International Telecommunication Union (1989), pp. 23-24.

⁶ Asymmetric regulation refers to actions by representatives of government which seek to ensure that incumbent suppliers do not have opportunities to exercise market power in a way that forecloses market entry. It is often interpreted as favouring new entrants and placing restrictions on incumbents.

⁷ See R. Mansell (1993) covering the United States, France, Germany, the United Kingdom and Sweden; and R. Mansell et al. (1995).

⁸ See W.H. Melody et al. (1993); see also International Telecommunication Union (1995).

⁹ In addition France, Portugal, Italy, Ireland, Spain and Sweden in Western Europe are considering moves to privatize their national operators. In Central and Eastern Europe privatization is expected in Albania, Lithuania, Hungary, Slovenia, Romania, Russia and Poland. In the Middle East, privatization is expected in Egypt, Israel, Côte d'Ivoire, Ghana, Cameroon, Kenya, Morocco, South Africa, Turkey, Uganda and Zambia. In Latin America, Venezuela, Ecuador, Bolivia, Honduras, El Salvador, Panama, Nicaragua, Brazil and Haiti are moving towards privatization. In the Asia-Pacific region, Fiji, Japan, South Korea, India, Indonesia, Pakistan, Sri Lanka, Singapore, Australia and Thailand have privatization on their agendas. "International Telecommunications" in the *Financial Times*, 3 Oct. 1995, produced by Financial Times and Salomon Brothers.

¹⁰ International Labour Organization (1991), p. 68.

¹¹ International Labour Organization (1991).

¹² According to the UNCTAD the world total of multinational enterprises (MNEs) in 1990 was 37,000 parent firms which controlled over 200,000 foreign subsidiaries, UNCTAD (1994).

¹³ UNCTAD (1994).

¹⁴ J.A. Ritter (1990), p. 156.

¹⁵ UNCTAD (1994), p. 174.

¹⁶ Postal, Telegraph and Telephone International (1993), p. 12.

¹⁷ G. Papaconstantinou (1993), p. 227.

¹⁸ V. Boland (1995).

¹⁹ See J.L. Schenker (1995), p. 19. Citing report by Cambridge Strategic Management Group, "The macroeconomic effects of near-zero tariff telecommunications". See also, R. Mansell (1994).

²⁰ OECD (1995), p. 26. Core revenue includes call revenue and rental and connection charges for basic telephone services.

- ²¹ C.M. Harland (1994) "Trends in strategic and market equity investments", in B. Wellenius and P.A. Stern (eds.) (1994).
- ²² "Big risk for global high-fliers", in *Public Network Europe*, Oct. 1994, p. 28; and R. Castillo (1995), p. 6.
- ²³ "Big risk for global high-fliers", in *Public Network Europe*, Oct. 1994, p. 28.
- ²⁴ M. Newman (1994), p. iv.
- ²⁵ OECD (1995), p. 45.
- ²⁶ European Information Technology Observatory (1994), pp. 59-61.
- ²⁷ International Telecommunication Union (1994), pp. A47-48.
- ²⁸ International Telecommunication Union (1994), p. A48.
- ²⁹ International Telecommunication Union (1994), pp. A47-48.
- ³⁰ International Telecommunication Union (1994), p. A48.
- ³¹ International Telecommunication Union (1994), pp. A29-A30.
- ³² European Information Technology Observatory (1994), p. 277.
- ³³ International Telecommunication Union (1994), p. A57.
- ³⁴ OECD (1995), p. 105.
- ³⁵ OECD (1995), p. 106.
- ³⁶ International Telecommunication Union (1994), pp. A55-A56.
- ³⁷ International Telecommunication Union (1994), p. 22 and see R. Hawkins (1995).
- ³⁸ BPA (Technology & Management) Ltd. (1995), p. 112.
- ³⁹ Office of Technology Assessment (1995), p. 11. It is misleading to describe computer and networking jobs as non-core, given their increasingly vital role in a "convergent" telecommunication market.
- ⁴⁰ Data provided by S. Paltridge, OECD Paris, 1995. See also OECD (1994).
- ⁴¹ OECD (1995a); the OECD is organizing a series of workshops on the economics of information societies which aim to develop theory, methodological and analytic tools to understand how information and communication technologies and infrastructures shape the economy and society. The first workshop in Toronto in June 1995 focused on empirical work on impacts on productivity and jobs.
- ⁴² G. Sciada and D. Sussman (1995). Includes 1980 SIC codes 481 (broadcasting), 482 (telecommunication carriers), 483 (other telecommunication industries) and 772 (computer and related services).
- ⁴³ W.H. Melody et al., 1993, p. 46.
- ⁴⁴ Parliamentary Office of Science and Technology (1995), p. 6.
- ⁴⁵ Office of Technology Assessment (1995), p. 17.

⁴⁶Office of Technology Assessment (1995), p. 17; *Fortune*, 1 Apr. 1996, p. 38.

⁴⁷Data provided by S. Paltridge, OECD, Paris, 1995.

⁴⁸G. Sciada and D. Sussman (1995).

⁴⁹R. Richardson (1994) "Backofficing front office functions — Organizational and locational implications of new telemediated services", in R. Mansell (ed.) (1994).

⁵⁰W.H. Melody et al., 1993, p. 38 and *Fortune*, 7 Aug. 1995, p. F-1.

⁵¹The Wall Street Journal Europe, *Central European Economic Review*, Summer 1994, pp. 12-14, and Budapest Business Journal, *The BBJ Guide to Hungarian Business and Services Book of Lists 1996*, p. 106.

⁵²OECD (1994).

⁵³R. van de Krol and M. Lindemann (1995), p. 23.

⁵⁴"Efficiency, size and competition", *Public Network*, July/Aug. 1995, p. 28, citing study by Mercer Management Consulting, London.

⁵⁵McKinsey Global Institute (1992).

⁵⁶It is worthwhile to recall that the United States, Canada and Mexico are the three parties to the North American Free Trade Agreement (NAFTA), hence the inclusion of Mexico in the "North American region".

⁵⁷B. Bolton et al. (eds.) (1993), pp. 127-128.

⁵⁸"US telecoms reform moves nearer", in *Financial Times*, 7 Aug. 1995.

⁵⁹Communication Workers of America (1995a).

⁶⁰Office of Technology Assessment (1995).

⁶¹Office of Technology Assessment (1995) SIC 4811 (telephone communications was split into 4812 (radiotelephone) and 4813 (telephone excluding radio)); message communications (4899) and telegraph communication (4821) formed a new code, telegraph and other message communications (4822); subscription television was removed from 4833 and cable television was removed from 4899 to form a new group, 484 (cable and other pay television services). All other services in SIC 4899 remained when new codes were applied to labour data in 1989.

⁶²CWA (1995b).

⁶³Office of Technology Assessment (1995). Labour productivity estimates are based on calls and access lines per full-time equivalent employee, while capital productivity is based on the measured calls per dollar invested network capital, weighted by cost relations of labour and capital to obtain overall productivity. See McKinsey Global Institute (1992) for a full description of the methodology.

⁶⁴CWA (1995a).

⁶⁵CWA (1995a).

⁶⁶CWA (1995a).

⁶⁷CWA (1995b).

⁶⁸ Office of Technology Assessment (1995). Data represents all the Regional Bell Holding Companies and 471 or about 50 per cent of the independents. However, it represents about 99 per cent of all access lines, invested plant and revenues. Cellular telephone data are from surveys and include some workers from the Bell companies and independent operators, p. 19.

⁶⁹ Office of Technology Assessment (1995), p. 20, and see Communication Workers of America (1994), p. 4.

⁷⁰ Office of Technology Assessment (1995), p. 33, based on International Telecommunications Association estimate.

⁷¹ Northern Telecom (1994).

⁷² Northern Telecom/BNR offer package, July 1994.

⁷³ Postal, Telegraph and Telephone International (1993), p. 12.

⁷⁴ The Lex Column (1995), p. 18.

⁷⁵ A. Cane (1995), p. 13.

⁷⁶ The Lex Column (1995), p. 18.

⁷⁷ A. Cane (1995), p. 24.

⁷⁸ R. van de Krol and M. Lindemann (1995), p. 23.

⁷⁹ T. Sweeney (1995), p. 42.

⁸⁰ J. Schenker and R. Castillo (1995), p. 1.

⁸¹ J. Blau (1995a), p. 1.

⁸² This figure is corroborated by the CWA and by Office of Technology Assessment (1995).

⁸³ International Labour Organization (1991).

⁸⁴ Communication Workers of America (1995b).

⁸⁵ Communication Workers of America (1995b).

⁸⁶ International Labour Organization (1991).

⁸⁷ International Telecommunication Union (1994), p. 56.

⁸⁸ Analysis (1994).

⁸⁹ B. Wellenius and P.A. Stern (eds.) (1994), p. 135.

⁹⁰ R. Castillo and P.H. Wertheim (1995), p. 6.

⁹¹ B. Wellenius and P.A. Stern (eds.) (1994), p. 136.

⁹² United States Department of Commerce (1992), p. 91.

⁹³ International Labour Organization (1991).

⁹⁴ International Labour Organization (1991).

⁹⁵ TELEBRAS annual reports (various years).

⁹⁶ NEC Corporation, *Annual reports 1994 and 1995*, pp. 17 and 19 respectively. The currency conversion rate for 1994 is 115 Yen=US\$1 and for 1995 it is 97 Yen=US\$1.

⁹⁷ Information supplied by NEC, Tokyo.

⁹⁸ NEC Corporation (1994).

⁹⁹ Commission of the European Communities (1987). See also R. Mansell (1993); J. Mueller and E. Nyevrikel (1994) and European Commission (1994).

¹⁰⁰ Commission of the European Communities (1993); Commission of the European Communities (1994).

¹⁰¹ See R. Mansell and A. Credé (1995).

¹⁰² Communication Workers' Union (1995).

¹⁰³ Office of Telecommunications (1995), pp. 1-2.

¹⁰⁴ A. Cane (1995).

¹⁰⁵ Parliamentary Office for Science and Technology (1995), p. 6.

¹⁰⁶ Parliamentary Office for Science and Technology (1995), p. 6.

¹⁰⁷ N. Hickey (1994).

¹⁰⁸ Parliamentary Office for Science and Technology (1995), p. 6.

¹⁰⁹ R. Snoddy (1995), p. 18.

¹¹⁰ International Labour Organization (1991).

¹¹¹ BT (1995), p. 9.

¹¹² J. Blau (1995), p. 3.

¹¹³ K. Hart (1995), p. 1.

¹¹⁴ "BT makes a French start", in *Communications International*, June 1995, pp. 23-24.

¹¹⁵ K. Thomasson (ed.) (1994), pp. 92-94.

¹¹⁶ BT (1995).

¹¹⁷ OECD (1995), p. 102.

¹¹⁸ International Labour Organization (1991).

¹¹⁹ International Labour Organization (1991).

¹²⁰ Communication Workers' Union (1995), p. 5.

- ¹²¹ International Labour Organization (1991).
- ¹²² International Labour Organization (1991).
- ¹²³ Postal Telegraph and Telephone International (1995a). The survey covered 1,349 personal contract group managers and professionals and 214 members of the professional sales group.
- ¹²⁴ Communication Workers' Union (1995), p. 6.
- ¹²⁵ Ericsson (1995, 1994).
- ¹²⁶ T. Sweeney (1995).
- ¹²⁷ T.E. Nulty (1994), "Challenges and issues in Central and Eastern European telecommunications", in B. Wellenius and P.A. Stern (eds.) (1994), p. 340.
- ¹²⁸ Up to the end of the first quarter of 1996, Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia had signed such agreements.
- ¹²⁹ V. Boland (1995), p. 15.
- ¹³⁰ A. Dalos (1994).
- ¹³¹ "Foreign investment in Hungarian telecommunications", mimeo., Budapest, Sep.; Datapro (1994); and A. Dalos (1994).
- ¹³² Datapro (1994); A. Dalos (1994); K. Heller (1994). "Restructuring in Hungary", in B. Wellenius and P.A. Stern (eds.) (1994), pp. 375-382.
- ¹³³ A. Dalos (1994), p. 8. Budapest Business Journal, *The BBJ Guide to Hungarian Business and Services Book of Lists*, 1996, p. 106.
- ¹³⁴ International Labour Office (1994), p. 11.
- ¹³⁵ International Labour Office (1994), p. 17.
- ¹³⁶ L.G. Tóth (1995, forthcoming), p. 10.
- ¹³⁷ "The MATAV story or the biggest Hungarian privatization", Magyar Távközlési Részvénytársaság, 1994, p. 9.
- ¹³⁸ Datapro (1994), p. 13.
- ¹³⁹ Datapro (1994), p. 11.
- ¹⁴⁰ A. Dalos (1994), p. 8.
- ¹⁴¹ International Labour Office (1994), p. 12.
- ¹⁴² International Labour Organization (1991).
- ¹⁴³ International Labour Organization (1991).
- ¹⁴⁴ International Labour Organization (1991).
- ¹⁴⁵ Siemens (1994), pp. 8-9.

¹⁴⁶ Siemens (1994), p. 61.

¹⁴⁷ Information provided by G. Gaul, Marketing Manager, Siemens Telefongyár Kft.

¹⁴⁸ Commission of the European Communities (1994).

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The monographs and working papers are published under the ILO's Programme on Multinational Enterprises in response to requests made by the ILO's constituents at meetings of the Governing Body Subcommittee on Multinational Enterprises and sectoral meetings held under the ILO's Sectoral Activities Programme. The working papers, which are signed by their authors, are intended to stimulate discussion and critical comment.¹

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² The studies carried out in the 1970s are included since they may be useful to those persons wishing to examine developments in a given industry or sector over the decades. They are listed in the language(s) for which there are still stocks.

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