

**TELECOMMUNICATIONS:  
GLOBAL RESTRUCTURING AT FULL SPEED**

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**1. INTRODUCTION**

Telecommunications continues to go through an amazing state of flux during the 1990s. Monopolies have come under attack, large-scale investment is being made in order to keep abreast of new technologies, new telecommunications equipment and new services have been launched, new markets are being entered, and acquisitions and joint ventures are reshaping the structure of the telecommunications industry.

The telecommunications industry is having to adjust itself to the increasing global competition in the fields of telecommunications services and telecommunications equipment. For individual companies this means braving the uncertainties and seeking the right balance between market opportunities and threats. Strategic decisions involving massive investment in Eastern Europe are having to be weighed against the absence of guarantees on short-term financial returns. At the same time, a high level of investment in new technologies is being made without knowing the precise direction in which technology is heading. New services are being developed, often without the slightest idea of what the likely demands of consumers will be. Opportunities and threats appear to have reached an equilibrium. Only those able to profit most from the opportunities seem have the best chance of survival in this volatile market.

This chapter describes the changes in the market structure of the telecommunications industry. The spotlight focuses on the European telecommunications industry. However, since telecommunications has become a global industry, comparisons will also be made with the American and Japanese markets. A brief outline is given of the main driving forces behind the changes in the telecommunications industry and in its markets. Special attention is paid here to technological developments and institutional transformation, in particular, to the processes of privatization, deregulation and liberalization. This chapter also provides

some information about the telecommunications markets in Eastern Europe. The concluding section presents a glimpse into the future and concentrates partly on the continuing politicization of the markets and partly on the emerging consortia in the telecommunications industry.

## 2. THE STRUCTURE OF THE TELECOMMUNICATIONS INDUSTRY

The telecommunications industry can be divided into two main groups: the suppliers of telecommunications services on the one hand, and the manufacturers of telecommunications equipment on the other. The suppliers of services and the equipment manufacturers have close links with one another. Typically, suppliers have long-term contracts with the manufacturers of telecommunications equipment, who themselves have an obvious interest in providing those suppliers with state-of-the-art equipment. The product delivered by the suppliers of telecommunications is telecommunications services. Competition is increasing, particularly in the area of international telecommunications services. Both the system of tariff setting (the so-called accounting rate system) and the international cartel of public telephone companies which is responsible for the system, have been severely criticized.

### 2.1 Telecommunications Services

Telecommunications services are predominantly supplied by public authorities, in particular, by the Post en Telecommunications Organizations (PTOs), the new name for the former PTTs. In most European countries the telecommunications infrastructure is owned by a public authority responsible for the management, quality and maintenance of the network. Until recently, these public authorities have enjoyed a monopoly position selling and leasing terminal equipment and in the supply of services. Since the mid-1980s, there has been a rapid restructuring of supply. The former PTTs, which nowadays are usually split up into separate units, each responsible for postal and telecommunications services, have come under growing pressure to adapt to competition and to the changing demands of the market. International private business, in particular, has put pressure on the former PTTs to deregulate and liberalize the supply of customer equipment and telecommunications services. The process of deregulation was already underway in 1984 in the United States and the

United Kingdom. In the late eighties, several other European countries followed suit, although the restructuring of the public telecommunications authorities has not been as drastic as in the US and the UK. In most European countries, a more cautious path has been chosen, as for example in the Netherlands, Germany, France and Belgium. One of the positive features of the deregulation process has been the development of new value-added networks, new services, and the emergence of new companies in niche markets.

Telecommunications services form part of the information services industry. The industry underwent a rapid period of expansion during the 1980s. According to the European Commission, the consolidated value of Europe's information services industry is estimated at more than 120 billion ECU, and increased by over 11% during 1989. The three main sectors of information services can be split up as follows: telecommunications services (71%), software and computing services (28%) and electronic information (1%). In 1989, telecommunications services experienced a growth rate of 9-10% and were then considered to be worth 85 billion ECU. It is predicted that telecommunications services will maintain an average growth rate in excess of 9% per year. In the United States, this market accounts for approximately 155 billion ECU (Source: Panorama of the European Industries 1990-1991, Chapter 29:1).

The areas covered by the telecommunications services include voice telephony, text services, mobile communications, data and image communication, videotext and ISDN (Integrated Services Digital Network). Voice transmission continues to maintain a dominant share of the market and accounts for over 80% of the total. However, current growth rates appear to be 5-7% lower than sales of image data and video signals, which reached an annual growth rate of 20%. In 1989, the EC had cornered 26% of the world's turnover in telecommunication services (estimated at 330 billion ECU) and approximately 30% of the world market in value-added services. As can be seen in Table 1, the telecommunications services market is expanding rapidly. The telecommunications services market is highly concentrated. The world's top ten suppliers of services control about 64% of the global market. However, this is hardly surprising in view of the fact that all top suppliers have (had) monopoly or 'defacto' monopoly positions in their own national markets.

Table 1 The Top 10 in the world telecommunications services market\*

Company	Country	1990 turnover (\$ bn)
NTT	Japan	44.2
AT&T	United States	25.1
DB Telekom	Germany	24.8
BT	United Kingdom	24.3
France Télécom	France	21.1
BellSouth	United States	14.3
SIP	Italy	14.0
Nynex	United States	13.6
GTE	United States	12.8
Bell Atlantic	United States	12.3
WORLD MARKET TURNOVER		320

\* Top 10 = 64 per cent of the world market.

Source: IDATE Industrial Analysis, Montpellier (France). Derived from: *Financial Times Survey 'World Telecommunications'*, October 7, 1991:11.

## 2.2 Increased Pressure on the International Telephone Cartel's System of Tariff Setting

The telecommunications services market has been a rather stable market for many years. Each national PTT used to have its own territory, and national telephone tariffs were set by the PTT, a state-owned company and part of a government Ministry. That's why there had always been a very high level of government involvement in the telecommunications services. For political reasons, local tariffs had been kept low in the belief that telecommunications were an essential public service. The same is true for the provision of the telecommunications infrastructure. Rural areas with low population densities are not denied general access to the telecommunications services. In most countries, the tariffs per minute charged for services in remote areas are the same as those for services in densely populated urban areas. Local phone call tariffs and the cost of installing the telecommunications infrastructure could be kept below cost price because public phone companies would overcharge on other services, especially on international phone calls.

An investigation carried out by the Financial Times in 1990 instigated the controversy about the high tariffs being charged for international telephone calls, by disclosing that public phone companies throughout the

world were overcharging their customers by between \$ 10-20 billion a year. The journalist, Hugo Dixon, an expert on telecommunications and who wrote the articles in the Financial Times, revealed that tariffs for international calls, which are typically between two and four times above cost, were being kept artificially high by a number of quasi-cartel practices (Hugo Dixon, Financial Times, Survey on World Telecommunications, October 7, 1991:2).

The cartel has come under attack from all sides, and although it has not yet been broken, it would seem highly improbable that the cartel will be able to pursue its tariff-setting practices indefinitely.

The US government, particularly the Federal Communications Commission and the European Commission, have both been investigating whether the cartel is in breach of anti-trust regulations and whether it is stifling competition. The Organization for Economic Co-operation and Development (OECD) has also been lobbying for change. The OECD believes that the accounting rate system used by the cartel is comparable to that of customs tariffs which are aimed at constraining the flow of goods.

However, it will be extremely difficult to change the accounting rate system. One argument often used to legitimize the practice of overcharging is that surplus income earned from international calls can be used to subsidize local calls. One of the major stumbling blocks in breaking the cartel is that there are too many vested interests. Some countries, such as the US, Australia, Canada and Sweden, have large deficits in their telecommunications trade balance, whereas other countries, particularly the developing countries, are net-earners. A decrease in tariffs would have far-reaching consequences for the telephone companies in those countries because they depend very heavily on the system of tariff setting. Even newcomers with highly sophisticated private carrier networks benefit from a system that overcharges for international phone calls. Even if they were to oppose it in the short term, they would also have to consider the revenues which could be earned in the long term from maintaining the high tariff system. It would therefore be in their interests to become member of the cartel club without delay. In view of such arguments, it is hardly surprising that the International Telephone and Telegraph Consultative Committee (CCITT) in Geneva has been unable to reach agreement among its members on a reform of the tariff-setting system.

The debate on tariff setting and the agreements between the telephone carriers about the payments to be made by the originating carrier to the terminating carrier will intensify in the near future. In practice, the accounting rate is split 50:50 between the two carriers. Usually the

originating carrier's net revenue is small because the collection rate is not much higher than one half of the tariff charged by the terminating carrier. However, in the case of some US carriers, the net revenue can be negative. Leland Johnson, in his article on monopolies in international telephone services, cites the example of telephone traffic between the US and Brazil. In 1986, the US carriers earned \$ 1.17 per minute on calls to Brazil but had to pay Brazil \$ 1.25 per minute for the privilege. However, such losses are more than offset by the revenues US carriers receive for terminating traffic originating in the other country. In 1986, the negative revenue of minus \$ 1.6 million to US carriers for traffic to Brazil was less than the \$ 33.6 million they earned from Brazil (Johnson, 1989/91:227).

The problem of setting tariffs for international telephone calls goes to show that there are still too many participants who do not want any further increases in competition, at least not yet. What the privatized PTTs want to do initially is to safeguard their markets before allowing others to compete with them. Although the United Kingdom is one of the front runners as regards the liberalization of telecommunications, the U.K. is not interested in stimulating any further competition, other than that which exists between British Telecom and the much smaller Mercury Communications, which has close links with Cable and Wireless, a world leader in the manufacture of telecommunications equipment. Although Sprint, the American private carrier, is now knocking on the door to enter the liberalized British market, it finds many hurdles on its way. Moreover, in other 'liberalized' markets such as the US and Japan, there are restrictions on any further competition. Japan has only licensed three international operators. The US is currently employing political arguments (e.g. 'national security') to curb any further competition between Intelsat and PanAmSat in the satellite communications sector. PanAmSat is a private US satellite communications company which could threaten Intelsat, the international organization involved in satellite communication and which is owned by the public phone companies (Hugo Dixon, Financial Times, Survey on World Telecommunications, October 7, 1991:2).

Some authors, like Leland Johnson mentioned above, argue that future reductions and restructuring of the tariff-setting system may take place because of the limitations of the bargaining power of PTOs, brought about by continuing technological advances and the role of communications commissions, like the FCC in the US. An important element in this rationale is the increased use of third-country routings. Third-country routings start to become interesting when the collection rate from country A to

country B, plus the rate from country B to country C is lower than the rate from country A to country C. For example: a direct call from Germany to the United States is more expensive than the call routed through the United Kingdom. Multinational firms find this routing sequence particularly attractive. They can route through their private branch exchange (PBX) in the UK. What multinational companies often do is to route their calls around their private networks before putting them onto the public networks, thereby taking advantage of the cheapest tariffs, even though this may contravene the regulations. Under such circumstances, the PTOs, whether monopolies or privatized companies, will come under pressure to lower tariffs in order to stem the tide of revenue being lost on international phone calls.

Moreover, they will want to compete with other PTOs and carriers as an attractive 'hub'. Attractive 'hubs' can also attract other related telecommunications activities such as teleports. In this respect, international telecommunications traffic is beginning to resemble international air traffic more and more.

### 3. THE STRUCTURE OF THE TELECOMMUNICATIONS EQUIPMENT MANUFACTURING INDUSTRY

The telecommunications manufacturing industry provides the networks and terminals of the telecommunications services sector. During the mid-1980s telecommunications equipment suppliers enjoyed large increases in sales. After several years of sluggish growth, new market opportunities seem to come in Eastern Europe, as well as in Asia and Latin America as a consequence of privatizations of telephone companies in these two continents. Currently the world market for telecommunications equipment is estimated at \$ 120 billion.

#### 3.1 Telecommunications Equipment: Typology of Main Products and Customers

The telecommunications manufacturing industry provides the networks and broadly speaking, telecommunications equipment can be split into three main product areas:

- switching equipment, either public (inside the network) or private. This equipment serves to connect terminals and co-ordinates entire telecommunications networks.
- transmission equipment, including electronics to transmit and receive signals, and cables to support it. The transmission equipment carries the signal between terminal stations and switching centres.
- terminal equipment, to transmit and receive either voice, data, text or image communication.

Table 2 Telecommunications equipment. Breakdown of the demand by type of product, 1989/1992

	1989 (%)	1992/89 AAGR*
Public switching	22	7
Transmission	20	6
Terminals	19	10
Private switching	13	6
Data communications	10	8
Mobile communications	5	15
Other	11	7
Total	100	7.7

Note AAGR = Average Annual Growth Rate.

Source: Eurostrategies ESTEL. Derived from: *Panorama of the EC industries 1991-1992*, Commission of the European Communities, 1991, Chapter 12:20.

The demand for telecommunications equipment can be divided into two main target groups:

- Network operators (PTOs and private carriers) who mainly buy public switching and transmission equipment. This group represents over half of the total European market.
- Business users who make use of public networks for their communications requirements. The bulk of the demand lies in terminals, data communications and private switching equipment. In 1989 this target group represented 41 % of the total market.

The remainder of the market centres on household demand – primarily telephones, answering machines and other terminal equipment, such as

videotext terminals. Telecommunications is regarded as a strategic resource without which business would be virtually impossible. A few years ago, a fax machine was an exception. Nowadays, however, no company or office could imagine working without one.

Within a few years we will probably experience the same phenomenon with mobile telephones. The demand for new business equipment is high, particularly in sectors which are heavily dependent on telecommunications, such as aviation, tourism, banking and insurance, as well as the industrial and retailing sectors too. Predictions indicate that businesses will continue to spend more and more on new technology.

A prerequisite to this expansion in the use of telecommunications equipment both in the office and the home, is the provision of an advanced, highly reliable public network infrastructure. Investment in telecommunications is essential in order to keep up with the demands of business and with competitor countries. There is, however, a strong correlation between the national telecommunications market, the size of the population and each country's GDP. The richer the country, the more advanced its telecommunications network.

Italy, Spain and the Unified Germany are regarded as the most important European growth markets. Some countries, particularly ones like Greece and Portugal, are lagging a long way behind countries like France and the Netherlands. It is feared that the 'telecommunications gulf' will widen over the next few years. This could have far-reaching implications for those countries' economies.

A number of programmes and initiatives have been set up within the EC framework, to stimulate a pan-European telecommunications network. Some examples include: a pan-European ISDN (Integrated Services Digital Network) in 1990; the introduction of the GSM digital mobile network (among others, one for car-phones) in 1991; the introduction of ERMES network in 1992 – an advanced messaging system; the introduction of personal communications via Telepoint Services, already in operation in London; Broadband ISDN in the time frame 1995-2000; and the development of a single European market in satellite communications as agreed upon in 1991.

### 3.2 Telecommunications Equipment: EC Production

The European suppliers of telecommunications equipment still occupy a strong position in the European market. The top 15 suppliers of telecommunications equipment together control 90% of the EC-market.

Table 3 shows Alcatel/Telettra in the pole position, closely followed by Siemens/GEC. The gap between the first two and Ericsson is considerable. The table shows that the market is rather segmented and that companies have become specialized in a small number of telecommunications equipment markets.

Table 3 The top 15 telecom equipment suppliers of the EC market

Rank	Company	Country	Telecom turnover (million ECU)	Main areas of activities
1	Alcatel + Telettra	France	5334	Public switching, transmission, business communications
2	Siemens/GEC	Germany	4644	Public switching, transmission, business communications
3	Ericsson	Sweden	1610	Public switching, business communications, mobile
4	Bosch	Germany	1575	Business communications, transmission, mobile
5	Italtel + AT&T NSI	Italy	1456	Public switching, business communications
6	Philips	Netherlands	1181	Transmission, business communications
7	Motorola	United States	1089	Mobile, business communications
8	STC	United Kingdom	720	Transmission, business communications
9	Matra	France	599	Public switching, business communications, mobile
10	Sagem/Sat	France	471	Business communications, transmission
11	IBM	United States	438	Business communications
12	Ascom	Switzerland	400	Business communications, transmission
13	Racal	United Kingdom	320	Business communications, mobile
14	Pirelli	Italy	299	Transmission
15	Nokia	Finland	264	Mobile, transmission

Note: Business communications include private switching, terminals and data communications.

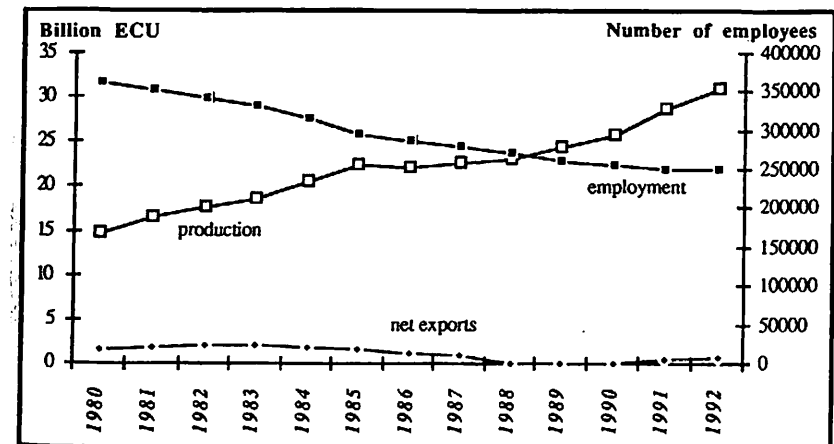
Source: *Panorama of EC Industries 1991-1992; current situations and outlook for 180 sectors of manufacturing and service industries in the European Community*, Brussels, 1991, chapter 12:22.

The suppliers of telecommunications equipment can be divided into a number of different categories. Firstly, there are the telecommunications specialists. Telecommunications is the dominant activity in these com-

panies and they produce a wide range of equipment. Alcatel, Ericsson, Italtel and AT&T NSI belong to this category. AT&T NSI is the European subsidiary of AT&T. Its headquarters is in Brussels. AT&T's share of AT&T NSI increased to 74 per cent, after Philips sold its 15 per cent share in AT&T NSI. STET of Italy owns 20 per cent, and Telefonica de Espana owns 6 per cent. Matra, a much smaller player in the league, could also be considered a member of this category, although the company is mainly specialized in defence electronics and communications. The electronics generalists, such as Siemens, Bosch and Philips belong to the second category. The Japanese also belong to this category. They appear in Table 8 in which the world's top 15 manufacturers of telecommunications equipment are illustrated.

Moreover, there is also a third category of company which specializes in one field of telecommunications equipment. Motorola, a company specialized in mobile communications, IBM, which is specialized in data communications, and Pirelli specialized in the field of transmission, all belong to this category.

Figure 1 The production of telecommunications equipment and employment in the EC



Note: A change of trade nomenclature in 1988 makes a comparison of pre 1987 and post 1988 figures hazardous.

Source: *Eurostrategies (ESTEL)*, EUROSTAT. Derived from: *Panorama of EC Industries 1991-1992; current situation and outlook for 180 sectors of manufacturing and service industries in the European Community*, Brussel, 1991, chapter 12:19.

The telecommunications equipment industry belongs to one of the largest industries in the EC. Although there is a declining trend in employment in the telecommunications equipment sector, it is still substantial. In 1980 there were still 360,000 people in the EC working in this sector. By 1992 the number had declined to about 250 thousand people. Figure 1 and Table 4 show that during the last decade a higher volume of production was achieved with fewer people working in the sector.

There is evidence of a steep rise in the volume of production, particularly since 1988. Between 1988 and 1992, the production of telecommunications equipment in the EC leapt from almost 23 billion ECU in 1988 to almost 31 million ECU in 1992.

Net exports showed a steep rise during the first half of the 1980s, but in the second half, exports fell. The downturn in exports could perhaps be explained by high demand for telecommunications equipment, particularly by the PTOs and private businesses in the EC. The 1990s seem to mark a turn in the tide for exports.

Table 4 Telecommunications equipment in the EC.  
Main indicators, 1980-1992

	Production in billion ECU	Net exports in billion ECU	Employment in 1000s
1980	14.763	1.5	360
1981	16.379	1.759	351
1982	17.593	1.949	340
1983	18.543	1.949	329
1984	20.601	1.745	315
1985	22.390	1.570	294
1986	22.226	1.233	286
1987	22.584	1.029	279
1988	22.939	0.091	270
1989	24.328	0.109	261
1990	25.798	0.125	255
1991	28.645	0.405	250
1992	30.970	0.754	250

Note: A change of trade nomenclature in 1988 makes a comparison of pre 1987 and post 1988 figures hazardous.

Source: *Eurostrategies (ESTEL)*, *EUROSTAT*. Derived from: *Panorama of EC Industries 1991-1992; current situation and outlook for 180 sectors of manufacturing and service industries in the European Community*, Brussels, 1991, chapter 12:19.

The EC telecommunications equipment market represents about a quarter of the world market. In the EC, the demand for telecommunications equipment will probably grow by 7.7% in real terms up till 1992.

Public switching forms the core element of the telecommunications network. In a previous analysis of telecommunications equipment industry (Roobeek, 1988:302) growth estimates were published for the different segments of the global telecommunications equipment industry. If the data from Table 2 are compared with the earlier analysis, it may be concluded that public switching is not as important any more as was first thought back in 1985. At that time, public switching was responsible for about 50% of the market, and transmission for 24%. Nowadays, the market for public switching is more or less saturated due to the fact that PTOs and other network operators have installed new digitalized switching equipment. This process took place far more quickly than had been expected.

The transmission market is more stable. Transmission is still responsible for about 20% of the equipment market in the EC. The EC has a strong position in telecommunications cables. The production figures in Table 5 show that, particularly between 1986 and 1988, the production has jumped from about 2 billion ECU to more than 2.5 billion ECU. After 1989, the market stabilized at a rather high level.

Table 5 Production of telecommunication cables in the EC,  
1986-1992

Year	Production in million ECU
1986	2062
1987	2196
1988	2548
1989	2756
1990	2615
1991	2663
1992	2735

Note: The figures for 1990-1992 are estimates.

Source: *Europowercab*, *Eurotelcab* and *European Enamellers Council*. Derived from: *Panorama of EC Industries 1991-1992; current situation and outlook for 180 sectors of manufacturing and service industries in the European Community*, Brussels, 1991, chapter 11:9.

Table 7 Cellular telephone subscribers in the EC (July 1991)

Country	System	Subscribers	Total penetration <sup>1</sup>
Andorra	NMT-450	189 <sup>2</sup>	4.02
Austria	NMT-450	64.104	12.16
	TACS-900	28.342	
Belgium	NMT-450	45.204	4.56
Cyprus	NMT-450	3.929	5.16
Denmark	NMT-450	52.183	31.48
	NMT-900	109.661	
Faroe Islands	NMT-450	1.222	26.00
Finland	NMT-450	144.734	52.73
	NMT-900	117.325	
France	RC-2000	259.523	5.90
	SFR NMT-450 <sup>3</sup>	72.500 <sup>2</sup>	
Germany	C-450	369.985	4.74
Hungary	NMT-450	4.600	1.31
Iceland	NMT-450	10.896	21.79
Ireland	TACS-900	27.200	7.64
Italy	RTMS	87.707	7.53
	TACS-900	346.142	
Luxembourg	NMT-450	767	1.53
Malta	ETACS	1.707	4.27
Netherlands	NMT-450	29.600	6.76
	NMT-900	71.200	
Norway	NMT-450	145.805	52.09
	NMT-900	72.966	
Portugal	C-450	9.705	0.93
Spain	NMT-450	61.903	2.00
	TACS-900	16.662	
Sweden	NMT-450	245.119	64.08
	Comvik <sup>3</sup>	21.000	
	NMT-900	278.593	
Switzerland	NMT-900	150.767	22.84
United Kingdom	Rac-Vod TACS-900 <sup>3</sup>	671.500 <sup>2</sup>	20.87
	Cellnet TACS-900 <sup>3</sup>	524.500 <sup>2</sup>	
<b>Total</b>		<b>4.047.241</b>	<b>10.75</b>

Note: 1) Per 1000 of population; 2) Estimates; 3) Systems operated by private companies.

Source: *Mobile Communications*. Derived from: *Financial Times Survey World Telecommunications*, October 7, 1991.viii.

Table 8 The world's top 15 suppliers of telecommunications equipment (1988)

Rank	Company	Country	Telecom turnover (million ECU)	Main areas of activities
1	Alcatel + Telettra	France	8040	Public switching, transmission, business communications
2	AT&T	United States	8010	Public switching, transmission, business communications
3	Siemens/GEC	Germany	7990	Public switching, transmission, business communications
4	NEC	Japan	4680	Public switching, transmission, business communications
5	Northern Telecom	United States	4350	Public switching, business communications
6	Motorola	USA	3630	Mobile, business communications
7	Ericsson	Sweden	2960	Public switching, transmission, mobile
8	Fujitsu	Japan	2150	Public switching, transmission, business communications
9	Bosch	Germany	1750	Business communications, transmission, mobile
10	IBM	United States	1750	Business communications
11	Italtel + AT&T NSI	Italy	1615	Public switching, business communications
12	Philips	Netherlands	1440	Transmission, business communications
13	Matsushita	Japan	1200	Business communications
14	Hitachi	Japan	1150	Public switching, business communications
15	STC	United Kingdom	970	Transmission, business communications

Note: Business communications include private switching, terminals and data communications.

Source: *Eurostrategies (ESTEL)*, based on 1988 company figures. Derived from: *Panorama of EC Industries 1991-1992; current situations and outlook for 180 sectors of manufacturing and service industries in the European Community*, Brussels, 1991, chapter 12:23.

#### 4. TRADE FLOWS IN TELECOMMUNICATIONS EQUIPMENT BETWEEN THE EC, THE US AND JAPAN

The Japanese telecommunications manufacturers have found their way to the top. Although none of the Japanese firms has been able to rise into in the EC's Top 15, they are nevertheless strongly represented in the world's Top 15 (see Table 8). They have a strong position in South-East Asia, and they are penetrating the US market. In Europe, the Japanese manufacturers concentrate mainly on business telephone systems, fax machines, equipment related to office automation, and increasingly on



cellular handsets. These markets have not been heavily regulated as is the case with the switching and transmission equipment markets. Table 9 shows evidence of this trend.

Table 9 Japan's telecommunications equipment exports to European countries (in million of US dollars)

	1988	1989	1990
Germany	420	470	446
<i>of which facsimile</i>	362	404	347
United Kingdom	446	483	346
<i>of which facsimile</i>	221	211	124
Netherlands	294	237	246
<i>of which facsimile</i>	267	199	203
Italy	163	144	191
<i>of which facsimile</i>	128	99	87
France	86	156	127
<i>of which facsimile</i>	47	87	38

Source: Derived from: *Communicationsweek International*, December 16, 1991:C15.

On the one hand, it could be said that the appearance of the Japanese manufacturers in the EC market presents no threat whatsoever, because they are not involved in the public switching market. In some of the main markets, like Germany and the UK, the amount of Japanese exports in telecommunications equipment has actually declined. The overall picture, however, is alarming. In 1990, imports from Japan to the five most important telecommunications markets in the EC alone was more than ECU 1.13 billion. That means that the total size of the imports from Japan to the EC is even larger. In 1988, imports from Japan to the EC rose to ECU 1.2 billion, an increase of ECU 0.9 billion in 1987 and ECU 0.7 billion in 1986 (Panorama of the EC industry 1990, Brussels, 1990, chapter 12:24). Increasing imports from Japan has not been balanced by an increase in exports to Japan. These figures confirm that Japanese producers are very successful in penetrating the European market in the area of terminal equipment.

Until now the strategy of the Japanese firms has been to enter the market from the lower end (and from the less regulated side of the market), in order to get a strong foothold in preparation for the next wave of large-scale infrastructural equipment in ten years from now. In this respect, PBX equipment with local assembly in the EC countries comes to mind, or, more longer term, optical switching systems, since the Japanese firms have a strong position in optical electronics and superconductive materials.

However, the question remains whether Japanese equipment manufacturers will succeed in obtaining a large share of the telecommunications equipment market in the EC before the end of the century. The market for telecommunications equipment, particularly switching and transmission equipment, is highly politicized. Doing deals in the world of telecommunications is not easy. The sums of money involved, and the government bodies which are involved in every telecommunications transaction, makes the whole process of buying and selling telecommunications equipment (except for terminals) rather like a sort of diplomacy. It is a process of give and take. Not only in terms of telecommunications equipment or services, but also in terms of compensatory orders in totally different sectors, such as in oil, or defence. It is not price, or quality which persuades buyers to opt for supplier A, B or X. Prices can be adjusted and the world's leading suppliers all deliver high-quality products. What customers are looking for, particularly the PTOs and private network operators, is a long-term relationship with a reliable partner who is able to share the responsibility for the entire telecommunications project, and who can put up a substantial part of the project investment. It may be concluded from the above that there is no 'quick fix' in telecommunications trade as is the case in (consumer) electronics and computers.

Even if the Japanese companies do not succeed in gaining a large slice of the future telecommunications switching market, they will certainly continue to play a significant role in the European terminal market. According to David Charles, in a recent article on procurement in European telecommunications, new investments in the consumer terminals market in Europe are likely to be made by the major audio manufacturers of Japan and Korea (Charles, 1991:142). Already such firms are increasing their investment in other areas of the consumer electronics in Europe, with telecommunications as their next major sector. Compared to consumer electronics, the profit margins and the added value are much higher in telecommunications. In view of the rather depressed situation in the highly saturated market for consumer electronics, it would seem

to be a logical step to enter the telecommunications terminal equipment. Charles gives five reasons why the Single Market will be highly beneficial to them:

- 1) The ability to supply customers direct, thus allowing them to benefit from established and respected brand names.
- 2) Close relations with major electrical retailers in Northern Europe give them an advantage over traditional telecommunications firms without a consumer-oriented culture.
- 3) Harmonized standards allow more effective exploitation of the economies of scale while establishing market share.
- 4) The emergence of a common approach to new broadcasting and communications networks removes a major area of uncertainty.
- 5) The Europeanization of other sectors – advertising, retail, financial services, broadcasting, etc. – will also benefit international market entry.

If we examine the US trade with the EC in telecommunications equipment, we find a totally different picture. Although the EC imports more from the US than it exports to the US, the trade balance is less out of balance compared to the trade balance with Japan. Table 10 also shows that the US is the second largest export market for EC manufacturers of telecommunications equipment after the EFTA countries.

Table 10 EC's trade in telecommunications equipment by region (in mln ECU)

Region	1988			1989		
	Exports	Imports	Balance	Exports	Imports	Balance
EFTA	1038	951	87	1128	1135	-7
USA	412	820	-408	715	1037	-322
Japan	51	1223	-1172	65	1449	-1384
S.E. Asia	186	343	-157	258	408	-150
East. Europe	102	28	74	109	43	66
Rest	1998	331	1667	2377	471	1906
Total	3787	3696	91	4652	4543	109

Note: 1 ECU = 1.2 US dollar

Source: Eurosta. Derived from: *Panorama of EC Industries 1991-1992; current situations and outlook for 180 sectors of manufacturing and service industries in the European Community*, Brussels, 1991, chapter 12:24.

The overall picture is that of a positive trade balance in telecommunications equipment, although there are very substantial differences in trade patterns between the EC and the other regions of the world.

## 5. NEW MARKET OPPORTUNITIES IN TELECOMMUNICATIONS EQUIPMENT AND SERVICES

For only a few years ago the European market for telecommunications equipment and services was regarded by American analysts as a slow-growth market. Some analysts strongly disagreed with this view (Roobeek, 1988:305-306). The continuing high demand for telecommunications and the rapid digitalization of the telecommunications network in Western Europe goes to show that the EC and the EFTA markets are still very important.

### 5.1 Europe has become the Most Important Telecommunications Market

Recent data on telecommunications equipment expenditure in different regions of the world also show that Western Europe is the biggest market for equipment. Western Europe has surpassed the US as the leading market. The world market for telecommunications equipment in 1990 was estimated at about \$ 120 billion. This means that in 1990 the North and South American equipment market was around \$ 35 billion and the market in Western Europe around \$ 40 billion. If we take into account Eastern Europe as part of the European market, then clearly Europe is by far the largest market for equipment. However, the American (US) market is far ahead in terms of telecommunications services, particularly as regards the development of new services.

Table 11 Telecommunications equipment expenditure per region

Regions	1986	1990
North and South America	35.5%	29.3%
Western Europe	29.6%	32.6%
Asia-Pacific	15.0%	15.1%
Eastern Europe	11.7%	13.0%
Asia	3.9%	5.1%
Africa	1.9%	1.9%
Middle and Near East	2.1%	3.0%

Source: TRC. Derived from: *Financial Times Survey 'International Telecommunications'*, April 19, 1990:3.

The importance of Europe as a growth market can also be derived from the growth in the number of telephone lines in the EC, the US, Japan and the former USSR. Telephone lines are regarded as an important indicator for the telecommunications equipment and services market and of market potential.

Table 12 The major telecommunications markets: number of telephone lines

	1970	1980	1987
EEC-12	37.336	87.830	121.930
United States	69.039	94.282	94.906
Japan	14.000	38.611	48.014
USSR	7.200	20.148	24.540

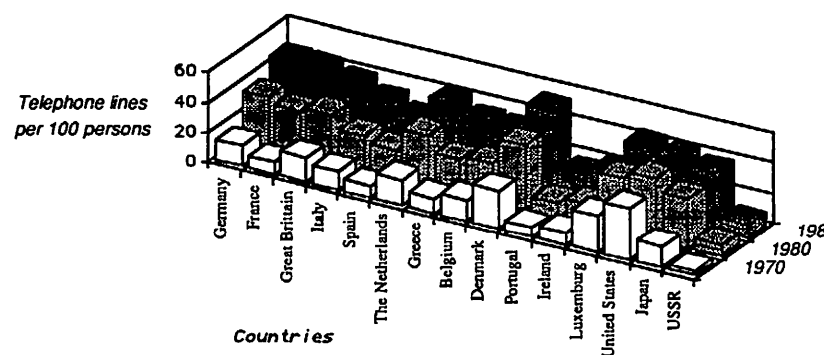
Source: *Compendium of Social Statistics and Indicators*, New York, 1991: 317-329.

The EC has enjoyed a dramatic increase in telephone lines between 1970 and 1980. The number of lines more than doubled. In the period 1980 to 1987, there was an increase of about 45%. If we examine the number of lines in the US we find that the number of telephone lines was already much greater in 1970. Between 1970 and 1980 there was a steep increase, as there was too in the EC, Japan and even in the former USSR. However, between 1980 and 1987 (the latest year for which we could obtain UN

data), the number of lines flattened in the US. In Japan, the market grew, though not as fast as in the EC.

A more detailed examination at country level shows the penetration rate of telecommunications connections in different countries in the EC, the US, Japan and the former USSR. As was stated earlier, a high penetration rate corresponds to a high GDP. It also corresponds to a higher penetration of advanced equipment and new telecommunications services. For the EC market this means that, in particular, Portugal and Ireland are weak markets. However, their low penetration rate is still higher (more than twice as high) than the number of telephone lines per 100 inhabitants in the former USSR.

Figure 2 Telephone lines per 100 inhabitants in 1970, 1980 and 1987



Source: United Nations, *Compendium of Social Statistics and Indicators*, New York, 1991:317-329.

## 5.2 Market Opportunities in Eastern Europe and the Former USSR

In a previous analysis of the telecommunications industry (Roobeek, 1988:324) one of the author wrote: 'A market which is very much underestimated, but which will perhaps become important for the survival of the European telecommunications industry in the long run, is the Soviet Union and the Eastern European market.' This was written two years before the fall of the Berlin Wall in November 1989.

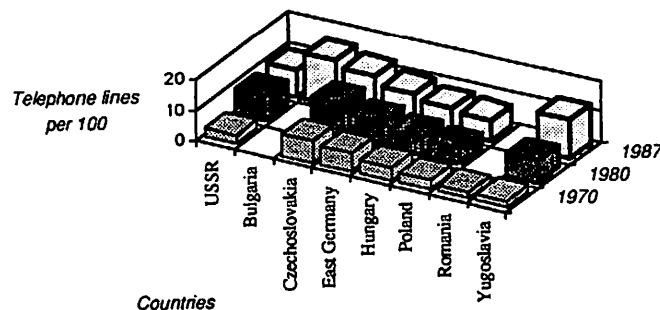
Now, four years later, a great deal has changed, particularly the willingness of European, American and Japanese manufacturers of telecom-

munications equipment and services operators to invest in Eastern Europe and the Commonwealth of Independent States (formerly the Soviet Union; the Baltic Republics and Georgia do not belong to the CIS).

Under the old communist regime, telecommunications infrastructures were severely neglected, partly due to a failure to appreciate the value of communications and partly due to the perception that a free flow of information could undermine totalitarian rule (Hugo Dixon, *Financial Times*, April 19, 1990:1).

Figure 3 shows that the large growth potential in the Eastern Europe when the amount of telephone lines is compared with Figure 2. When making estimates about data on Eastern Europe, we have to be cautious, since it is still difficult to obtain up-to-date 'neutral' data. We therefore consulted the United Nations Compendium of Social Statistics and Indicators. One drawback to it was that the latest Compendium (1991) was only able to provide data up to 1987.

Figure 3 Telephone lines per 100 inhabitants in Eastern Europe and the former USSR in 1970, 1980 and 1987



Note: No data available for Albania. Only one figure available for both Romania and Bulgaria.

Source: United Nations, *Compendium of Social Statistics and Indicators*, New York, 1991:317-329.

Table 13 provides the actual numbers of lines and illustrates the underdevelopment of the telecommunications market in Eastern Europe in comparison to western industrialised countries.

Table 13 East-West comparison of telephone lines per 100 inhabitants

	1970	1980	1987
Germany	14	33	44
France	8	29	44
Great Britain	16	32	39
Italy	12	23	33
Spain	8	19	26
The Netherlands	17	34	42
Greece	10	23	35
Belgium	14	25	34
Denmark	25	43	53
Portugal	6	10	16
Ireland	8	14	22
Luxembourg	24	36	44
USSR	3	8	9
Bulgaria	n.a.	n.a.	15
Czechoslovakia	7	11	13
East Germany	6	8	10
Hungary	4	6	8
Poland	3	5	7
Romania	2	n.a.	n.a.
Yugoslavia	2	7	13
United States	34	41	41
Japan	14	33	38

Source: *Compendium of Social Statistics and Indicators*, New York, 1991: 317-329.

The opening up of Eastern European economies has increased the demand for telecommunications. This is the basic, modern infrastructure necessary to build up further economic relations with the West. The scale of demand and the objectives are enormous. Most of the existing equipment, outside the privileged military sectors is technologically obsolete and much of it 40 years out of date or even pre-war. It is impossible to give an accurate estimate of the market potential in Eastern Europe and the former Soviet Union. However, it is estimated that the investments required to modernize services is likely to be more than \$ 100 billion over the next two decades (Robinson, 1991).

Since 1990, not only European suppliers but others too, have been extremely active in this new market. Many joint-ventures have been concluded between European manufacturers of telecommunications equipment and local suppliers. Alcatel and Siemens particularly seem to have secured good footholds in these new markets. As regards Alcatel, it benefits from its large manufacturing base in Germany where its SEL subsidiary is based. The European telecommunications companies will have to take risks in their ventures with Eastern Europe, because they have not been able to secure large market shares in the rather closed markets of the US and Japan. The exception is Siemens, which has a substantial market share in the US which it obtained through strategic alliances and takeovers. Apart from Alcatel and Siemens, Italtel, AT&T NSI, Ericsson and Northern Telecom have also made inroads in Eastern Europe.

Trade with Eastern Europe and the Independent States of the former Soviet Union is very different from trade with Western countries. Firstly, there are still restrictions such as the COCOM rules designed to prevent these countries from using dual technology. Such regulations make the telecommunications trade very difficult, because most of the technology used in telecommunications systems is of a dual use character. This means that almost every item of equipment can be used for civil or military purposes. In September 1991, new COCOM rules came into effect, which brought about a significant relaxation of restrictions on western exports. Moscow, for example, will now be allowed to buy fibre-optic cables (with a capacity of up to 45 megabits per second), which are equivalent to the best available in the US a decade ago. They will also be able to buy high-powered telecommunications switches and other equipment which at one time had been banned. Sovintel, a joint-venture formed by GTE, the US telecommunications group, the Soviet PTT and San Francisco-Moscow teleport, a US-Soviet joint-venture, plans to improve telecommunications links for business and hotels.

The relaxation of export restrictions not only has a lot to do with the political changes in Eastern Europe and the former Soviet Union, but also a lot to do with economic interests, not least those of the American government and American industry. The needs of western businessmen, too, for better telecommunications have spurred on the changes of export regulations.

Secondly, the other reason why trade with Eastern Europe is so different, is that telecommunications equipment companies and Western PTOs are requested to invest heavily in the long-term telecommunications

projects in those countries. Contracts are usually only awarded if Western companies can demonstrate their willingness to set up large equipment-manufacturing plants, and to provide training.

In the light of the rather uncertain situation in the economies of Eastern European, trade with this part of the world remains an exciting though high-risk business.

Until now, it would appear that the American equipment producers and network operators have been more successful in being awarded large-scale contracts in the former Soviet Union, in Poland and in Czechoslovakia. Poland, Hungary and Czechoslovakia are together considered to be the 'fast track' countries. Massive investments are underway. The role of the World Bank and the European Bank for Reconstruction and Development is crucial since they provide very considerable loans for the installation of new telecommunications infrastructures in Eastern Europe. The pace of modernization is expected to be slower in Bulgaria and Romania. Based upon recent articles in the *Financial Times*, *Communications Week International*, and clippings from *Telecombrief*, a somewhat anecdotal impression of the activities in telecommunications in Eastern Europe now follows.

In August 1991, Cable & Wireless agreed to acquire a 33% stake in Sovam Teleport, a Soviet-American telecommunications joint venture. A consortium consisting of Cable & Wireless, the American Simpex Wire and Cable Company and the Soviet Ministry of Post and Telecommunications, agreed to build two high-capacity undersea cables linking the west and east coasts of the Soviet Union to the existing international fibre-optic network by 1994. This \$ 100-150 million project aimed at avoiding security problems by making full use of high-capacity cables outside the former USSR and allowing the internal network to modernize itself as far as possible, within the limitations of western export controls.

A consortium consisting of the Danish firm GN Great Nordic and Telecom Denmark (the Danish PTT) have recently signed a contract to build the first fibre-optic cable between the former Soviet Union and the outside world.

In Armenia, AT&T inaugurated the first direct-dial service between Armenia and the rest of the world. Total costs involved are about \$ 6 million, with AT&T putting up \$ 4.2 million and Armenia paying the rest.

In Leningrad, Krasnay Zarya (Red Dawn) has set up a joint-venture with Alcatel Bell, the Belgian subsidiary of Alcatel, to manufacture the French company's new generation of digital exchange called 'System 12'.

This contract was only achieved after intensive lobbying by the Belgian government. The state-owned Belgian Post and Telecommunications authority is also involved in this contract. Siemens has teamed up with a defence plant called Motozavod, east of Moscow, to produce the German company's EWSD's digital switching system.

In the Ukraine, the second most important Independent State of the former Soviet Union, AT&T has agreed to a joint-venture with the Ukrainian government (51%), and the Dutch PT Telecom (10%), to install 60 new international circuits (with a capacity of 2,000 telephone conversations), and to build and operate a long-distance network connecting 13 of the Ukraine's 25 telephone districts.

Poland recently received a \$ 120 million telecommunications loan from the World Bank. Total investment in telecommunications in Poland is estimated at about \$ 1.5 billion over the next decade. AT&T has been very successful in Poland, where it signed a \$ 600 million contract with the Polish PTT in June 1991. Siemens, Alcatel, Italtel and Ericsson — following heavy lobbying by the Swedish government — have also been awarded contracts in Poland. According to a European Commission publication, Alcatel's equipment orders to Poland have reached more than \$ 170 million.

Alcatel SEL and Siemens have both secured 30% of the supply market by signing joint-venture agreements with Tesla-Liptovsky and Tesla-Karlin of Czechoslovakia.

US West and Bell Atlantic have signed a joint-venture agreement with the two PTTs in each republic, to supply Czechoslovakia with cellular telephones and packet-switching data networks. The network provided by the joint-venture, called EuroTel, is already in operation in Prague, Brno and Bratislava.

Modernizing the telecom infrastructure in the former East Germany (GDR) will cost \$ 30 billion. It is expected that predominantly German telecommunications suppliers, like Siemens and Alcatel's German affiliate SEL, will benefit from this market.

Ericsson has supplied an AXE exchange to Hungary for the international gateway. The company also supplied the cellular mobile telephone NMT-450 to Hungary which, at the end of 1991, had an estimated 20,000 subscribers. HTC, the Hungarian state-owned telephone company has planned to invest \$ 140 million in equipment. Three quarters will be spent on a digital overlay network. The 56 digital switches required for the network will be supplied by Ericsson and Siemens. The money will be provided by international organizations like the World Bank (\$ 150

million), and the European Investment Bank (\$ 100 million). There is also a mobile telephone venture between HTC and US West, called WesTel, which had 5,000 customers in 1991. Alcatel has signed three co-operative agreements in Hungary for private networks, microwave links and a public switch network.

The list of new contracts can easily be expanded. The point was simply to give an impression of the enormous activity among Western telecommunications companies in Eastern Europe. However, these markets, which potentially are highly lucrative, are still a long way from generating a significant turnover. According to Pierre Suard, Alcatel's chairman, 'the main uncertainty stems from the fact that the traditional socio-economic system has been done away with, and has not yet been replaced by a clear and stable new system. This calls for a great deal of indulgence and patience' (Marchal, 1991:17).

#### 6. CO-OPERATION AND CONCENTRATION: THE DEVELOPMENT OF NEW CONSORTIA

It is clear from the above list of companies bent on securing a foothold in the new Eastern European markets, that it is always the same names which keep reappearing. This is not just the case in new markets, but also in established markets in the western industrialized world. The telecommunications equipment industry is highly concentrated, as is the telecommunications services sector.

Table 14 Concentration ratio of telecom equipment manufacturers in the EC and in the world (1989)

% of total market share	World	EC
TOP 5	32	65
TOP 10	49	81
TOP 20	62	92

Source: *Panorama of EC Industries 1991-1992; current situation and outlook for 180 sectors of manufacturing and service industries in the European Community*, Brussels, 1991, chapter 12:22.

The concentration is high, both at EC level and globally. The Top 20 of the world's suppliers represent 62% of the total world market. The Top 10 suppliers in the EC control 81% of the market. Apart from Motorola, which is American based, these suppliers are all European.

The outlook for new entrants from Japan and South-East Asia may actually be rather hopeful for the terminal equipment market, as was illustrated in section 4 of this chapter. However, it is very much the question whether there will be any room for new entrants in the transmission and switching market. If we examine the joint-ventures that have been set up between the world's Top 15 equipment suppliers and their Eastern European partners, it is doubtful whether one of those Eastern partners will ever reach a position in the top. Their dependency on technological capability, distribution logistics and manpower of the Western companies is so great that it seems likely that in the end these Eastern partners will become part of Western companies. Or, to put it another way, Western telecommunications companies (including the Japanese electronics companies in the top league) will control the global telecommunications manufacturing and services market.

Table 15 Cross-border acquisitions in the telecommunications world

Year	Number of deals	Value in million of US dollar
1985	5	399.0
1986	7	132.0
1987	7	63.0
1988	11	116.5
1989	50	2694.1
1990	67	16539.0

Notes: Number of deals refers to all, while value of deals includes only the deals the value of which were announced. The high value of cross-border acquisitions in 1990 is due to privatisations which occurred in that year (US \$ 9.9 billion).

Source: *Financial Times*, October 9, 1991.

This observation is based on the concentration movement that has been taking place since the early 1980s. Cross-border acquisitions have inten-

sified, particularly since the second part of the 1980s, as a result of the liberalization of markets and deregulation policies of governments and PTOs.

The increase in merger and acquisition activities by telecommunications companies have a lot to do with the high R&D intensity in this sector. On average it is estimated that 10% of revenues are recycled into R&D. Public switching equipment and transmission techniques in particular require high R&D inputs. It is very difficult to obtain data on R&D expenditure by telecommunications companies. Estimates are given in Table 16 of the R&D expenditures in 1987 (the heydays of digital switching development).

The data indicate that large differences between companies exist, though the overall picture shows R&D intensity to be quite high. According to Hans Dinklo, Director of Strategic Planning and Corporate Development at Philips, current digital systems are expected to last 5-8 years. This is much shorter than the electromechanical systems which were in use for 25-30 years, or the analogue equipment which was in use for 8-12 years. The investment curves for the new telecommunications equipment show steep rises. An ISDN can cost \$ 1 billion. According to Dinklo, a telecommunications supplier needs at least 8% of the world market to make an adequate return. But the increasing costs of developing new applications on top of the basic network will mean that by the mid-1990s, the market share necessary to stay in the game will be between 16 and 19% (Dinklo, 1988:2). The result of this competition will be a shake-out of network suppliers. What is more likely will be the formation of collaborative company networks managed by one of the super players. In Table 16, the development of the concentration process has been sketched as from 1980. We have restricted ourselves to the development of the world's Top 10 telecommunications equipment manufacturers. This explains why smaller players, like Hitachi, Oki, Ascom, Philips and Italtel, have not been included. Even within the top league the concentration process goes on. In March 1992 ITT sold its 30% stake in Alcatel for \$ 3.6 billion to Alcatel-Alsthom, the French telecommunications equipment group. Alcatel-Alsthom and ITT came together in 1986 when they merged their telecommunications interests in Alcatel. The acquisition of ITT's shares will not have strategic implications for Alcatel, for Alcatel's majority shareholding already gave it strategic control of the business (*Financial Times*, 4 March 1992:1).

Table 16 Concentration processes in the telecommunications industry  
1980-1990

1980	1985	1990
Alcatel Thomson ITT Telettra	Alcatel ITT Telettra	Alcatel
AT&T APT GTE Amper	AT&T GTE Amper	AT&T
Siemens Rolm Nixdorf GEC Plessey Stromberg-C GTE	Siemens Rolm (IBM) Nixdorf GEC Plessey GTE	Siemens
NEC	NEC	NEC
Northern Telecom STC	Northern Telecom STC	Northern Telecom
Motorola	Motorola	Motorola
Ericsson Thorn MET (Matra)	Ericsson Thorn MET (Matra)	Ericsson
Fujitsu	Fujitsu	Fujitsu
Bosch Telenorma ANT Jeumon-Schneider	Bosch Jeumont-Schneider	Bosch
IBM	IBM	IBM
27 companies	22 companies	10 companies

Note: GTE was divided between Siemens and AT&T.

Source: *Ufficio Studi Italtel*. Derived from: *SMAU Observatory On Information Technology, Multimark 1991*, Italy, 1991:117.

## 7. FUTURE OUTLOOK

The telecommunications industry is adjusting to the new market circumstances of the 1990s. The restructuring of the industry which started in the 1980s is still underway. Although liberalization of the telecommunications equipment market has been underway since the mid-1980s, we have only begun noticing the effects recently. Most PTOs follow the system of tender, which allows for more competition among potential contractors. However, in the market for public switching systems, a definite trend towards duopolies has been observed. Only the smaller countries have shown a more open attitude towards new bidders, often against their own (employment) interests. Increased competition in the market for transmission equipment has led to a situation where several networks and fibre-optic lines have been installed parallel to each other, particularly along trunk routes. Such investments are expected to lead to overcapacity and redundancy in the short term. Moreover, the situation will result in unnecessary waste and environmental damage, an aspect of the equation which seems to have been totally overlooked. Unlike the redundancy situation along trunk routes (e.g. the Atlantic route between the US and Europe, or large networks in densely populated areas), there appears to be a communications shortage in rural areas, particularly in large countries with low population density. The cost of installing advanced telecommunications is simply too high and the revenues too small to interest private companies. This development could lead to severe constraints in the developments of large parts of Eastern Europe and the former USSR.

The whole discussion on deregulation, liberalization and privatization does not provide any answers to these kinds of questions, although it is expected that the problem of telecommunications shortage could become chronic in the decades to come. Jill Hills has given some hints on this for further discussion. She states that we should focus discussion much more on strategies which would reduce the cost of purchasing and maintaining equipment, and which would increase the efficiency of PTOs, through training and education, and through the utilization of the economies of scope and scale of fixed network (Hills, 1989:171). Particularly in view of the world-wide concentration process in telecommunications equipment and telecommunications services, it is imperative that governments, business users and consumers all start to rethink the effects of deregulation and liberalization in order to secure one of the basic ingredients for



equal economic opportunities: a reasonably-priced, free flow of communication and information, globally.

#### REFERENCES

- Charles, David R. (1991), Procurement in European Telecommunications, in: *Utilities Policy*, January:134-143.
- Commission of the European Communities (1990), *Panorama of EC Industries 1990-1991*, Brussels.
- Commission of the European Communities (1991), *Panorama of EC Industries 1991-1992*, Brussels.
- Dinklo, Hans (1988), *New Opportunities in Telecommunications in Europe*, research paper delivered at the Conference 'Telecommunications and New Economic Opportunities in Europe', Newcastle upon Tyne, 13-15 September.
- Financial Times (1991), *Survey World Telecommunications*, October 7.
- Financial Times (1990), *Survey International Telecommunications*, April 19.
- Hills, Jill (1989), Telecommunication Policy: The Movement towards Liberalization and Privatization, in: *Telecommunication Journal*, Vol. 56, no. 3:163-171.
- Johnson, Leland L. (1989/91), Dealing with monopolies in the international telephone service: a US perspective, in: *Information Economics and Policy*, no. 4: 225-247.
- Jong, H.W. de (ed.) (1988), *The Structure of European Industry*, Kluwer Academic Publishers, Dordrecht, 2nd revised edition.
- Marchal, Hervé (1991), Alcatel in Eastern Europe, in: *XIII Magazine*, European Commission, DG XIII, Luxembourg, issue no. 4, December:16-17.
- Robinson, Anthony (1991), Eastern Europe, in: *Financial Times*, Survey World Telecommunications, October 7:28.
- Roobeek, Annemieke J.M. (1988), Telecommunications: An Industry in Transition, in: H.W. de Jong (ed.), *The Structure of European Industry*, Kluwer Academic Publishers, Dordrecht, 2nd revised edition:297-328.
- SMAU Observatory on Information Technology (1991), *The technology, the laws and the market: the international scenario and Italy*, Multimark, 2nd edition.
- Telecombrief, several issues 1990, 1991 and 1992
- United Nations (1991), *Compendium of Social Statistics and Indicators*, New York.

#### ACKNOWLEDGEMENTS

This paper was written whilst Annemieke Roobeek was a Royal Netherlands Academy of Sciences Research Fellow and recipient of a research grant from the Technology Foundation (STW).

## AEROSPACE: THE POLITICAL ECONOMY OF AN INDUSTRY

KEITH HARTLEY

### 1. INTRODUCTION

Aerospace is a leading, high-technology sector which is believed to be central to Europe's future international competitiveness. It is research and development (R&D) intensive, requiring substantial inputs of human capital (e.g. scientific manpower), with potential technical 'spin-off' for the rest of the economy. It is also involved in the newly-emerging market in space. Traditionally, it is an industry which has been dominated by government with its defence demands and a national desire for independence. Increasingly, however, there are some aerospace R&D projects where the minimum entry costs are so high that it is necessary for nations and firms to combine. Already, European aerospace firms are collaborating in military and civil aircraft, helicopters, missiles and space projects and such collaboration provides the basis for the eventual creation of a European aerospace industry. In addition, the desire for a 'peace dividend' will mean smaller defence markets and an inevitable re-structuring of Europe's defence-dependent aerospace industries. These trends towards international collaboration and re-structuring will be reinforced with the ECs emphasis on creating a single European internal market, including its possible extension to defence equipment.

This chapter provides the basis for understanding European aerospace industries and their likely future structural changes. After a description of the market, the economic characteristics of aerospace industries are outlined, followed by an analysis of structure, performance and collaboration. The possible opening-up of EC defence markets and the implications of cuts in defence budgets are also considered.