SOCIAL EUROPE

Supplement on NEW TECHNOLOGIES AND SOCIAL CHANGE

TELECOMMUNICATION

COMMISSION OF THE EUROPEAN COMMUNITIES

DIRECTORATE-GENERAL FOR EMPLOYMENT,
SOCIAL AFFAIRS AND EDUCATION

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This publication is also available in the following languages:

DE ISBN 92-825-4586-5
FR ISBN 92-825-4588-1

Luxembourg, Office for Official Publications of the European Communities, 1985

Catalogue number: CE-NC-84-002-EN-C

ISBN 92-825-4587-3

Printed in the FR of Germany

S U M M A R Y

E D I T O R I A L

Over the last few years, telecommunications have undergone profound changes that have provided a number of improvements in the service the sector provides.

Thus there has been an almost simultaneous introduction in all the Member States of new technologies for the transmission and switching of signals. Optical fibre cables have, since the end of the 1970's been tested and integrated in the trunk networks - the highways of the telecommunications network.

More recently the first two satellites - ECS-1 and ECS-2 of the European Satellite Communications Organisation - were launched. In the early 1980's steps were also taken to replace the electro-mechanical and semi-electronic switching systems.

This technological development in telecommunications will improve the so-called "first-generation services" (telephone, telex, datel); it will allow the introduction of "second generation services" which require digital systems (datex, teletex, datatex, telemetry, etc.) and will ultimately provide the technological basis for "third generation" (broad-band) services (videoconference, videophone, etc.).

The change of technology and the introduction of new services will, in all the countries, require major efforts to be concentrated on education and vocational training.

Regarding employment the prospects are uncertain. Much will depend on the introduction and spreading of new (second and third generation) services which will counteract the falling demand for labour due to automation and digitalisation of the networks.

One thing is certain, however, the debate on the future of telecommunications services and networks will continue due to the diversity of attitudes between present and potential equipment providers;

between state monopoly authorities and private contractors; between Community and national interests.

The Commission's intention in publishing this issue is to provide the debate in the Member States with evidence emphasizing the necessity for a Community approach in the field of telecommunications.

J. Degimbe

Director General
for Employment, Social
Affairs and Education

FIRST PART : COMMUNITY ACTIONS

COMMUNITY ACTIONS FOR A POLICY ON TELECOMMUNICATIONS

COMMUNICATION NETWORKS, OR THE CONVERGENCE OF KEY TECHNICAL, ECONOMIC AND POLITICAL ISSUES FOR EUROPE

COMMUNITY ACTIONS FOR A POLICY ON TELECOMMUNICATIONS (*)

I. INTRODUCTION

As early as its 1979 communication to the Council concerning new information technologies (doc. COM(79) 650 f.), the Commission had stressed how the development within Europe of competitive and cost-conscious telecommunications networks, offering a wide array of new computer-based information systems and services, together with a Community market open to European industry, could provide a considerable stimulus to the Community's economic expansion.

Throughout the intervening period, the Commission and the Member States have been discussing ways of opening up national telecommunication authority procurement contracts, but so far without coming to any firm decisions.

The pace of advance in the telecommunications sector, however, has been quickening. The introduction of digital technology into communications has literally revolutionised the face of modern telecommunications. Rapid technical advances, the growing cost of research and development, the need for common standards to enable increasingly intelligent terminals to talk to one another; the reigning uncertainty as to what types of new service should be introduced and when, and the fragmentation of Europe's markets are all problems clamouring for an answer at Community level. It was for these reasons that the Commission, on the initiative of Vice-President Davignon, began in 1983 an approach towards a general Community policy on telecommunications.

II. LAUNCHING THE COMMUNITY POLICY IN THE FIELD OF TELECOMMUNICATIONS

The first steps in the Commission's move to introduce a Community telecommunications policy came with its transmission to the Council of two communications on telecommunications (doc. COM(83) 329 f. of 8 June 1983

(*) The author of this article is Christian GARRIC, Information Technologies and Telecommunications Task Force.

and COM(83) 573 f. of 29 September 1983) (1). The former was a general policy document, while the latter laid before the Council six guidelines for action:

Guideline I : Setting medium- and long-term Community objectives.
Guideline II : Common R&D actions in key growth areas.
Guideline III: Common action to develop approved interface standards, a clearly defined Community market, and the development of Community solidarity towards external interests.
Guideline IV : Joint development of the transnational part of the future telecommunications infrastructure within the Community.
Guideline V : Use of modern telecommunications techniques to build up a more advanced infrastructure in the least favoured regions of the Community.
Guideline VI : Common action to open up that part of the market in telecommunications equipment dominated by public procurement.

The Council, having noted both communications and following the Commission's proposal, agreed at its session of 4th November 1983 that the Commission should set up a Group of Senior Advisers to Ministers for Industry to:

- help the Commission define and implement a Community policy on telecommunications;

- determine, through contacts with the sectors of industry concerned and the telecommunications authorities, the elements of a programme of action essential for the balanced development of the sector.

This Group met fourteen times between November 1983 and June 1985. Its collaboration enabled the Commission to forward two communications to the Council in May and December 1984 on progress with the action programme as well as a number of concrete proposals for action.

The action programme revolves around three objectives :

(1) to make available to users, at least cost and delay, the equipment and services needed to make and keep them sufficiently competitive;

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(1) COM documents can be obtained from the Office for Official Publications of the European Communities, L-2985 Luxembourg.

(2) to stimulate European production of telecommunications equipment and services in order to create the conditions which will enable the Community industry to maintain its strong presence in the European market and retain its leadership on world export markets;

(3) to enable businessmen to meet the impending technological and industrial challenges they face with the best resources and at least risk.

The actions proposed in the programme fall under four main heads, all to be followed at Community level with the aim of meeting the Community's own pre-set objectives.

The four categories of action are:

(1) setting up a common telecommunications market by means of a Community policy on standardization and specific measures with regard to type approval of terminals and opening up the market for network operators;

(2) reducing the uncertainties which are stunting the growth of services and networks by establishing a common framework for discussion and consultation, and by promoting major infrastructural projects of common interest;

(3) improving Community expertise in certain basic technologies;

(4) taking full account of the regional dimension.

Council of Ministers' Meetings having given a positive reception to the Commission's proposal, the Commission is now implementing the action programme.

III. THE PROGRAMME OF WORK

The Commission, on the advice of the Group of Senior Advisers set up by the Council of 4th November 1983, has formulated a plan defining the work to be achieved, the objectives to be attained, the procedures to be implemented and the timetable to be followed to accomplish each of the four major heads of action.

a) The work in the first category of actions is aimed particularly at two target areas:

- Development of standards and type approval procedures

The Commission has signed with the European Conference of Postal and Telecommunications Administrations (CEPT) a joint declaration of intent concerning standards and type approval for telecommunications equipment.

This declaration forms the basis of future cooperation between the CEPT and the Community and defines the work to be accomplished by CEPT under the terms of a plan of work to be drawn up by the two parties jointly.

The aim is to foster the uniform application of international standards within the Community and the mutual recognition of type approvals for terminals by agreeing on common type specifications.
In this context the Commission, after consulting the national post and telecommunications authorities, industrial interests and end-users, will be setting priorities for the finalisation of standards and type specifications. The CEPT will take charge of the necessary technical work. For its part, the Commission has just put forward to the Council proposals on a Directive to ensure that the standards produced out of this process are put into effect by the relevant public agencies in the Member States. The initial results of CEPT's work will be available during the second half of 1985.

- Opening up the telecommunications authority market

There emerged from the meetings of the Group of Senior Advisers a general feeling that the Council should discuss two Recommendations concerning:

- the introduction of harmonization in the field of telecommunications;
- the first steps towards opening up public supply contracts for telecommunications equipment.

The Council has examined these Recommendations which should allow for the introduction of machinery to release around 10% of the annual value of public procurement contracts in telecommunications, and

approved them on 15th October 1984.

b) As far as the second category of actions is concerned, a Working Party on Analyses and Forecasting was set up in October 1984 with a remit to:

- undertake the common study of the development of telecommunications within the Community and its economic, industrial and strategic ramifications;
- formulate common views on the medium- and long-term outlooks;
- identify common objectives and analyse the intermediate stages leading to convergence.

Initially, the Working Party looked into the problems connected with the development of integrated services digital networks (ISDN) and has issued a report.

With regard to major infrastructural projects of common concern, a feasibility study into a proposed video-communications link between high-level government officials has been undertaken; the subsequent phase of the project is being discussed.

An initial study on the probable future development of telecommunications services has also pointed up the interest of establishing a Community-wide network of major broadband communication channels by 1990 to serve the communication needs of business. This network would be integrated into the future broadband and ISDN network planned for the 21st Century. This project is receiving active consideration.

Finally, a feasibility study on second generation transnational cellular mobile telephone systems is underway.

c) The Commission forwarded a proposal to the Council in March 1985 concerning the drawing up of an R&D programme in telecommunications. The Council of Ministers of Research, at its meeting of 4th June 1985 in Luxembourg set out the gist of an agreement to move to the drawing-up phase.

d) Studies are underway to define in concrete terms the actions which it would be desirable to launch, with assistance from Community financial instruments, to enable the Community's least favoured regions to take advantage of modern communications technologies and the spill-over effects of general Community telecommunications programme to boost their own development.

IV. CONCLUSIONS

Taken together, all the foregoing actions form a comprehensive and interlocking programme for achieving the Community's objectives. They should assist European industry and network operators take up the challenge of the future, and help users benefit from the modern telecommunications services which are essential to the economic growth of the Community.

COMMUNICATION NETWORKS, OR THE CONVERGENCE OF KEY TECHNICAL ECONOMIC AND POLITICAL ISSUES FOR EUROPE (*)

The offspring of the union between data processing technology and telecommunications has been an explosive proliferation of new uses for communication networks. Time-division switching, digitization of continuously variable signals, multiplexing techniques, the development of increasingly high-powered transmission environments, are some of the technological advances which are paving the way for:

- interactive broadband communication;
- the sending of voice, data and images over the same networks, after conversion into binary digital signals;
- the proliferation of terminals which can be hooked-up to networks (telephone, computer, word processor, telecopiers, funds transfer systems, mobile cellular systems);
- the development of new value-added services (automatic waking calls, personal line switching, automatic alarms, electronic mail, meter reading...).

The integration of telecommunications and data processing services will lead to an array of human activities being assumed by the network; it will lead to a fundamental restructuring of many fields of activity, with the network as focal point. What we are witnessing is a shift in the centre of economic and political gravity to a communication base.

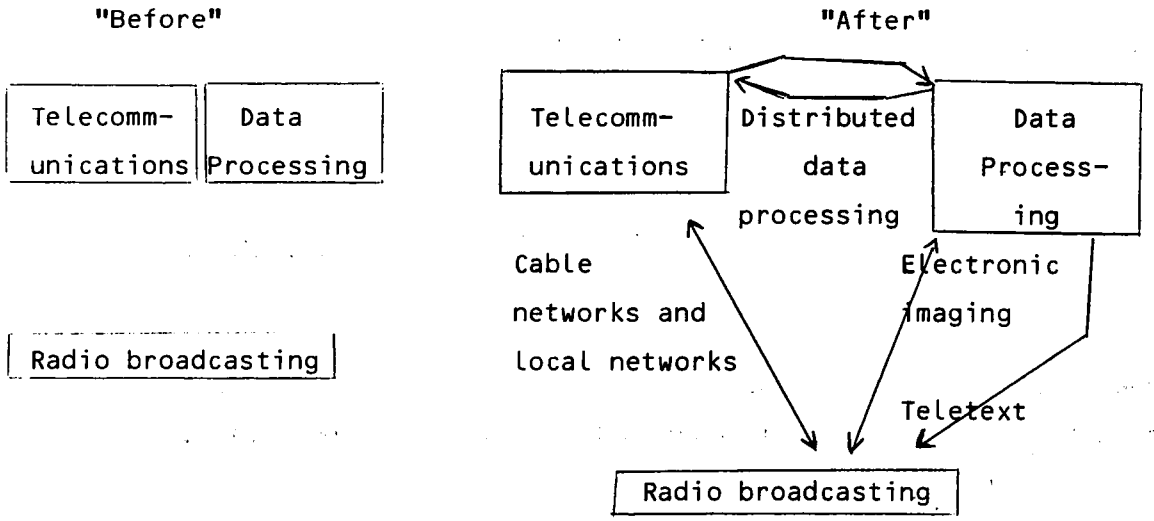
The urgency of the questions posed by this shift in focus for the actors on the European stage is equalled only by their complexity.

(*) The author of this article is Nicole DEWANDRE, FAST (Forecast and Assessment for Science and Technology), Commission of the European Communities. Address to the symposium staged by the Université Libre de Bruxelles (5-7 December 1984): "Man, the Computer and Organisation".

Europe now finds itself, in fact, on the horns of a strategic dilemma, faced with the external challenge of retaining control over its own network , and the internal one of giving a sense of direction to those networks and putting them at the service of users (business, administrative authorities, individuals).

The field in which solutions to these problems must emerge is a highly polarised one: the divestiture of AT&T and the deregulation of the long-distance market in the United States have exerted undeniable pressure on the debate in Europe, calling on player in the arena to take a stand on the deregulation issue. But beyond these questions lies the thorny area of radio- and TV-broadcasting with the momentous choices that must be made between cable networks, radio and satellite transmission. What is more, the divisions between telecommunications and radio broadcasting are becoming increasingly blurred at the edges, putting the actors on the communications stage in an entirely new strategic setting.

What are emerging now are a variety of different sources of structural change:



Merely listing these trends should give the reader some idea of the breadth and depth of the upheavals we are heading for: how is the chief executive of Havas, or American Express, going to position his company on the emerging markets; what exactly will the Smiths and the Joneses

be looking to acquire next...? An entirely new strategic dimension is being conjured into existence.

The aim of the COM programme, under the aegis of FAST, is precisely to assess the opportunities and the pitfalls for Europe of the impending shake-up in communications and the corresponding "strategic industrial system". And that means identifying the different forms communication might take and suggesting ways of getting there.

The discussion rests on two premisses:

- it is of strategic importance for any community, however constituted, to have efficient communication networks at its disposal;
- the management of the communication function implies choices of a normative character, which cannot be brought down solely to questions of effectiveness.

Between the two opposing extremes of total liberalization of network operation on the one hand, and preserving the status quo of the telecoms on the other, we have to design other alternatives in which to configure our two basic premisses. This can only be brought about by making a clear-cut distinction between the respective roles of the public and private sectors.

And it is in that clarification that the European market may discover its specific uniform character.

There are three factors, however, which make any distinction on a caused-and-effect basis problematic:

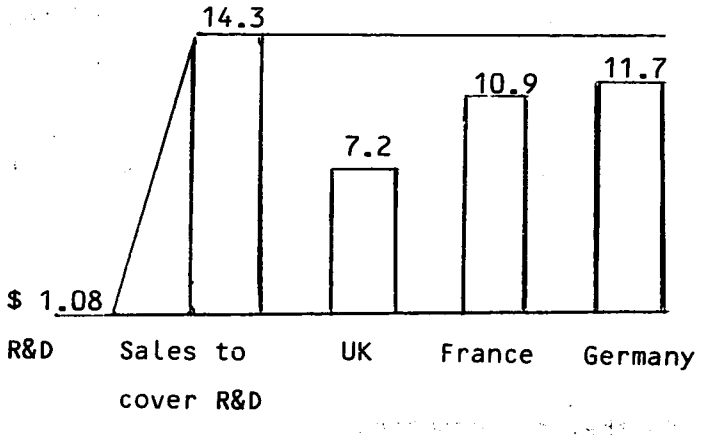
- the intense level of R&D in the telecommunications industry;
- the question of standards in the telecommunications industry;
- the by-passing of national powers which may result from the development of telecommunications.

The intense level of R&D in the telecommunications industry

It is hard to optimise the allocation of R&D resources in a competitive environment, particularly when their payback period and rate of return

are so uncertain. The intensity of R&D in the telecom industry is a significant clog on its development. A company needs to be able to rely either on a sufficiently large, captive domestic market, as in the USA, or, where the home market is too limited, on outside capital (as with the European countries). Take the market for digital central switching exchanges, for instance, where McKinsey estimates the Sales/ R&D cover at 7% for the telecommunications industry. Given that the costs of research and development into the next generation of digital switching systems will be in the order of one billion dollars, a company investing that kind of money will need to achieve $ 14.3 billion in sales just to keep abreast of the competition - a figure well in excess of the potential of any national market in Europe (c.f. chart below). The fragmentation of the European market is an obstacle to the emergence of a competitive export industry.

European market fragmentation - Next generation digital exchange



Projected markets 1980-1990

Source: Interviews, Mackintosh, Telephone Engineer Management, McKinsey Analysis.

The set-up in Europe, therefore, constrains governments to finance R&D in telecommunications directly or indirectly, whilst private enterprise finds itself forced into cover ratios somewhat in excess of the 7% reference figure just mentioned. The ratio reported by the CIT-

Alcatel Group, for instance, varied from 10% to 11.3% over the years 1978-1982 L.M. Ericsson's ratio is 8.4%, Olivetti's 7.5%.

At all events, and whatever the existing national situation (natural monopoly and/or state-funded R&D), the public sector is finding itself at the receiving end of demands either to cushion customers from the effects of monopoly practices by guaranteeing them"reasonable" value for money, or by providing public money to help finance the development of new products and services.

The question of standards in the telecommunications industry (including home and business information systems)

You cannot build up a communications market without at least a minimum number of standards. A Belgian telephone cannot be connected up to the French public network, it is worthless to a French consumer: Belgian telephones have no market in France. That reasoning is equally valid for the entire terminal equipment industry.

And increasing digitization demands increased standardization: a series of impulses is meaningless until it is decoded. in an analog signal, the electric impulse causes the membrane of the telephone to vibrate producing the sound "A", or alternatively deflects a beam of electrons to form a letter "A" on a screen. With a digital signal, however, those concerned have already had to agree that "11000001" represents "A", and that the significant unit is an eight-bit byte. That is not to deny the need for standards in analog communication of course (sweep rate, frequency range used, signalling...) but digitization widens the range of fields in which standards are required.

The need to communicate does not create a market per se, as does the need for food, for example. If we are to identify a communication market in the economic sense of the term (that is, the production and consumption of goods satisfying a communication need) then it must, in a sense, be brought about piecemeal through the definition of the market's 'software', or, to put it another way, its standards.

These standards, however, are not governed by market forces, but rather by the law of the jungle. If the public sector were not to involve itself in the setting or administration of standards, then those companies capable of imposing their own would be handed a powerful weapon for cornering the market. The problem is made more acute in Europe by the fact that the companies concerned are not European ones...

The by-passing of national competences resulting from the development of telecommunications

The expansion of communications networks may give rise to, or intensify, a conflict of competences between the political sphere (in the widest sense) and the economic sphere. Communication technology hands us the technical tools with which to create a world market for an increasing number of products. The business dimension within which an economic operator seeks to maximize his function/objective (utility, profit...) is constantly expanding, whilst his "personal space" remains more or less stable (few people commute daily by air, and friends rarely use videoconferencing facilities to keep in touch). Man travels less quickly than data and is more at the mercy of his immediate environment: the widening of the horizons of economic life and the relative stability of the socio-political frame pose problems both of organisation and priorities.

More than that, they throw the whole basic relationship between politically-organised entities and the scope of economic life into question.

What is the significance or our new-found ability to compartmentalize our physical and "relational" environments? Once we have done away with the constraints of physical proximity, what remains of the concept of 'society' or of 'belonging to' a society, as we know it? Are we to expect that differences will become accentuated in a reaction to the uniformity resulting from the organization of economic activity on a transnational scale? And what will be the macroeconomic feedback from these differences for the countries (in the geographic sense) concerned? Are we heading towards new forms of relationship between

economy and society (where "small is beautiful", or conversely towards a plethora of microprotectionist closed doors)? Will the possible deliquescence of "old" solidarities based on the national economy lead us 15-20 years hence to question the validity of some of the machinery we now accept for organising our socio-political lives? For example it might be wondered how and on what bases the nation states will manage to continue to redistribute the fruits of society in the way they do now (education, social security, unemployment...).

All of which tends to point to the size of the question mark which may be hanging over the future validity of the public sectors of nation states.

The three points just outlined put the public sector firmly on the spot, since it must finance R&D, control the standardization process in order to preserve competition and withstand the doubts about its validity if it fails to act at a relevant level.

It seems to me that, in a very preliminary sense, a monetary analogy might open up possible ways to a solution to this problem (1).

Communication networks are to exchange what money is to price: a means to an end. Now, exchange and price and two essential determinants to the functioning of a market. They can therefore be considered as exogenous or predetermined variables.
This endows both communication networks and money with a dual character with respect to their markets:

- as goods assuring the functioning of the market, they can be regarded as exogenous to it

- as goods which can be exchanged, they can be regarded as endogenous to the market.

The assessment of the part played by the public sector in relation to these two goods is determined by the manner in which we choose to

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(1) Without wishing to confer on it anything like the status of a pragmatic explanation.

represent this dual nature, and in particular its dominant pole. Where the exogenous variables predominate, it could be described as "exo-dominant"; where the endogenous factors are more important, it would be "endo-dominant". Let us take a simple example involving money. An exodominant representation of monetary duality would favour the creation of a fixed parity exchange market based on some form of standard (gold, average consumer price levels...), whereas an endodominant representation would bring us to floating exchange rates determined by supply and demand.

This monetary duality, together with the long-term pattern of see-sawing between variables has left deposits which have gradually built up into a complex machinery of regulations, practices and relations, both internationally between industrial and financial markets and between nation States, and nationally between the public and private sectors.

But who and what will be the communication equivalents of the central banks, the IMF, the commercial banks, the dollar...?

And it is to the extent that the monetary situation points up the limitations of a public monopoly/privatisation alternative in the case of non-specific goods that it can help us build an array of other options between these two extremes for the management of Europe's communication networks.

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SECOND PART

TELECOMMUNICATIONS
ACTIVITIES IN THE MEMBER STATES

INTRODUCTION - TELECOMMUNICATIONS AND SOCIAL CHANGE
OVERVIEW OF NATIONAL REPORTS (*)

Telecommunications have within a very few years undergone profound changes that have affected networks and services and even the organization of the sector.

There has been an almost simultaneous introduction in all the countries of the EEC of new technologies for the transmission and switching of telecommunications signals. Optical fibre cables have, since the end of the 1970s, been tested and integrated in the trunk-networks - in the highways of the telecommunications network ; more recently, the first European communications satellites were launched. The first steps to replace the electromechanical and semi-electronic switching by fully digital systems were taken in the beginning of the 1980s. Subscriber equipment is being developed and adapted to these new technological conditions.

This technological development in telecommunications will improve the so-called "first-generation services" (telephone, telex, datel) ; it will allow the introduction of "second generation services" which require digital systems (datex, teletex, datatex, telemetry, etc.) and will ultimately provide the technological basis for "third generation" (broad-band) services (videoconference, videophone, etc.).

The Integrated Services Digital Network was in most countries the technological concept chosen by the national telecommunications authorities. All types of services - whether they involve the transmission of voice, data or pictures - will be carried by a single network based on digital technology, laser technology, optical fibre cables and satellites. The first steps towards such an integration will be taken by the end of the 1980s by uniting the now separated telephone, telex and data communication networks : Germany expects to introduce an "integrated services network" on a national level in 1988 ; France plans to introduce a similar network in 1990.

(*) Prepared by Anders Joest HINGEL, Institute of Work Sociology and Organisation, Copenhagen School of Economics and Social Science, Copenhagen. This article, as well as the following national reports emphasizes the development related to the service providers and carriers and to the industry of telecommunications equipment. Aspects concerning consumers of telecommunications services and general cultural aspects are therefore not discussed.

For an explanation of telecommunications terms, designations, abbreviations, etc., please see the section : "Telecommunications Terminology"

The introduction of these advanced technologies in telecommunications will strongly influence developments in other technological fields. There will be a gradual integration of high-technology systems and telecommunications in the fields of office automation, manufacturing automation, high-technology-supported-education-and-research-systems, etc.

During the same period, and partly because of the introduction of digital technology, optical fibre cables, satellites and not least new services, the institutional framework of telecommunications has been subject to important changes in several countries. The most spectacular example in Europe is the abolition by 6 August 1984 of the public monopoly in the United Kingdom on telephone systems and the selling of British Telecom, by November of the same year. Other countries are preparing for changes in the organization of the telecommunications sector. The German Government is considering the possibility of allowing private companies to provide value-added-services. The Dutch Government has set up a commission to investigate the future structure, authority and control of telecommunications companies and a Danish governmental commission has been asked to present proposals on how to decrease public involvement in the sector. As regards Italy, a bill will be presented in parliament concerning a reorganization of the telecommunications services. The general situation in Europe is characterized by a public monopoly in telecommunications networks and services, whereas the subscriber equipment market has been opened in the United Kingdom and Ireland and is partly open in most other countries.

II. THE SPREADING OF TELECOMMUNICATIONS NETWORKS AND SERVICES

The national telecommunications carriers and producers have in many countries been engaged in testing the technical feasibility of telecommunications networks applying optical fibre cables, as well as the social need and applications of new services. One example is the Dutch experiment, DIVAC, in Geldrop. This network, which was set up in 1980, provides its subscribers - only two - with services like : two-way video communication, videolibrary, home banking and shopping, electronic newspaper, etc. The British Milton Keynes project is another example of a limited-scale experiment involving only a handful of subscribers. Limited-scale experimental optical cable networks have also been started up in Germany and in France. The French optical fibre cable network which was constructed in Biarritz and started up in May 1984, is expected to have some 1,500 subscribers by the beginning of 1985. The German BIGFON optical cable network will, when it is set up, cover seven bigger German towns (Hamburg, Hanover, Düsseldorf, Stuttgart, Nürnberg, Munich and West-Berlin) and will include ten networks. During the test period, 350 subscribers will, until 1986, be provided with 12 TV and 24 radio programmes, as well as services such as videotex, telefax, datex and teletex.

Optical fibre network in fact play a major role in the future investment programmes of telecommunications companies. British Telecom announced already in 1981 that only optical fibres would be used in the trunk network from 1984 on. 50% of the British trunk network will be optical fibre by 1990.

Only 8% of European homes are at present connected to cable TV, but the situation differs significantly between countries. Belgium and the Netherlands represent the most "cabled" countries with respectively 80% and 60% of all homes being connected. The investment plans in most countries show a spectacular future change in the situation; 50% of German homes will be connected to cable networks by 1990. In France, 5 to 6 million homes will be connected in 1990 under the recent Cabinet decision. Parts of these new cable network could be based on optical fibres.

But it is not only national optical fibre cable networks that are about to be set up. Certain cross-national networks have been decided: e.g. the transatlantic optical cable (TAT-8) which will be in service by 1988; other are proposed: e.g. an Europe-Asia cable covering 13,500km. Within Europe, negotiations are taking place on a cross-Channel (Paris-London) cable.

Another mode of transmission is the satellite communications system. 200 civil communications satellites are expected to be ordered worldwide between 1985-1995 (1). The two satellites, ECS-1 and ECS-2 of EUTELSAT (2) (a further lauch is planned), and the satellites of INTELSAT (3) are providing transmission of voice, text, data and video between national carriers and between private subscribers. France recently launched the first of two communications satellites, TELECOM-1A, providing the same services as the EUTELSAT satellites, but for application within France only.

Transmission systems, however, are only one field of telecommunications investments. The greater part of the 17 to 18 billion ECU invested annually in telecommunications in the EEC is earmarked for the digitalization of the networks. The proportion of subscribers connected to digital exchanges will increase rapidly and reach, for example, 40% in Belgium in 1990, 50% in France in 1986, where total digitalization of the networks, according to plans, will have been achieved by 1992. In certain regions of the Danish telecommunications network, 80% of the subscribers will be connected to digital exchanges by 1990. These technological changes are, as mentioned above, prerequisites for the application of new subscriber equipment and for the introduction of "second generation" telecommunications services.

About 125 million telephone sets were in use in the EEC countries by the beginning of 1982. Important differences existed, and still exist, as to

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(1) Financial Times, 23 March 1984.
(2) The European Satellite Communications Organization.
(3) The International Telecommunications Satellite Organization.

the situation in each country. Ireland has the lowest level of telephones per inhabitant - 22 sets per 100 inhabitants - whereas Denmark has reached the highest European level with 72 telephone sets per 100 inhabitants. Four countries had, in 1980, between 50-55 sets in use per 100 inhabitants (F, D, UK, NL) and two around 40 (B, I). In certain countries, like Greece, the increase in the number of telephone subscribers has been curtailed by low levels of telecommunications investments; in other countries the economic crisis has resulted in a spectacular increase in the number of cancellations of subscriptions due to arrears of payments: this is the case in Denmark which already experienced a continual decrease in the annual growth rate of the number of subscribers since the beginning of the 1970s.

Despite the introduction of numerous new telecommunications services, the "traditional" telephone service is still regarded as of the greatest importance to the sector. Between 80 and 85% of the revenue is expected to come from telephone traffic in 1990 (1).

The telex, another first generation service, is in general use in all EEC countries. There are about 450,000 telex subscribers in the EEC countries and the number is expected to increase by about 6% per annum in the coming years (2). The new generation telex, the teletex, which transmits texts 50 times faster, will have been introduced in most EEC countries by spring 1985. In Germany, which is the most advanced country in the field, the number of subscribers to the teletex service is estimated to amount to more than 150,000. In Denmark, the number of subscribers is expected to increase by about 50% per year, without significantly influencing the growth rate of subscribers to the traditional "slow" telex.

Telefax - a facsimile service which can be described as distance copying - is another new telecommunications service in rapid growth which has been introduced in most countries in recent years. The number of telefax terminals in for example Italy, is increasing by 33.8% per year. According to the Danish experience, the fastest telefax "groups" - Group 3, which transmits one A-4 page in less than 1 minute and the Group 4 telefax, the so-called datafax, which transmits one page in less than 10 seconds, will show an important increase in the number of subscribers, whereas the slower groups will experience a relatively large decrease during the coming years.

Datacommunications networks were set up in the 1960s using the telephone network. This was the so-called datel service. During the 1980s, new specially designed networks have been set up for the digital transmission of data, the datex service. The number of subscribers to both these data transmission services, the datel and datex services, is expected to increase. But, as in the case of the telefax service, the fastest Groups (more than 9,600 bits) and especially the "packet switched" datex - a technique that permits several simultaneous transmissions on the same circuit - will see the largest increase in the number of subscribers.

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(1) COM(84)277 final of 18 May 1984.
(2) National levels of the number of telex subscribers:
(D) : 152,600 (mid. 1983); (F): 105,000 (1983);
(UK) : 100,000 (1983); (NL): 35,000 (1984);
(DK) : 11,530 (1984); (B): 22,800 (1982).

Table 2 : The Introduction of Telecommunication Services and Networks in the EEC Member States (November 84)

	(D)	(UK)	(F)	(I)	(NL)	(DK)	(B)	(GR)	(Irl)
DATEL .	1965	1965	N.I.	1968	1961	1965	N.I.	N.I.	N.I.
DATEX	1976	N.I.	N.I.	N.I.	N.I.	Aug. 1981	N.I.	N.I.	N.I.
DATEX (packet switched)	** 80/82	Aug. 1981	End 1978	* 1984	Mar. 1982	end 1983	Dec. 1982	N.I.	end 1984
TELETEX	Mar. 1982	Apr. 1985	May 1985	N.I.	end 1984	Apr. 1984	end 1984	end 1984	N.I.
TELEFAX	1979	** 1979	1974	N.I.	1981	Apr. 1984	1983	N.I.	+
VIDEOTEX	*** 1979	*** 1980	* 1981	Apr. 1983	June 1984	* 1982	* 1984	N.I.	* 1983
Automatic Mobile Telephone Systems	* 1990	* 1983	1990	N.I.	Sep. 1978	Jan. 1982	+	N.I.	mid 1984
Automatic Radio Paging Systems	N.I.	**** 1981	N.I.	N.I.	+	**Oct 1983	N.I.	N.I.	N.I.
Telemetric Services	1985	***** 1979	1980	N.I.	+	Nov 1983	N.I.	N.I.	N.I.
Electronic Mailbox Services	1985	Mar. 1982	1983	N.I.	1984	Jun. 1984	end 1984	N.I.	N.I.
Video Conferencing Systems	**** 1985	+	**Sep 1979	+	+	Aug. 1983	N.I.	N.I.	N.I.
Optical Cable Networks	Feb. 1979	1978	*** 1980	1977 /79	end 1984	Dec. 1979	+	+	** 1979
Digital Switching	1981	****** 1981	1974	1981	1982	N.I.	end 1984	N.I.	1980 /82

Notes : (D) : * : Nation Wide service; ** : Nationwide; *** : Test systems **** : Pro type test in eleven cities ;
(UK) : * : Introduction in certain geographic areas; ** : BT introduction; *** : National service (Prestel) ; **** : Virtually National Service; ***** : First Central Exchange opened; ****** : System X.
(F) : * : Started up in Vélizy ; ** : Montpellier ; *** : Paris.
(I) : * : Six larger Cities.
(DK) : * : Limited experiments ; ** : Introduction in certain geographic areas.
(B) : * : Experiments
(Irl) : * : Limited experiments ; ** : Tests on three cable lines.

N.I. : No information. + : Service exists ; ‡ : Service does not exist.

Most countries have videotex systems in full service (D, UK, F, DK, NL) or as experiments (I, D, Irl, B) (1). In Italy and Ireland, full service networks will be introduced by 1985 and the "late 80's" respectively. The British Prestel was the first European videotex service to be set up in 1978 and now has about 42,000 subscribers (mid-1984). The French Teletel has about 500,000 subscribers (December 1984) and the German Bildschirmtext 15,500 by August 1984.

Despite some problems related to the present videotex market, several national services expect a significant future growth. The German Bildschirmtext estimates that the number of subscribers will increase considerably, and the French videotex system, Teletel, expects to have introduced more than three million terminals ('Minitel') in almost all regions by 1986.

The automatic mobile telephone system is another example of the lack of international standards. At least three different and incompatible systems are introduced in Europe. The Nordic Mobile Telephone system in the Scandinavian countries which was also introduced in Denmark is the largest and fastest growing mobile telephone system in the world. It has about 100,000 subscribers in Scandinavia. In Denmark, the system has about 16,000 subscribers (end 1983) and is expected to reach more than 40,000 by 1988.
The total European market of automatic mobile telephone services has been estimated to amount to about 1.1 million subscribers in 1990 (2).

The automatic radio paging systems are also experiencing rapid growth. The Italian system, which serves 3,800 terminals (1983), is expected to have 24,000 terminals by 1988. The Danish systems should, during the same period, increase the number of subscribers from 1,700 to about 16,500.

SOCIAL IMPACT

The major increase of employment in telecommunications operating companies took place in the 1960s, in most countries. Since 1975, employment levels have been almost stable in countries such as Belgium, Denmark, France, the Netherlands and the United Kingdom (until 1981). The workforce of the national telecommunications services in EEC countries totals some 850,000 employees (1983/1984).

The background to these general data on employment, however, comprises very different national situations as regards: (a) the level and development of automation and digitalization of the networks; (b) the growth of services and introduction of new services; (c) the launching of major investment programmes and their importance. These are all factors that influence present and future employment in the countries.

The automation of exchanges was carried out over different periods in the EEC countries. The Belgian network was fully automated by 1965, but the British network only reached this level by 1977 and the Danish by 1978. Other countries are still only about to automate their networks. In Greece, 60% of the exchanges were manual in 1982.

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(1) National videotex services: Prestel (UK), Teletel (F), Bildschirmtext (D), Viditel (NL), Videotel (I), Teledata (DK).
(2) Financial Times, 15 March 1984.

The employment effects of this specific technological change is illustrated by the Irish prospects of a loss of 4,000 telephone operator jobs (out of 5,000) between 1981-85 - one fifth of the t o t a l workforce.

The digitalization of the networks is also expectedto have a major impact on employment. It has been estimated that between 70 and 90% of maintenance engineers could be made redundant (1). This would for instance involve some 45,000 jobs in British Telecom.

The diverse technological progress of national telecommunications network makes it premature to draw any general conclusions on the effects on employment of a specific technological change. No country is likely to reproduce in full other countries' experiences in the field.

But in all countries future employment will depend heavily on the increase in services. The introduction and spreading of new (second and third generation) services will counteract the falling demand for labour due to automation and digitalization of the networks, but it is yet possible to produce estimates of the effects on employment of these new services as they are only about to be set up.

Some telecommunications authorities expect increasing employment levels in the coming years - e.g. (B), (Irl), (Gr) - others have announced the prospect of almost stable levels - (NL) and (DK).

The change of technology in switching and transmission, and the introduction of new services will in all countries require major efforts to be concentrated on education and vocational training. The financial resources allocated to this end will, for instance in Denmark, amount to about 7% of wages paid.

Other important changes in employment levels and conditions may, in some countries, come from factors not directly related to technology and new services: i.e. the reorganization of national services, the breaking down of monopolies, the privatization and the opening of national telecommunications equipment markets.

The telecommunications industry has in most countries been characterized by falling employment levels since the end of the 1970s. The present situation can be illustrated by the fact that, according to the national reports given below, five major firms (G.T.E., C.T.M.C., Italtel, Plessey and Face), are cutting in 1984/85 alone up to 12,000 jobs. The transition from electro-mechanical products to digital products has resulted in a fall in the demand for manual labour (up to 80% according to a Belgian estimate), but in an increase in the demand for engineers and technicians.

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(1) Caroline Berman: "Mass sacking at the top", New Statesman, 25 September 1983; Cadres CFDT, vol. 290, September/October 1979.

In electro-mechanical production, 75% of the workforce were manual workers and 25% were engineers and technicians; in the production of digital products only 50% are manual workers. The overall result of the transition is a fall in labour demand which, in Italy for example, will result in a potential cut of 30,000 to 35,000 jobs, according to estimates of the national association of manufacturers, ANIE.

The major cabling investment programmes to be carried out in a number of countries will, during a certain period, give rise to a increase in labour demand. The German cabling projects are estimated to provide between 13,000 and 20,000 new jobs (1); the French programme could, if rapidly introduced, provide up to 40,000 jobs, according to the estimates of the CFDT; and the setting-up of a Belgian broad-band network would provide 10,000 jobs in a five-year period.

The new services introduced until now mainly concern professional users. Private consumers have almost exclusively been involved only in a small number of experimental applications, from which no conclusive experience can yet be drawn. A majority of the new services (e.g. electronic mail- and message systems, home banking and shopping, videophone, tele- and video-conferencing systems, videotex , radiopaging, mobile telephone systems, telemetric services and datex) is likely to satisfy certain private consumer needs, but the spreading of these services depends, among other factors, on subscriber equipment prices and general tariff policies.

SOCIAL GROUPS

The modernization of the telecommunications networks and the introduction of new services have in general been met with positive attitudes by the relevant trade union organizations. The British trade union, POEU, for instance, reckons that the digitalization of the networks is the only guarantee for conquering new markets with new services and creating new jobs.

Stable and increasing employment levels in telecommunications can, according to the trade unions, only be ensured by an expansion of networks and services. Employment in telecommunications are perceived by trade unions in some countries to be threatened by the privatization of the sector. Several unions have militated against the dismantling of state monopolies. In the United Kingdom, the POEU has launched industrial action against the private networks of Mercury Consortium being connected to the networks of British Telecom; in France, CGT-FO has strongly critized the non-public elements of local cable network administrations; and in the Netherlands AbvaKabo and CFO have expressed fears about the employment effects caused by the opening of the equipment markets and the "selling out" of the prosperous public telecommunications services.

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(1) Bernd Schütt: "Informations-und Kommunikationstechniken: Schlüssel zur Rationalisierung und Privatisierung der Arbeit", WSI-Mitteilungen: 8, 1983.

The major investment programmes in broad-band (optical cable) networks have in most cases obtained trade unions' support. In France, the CFDT perceives the cabling programmes as an "opportunity for employment that should be exploited". The Danish trade union, FTF, has demanded that broad-band networks provide equal economic and physical preconditions for citizens' access to services; a decentralization of decision-making structures and of responsibilities in society; services and measures which ensure that children, women, old people as well as disabled persons can benefit from the system.

The professional organizations of the telecommunications industry have in all countries played an active role in the debate on the future of telecommunications services and networks. The diversity of attitudes due frequently to very contradictory interests - between present and potential equipment providers; between state monopoly authorities and private contractors; between Community, national and multinational interests, etc. - makes it difficult to present an overview of the attitudes of these organizations.

CONCLUSION

Twenty years ago, in 1964, Marshall McLuhan published his now classic book: "Understanding Media - The Extensions of Man". He believed that people were neither "intelligent" enough nor "fast" enough to master the "electric relationships" of modern media (telephone, telegraph, television, etc.).

More recent developments have made telecommunications networks and services even more complex and comprehensible only to specialists; but, at the same time, it has provided planners, decision-makers and citizens with a greater number of technical and social options. The often passionate public debate on the introduction of the future integrated and broad-band networks are a clear reflection of the importance of the interests at stake.

November 1984.

Anders J. HINGEL

UNITED KINGDOM *

I. INTRODUCTION

Until recently civil telecommunications services in the UK have been provided almost exclusively by the state-run concern, the Post Office. Due to some quirk of history, Hull has its own telecommunications network, administered by the local authority, but all other areas were in the hands of the state. The 1981 British Telecommunications Act separated the telecommunications business and the postal and Giro services of the Post Office and British Telecom was formed to take over the state-owned telecommunications services.

More importantly, the Act relaxed the monopoly to allow private sector firms to compete with British Telecom in specific areas. Firstly, private sector firms were to be allowed to sell subscriber apparatus direct to customers whereas, previously, they had to do so through BT; secondly, private firms would be allowed to provide value-added network services (VANs) over the national network; and thirdly, and most importantly, private firms would be allowed to set up a rival network on a national basis in competition with BT. As a result of this last development a consortium, Mercury Communications, was set up by Cable & Wireless, British Petroleum and Barclays Bank to run a new telecommunications network.

This Act was merely the first stage in the Conservative Government's aim to privatise the whole telecommunications business. They published a White Paper outlining how British Telecom would be converted into a private company and proposed to sell up to 51 per cent of the shares on the open market. In August 1984 British Telecom became a public limited company and lost its monopoly on running telephone systems. At the same time, a new regulatory body was set up; the office of telecommunications, OFTEL. The shares equivalent to 50.2% of British Telecom were finally sold by late autumn 1984.

Other important developments in recent years have included the granting of licences to private companies to set up Cellular Radio telephony services, and Cable TV systems.

Furthermore, the technology involved in telecommunications is going through rapid developments. BT is engaged on a programme of modernisation of its network to switch from electro-mechanical exchange systems to digital techniques incorporating sophisticated electronics. On the transmission side, there have been developments in cables and boosters allowing far greater volumes of traffic, the latest development being fibre optic cables which again are particularly suitable for digital transmission. Finally, similar developments in peripheral equipment utilising micro-elçctronics mean that a far greater range of services is now available to consumers.

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* Summary of a report prepared by Mr. T. BRADY, SPRU, University of Sussex, Brighton, United Kingdom.

II. TECHNICAL AND ECONOMIC ASPECTS OF TELECOMMUNICATIONS

1. The spreading of telecommunications

Until recently much of the national network has been based on old technology. The first digital exchanges - the System X exchanges - were not installed until 1981 and the vast majority of exchanges were Strowger exchanges, a type of exchange first introduced in the early part of the century. In the 1970s, some Crossbar exchanges (still electro-mechanical) and some semi-electronic exchanges (the TXE series) were introduced. Current modernisation plans involve a mixture of the latest generation of TX exchanges, the TXE4A, and the System X exchanges. At present there are over 6,000 local exchanges and nearly 400 trunk exchanges. The greater capacity of System X means that the 380 trunk exchanges could be replaced by just 90 System X exchanges. In the early 1980s it was clear that the initial introduction of System X would be on the trunk network whilst the TXE4A exchanges would replace electro-mechanical local exchanges. However, in January 1984, Sir George Jefferson, BT Chairman, announced an acceleration in the introduction of System X exchanges both at the trunk and local level. By 1987, BT hopes to have 2 million digital exchange lines in service, with at least 30 trunk exchanges and 1200 local exchanges converted to System X.

As with System X, the introduction of fibre optic cables is initially planned for the trunk network. By the end of 1983 some 10,000 km of optical fibre cable had been installed with ten times that due by 1988. However, in December 1983, BT announced that it was tendering for fibre-optic installations for the junction networks with nearly 20,000 km of cable at stake. In cabling terms, the trunk network is only 5 per cent of the national total, with the junction network accounting for another 8 per cent, and the rest contained in the lines running from local exchanges to homes and offices.

At the end of 1983, the Hull Telephone Department announced that it was ordering three System X exchanges, with the first to come into operation in 1984. Eventually all 14 local exchanges will be replaced by System X equipment.

Mercury Communications is currently installing fibre optic cable alongside railway lines to link the main business centres in its network. By 1985, London, Bristol, Birmingham, Manchester, Liverpool and Leeds should be linked by fibre optic cables. Following this, trunk access nodes and local distribution systems will be commissioned gradually as Mercury possibly makes deals with some cable TV franchises.
Mercury have not released details of which exchanges they will introduce but they are likely to be digital since most of the business they are aiming for is the lucrative business traffic in voice and, more importantly, data communications. The provisions of international services is also a priority area for Mercury.

The diffusion of electronic peripheral equipment is likely to increase in line with the introduction of digital equipment in the main networks and partly as a result of the liberalisation of this sector following the 1981 British Telecommunications Act.

2. Trade and commercial balance

The Telecommunications Providers Sector: Despite the liberalisation of telecommunications following the 1981 Act, British Telecom still runs virtually all the telecommunications services that are available in the UK. There are over 21 million telephones in the BT system, while Hull has some 135,000 in its network (1). Mercury has some customers in the business community but until its fibre-optic cable network is complete it will not seriously threaten BT. Until 1990 Mercury is the only telecommunications carrier allowed to compete with British Telecom. After that, and quite possibly depending on the success or failure of Mercury, other private concerns will be free to apply to the DTI for a licence to set up a telecommunications network in competition with BT and Mercury (2).

The Telecommunications Equipment Manufacturing Sector: This sector is covered by MLH 363 in official statistics. Not surprisingly, the sector depends heavily on British Telecom for much of its business. In 1982, some 74 per cent of the output was to BT, with a further 17 per cent going to other domestic customers. Furthermore, a high proportion of its sales (47 per cent in 1982, 53 per cent in 1975, 46 per cent in 1967) was accounted for by public exchange equipment*. This means that the exchange purchasing policies of BT are a major factor in determining the performance of this sector.

Export performance has been poor. In 1982 only 9 per cent of the sales were exports and over half this number was in transmission equipment. Export figures for 1967 and 1975 were 23 per cent and 14 per cent, thus the performance has declined over the years. Much of the problem can be attributed to the slow development of digital systems due to the demand for less sophisticated equipment from the Post Office and then British Telecom. Foreign manufacturers were developing digital exchanges while UK manufacturers, with their dependence on BT for much of their output, were happy to continue manufacturing older vintage equipment. Successful exports of System X are vital to the sector if it is to expand output. However, up to now, the only successful export of System X has been a small order to the tiny West Indian island of St. Vincent.

The UK telecommunications equipment manufacturing sector is dominated by three firms - Plessey, GEC and STC. Other domestic producers of public exchange equipment include: TMC, a subsidiary of Pye (itself a subsidiary of Philips); Thorn-Ericsson, a joint venture between LM-Ericsson of Sweden and Thorn-EMI. Foreign competition comes from CIT-Alcatel of France, Northern Telecom of Canada, and AT&T (of the US) and Philips (of Holland).

In the small PABX market both GEC and Plessey supply the Monarch PABXs, while TMC and STC supply the Herald exchanges. Mitel, a Canadian company which has set up a factory in Wales, supplies the Regent PABX. Since liberalisation, some smaller firms have entered this market, including Merlin and Small Systems Engineering.

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* Calculated from PQ 363 Business Monitors.

(1) British Telecom Statistics, 1982.

(2) Communications supplement: Computing, 12 January 1984.

In the large PABX market, the main UK suppliers are STC, TMC, Plessey and GEC, with IBM offering competition from abroad. Since liberalisation, Ferranti-GTE, Harris Systems, Mitel and Philips Business Systems have also entered the market.

Optical fibres are produced in the UK by GEC, Pilkingtons, STC and by Optical Fibres - a joint venture between BICC and Corning Glassworks (of the US) - which is the largest domestic producer. Pirelli General, the UK cable subsidiary of the Italian firm Pirelli, also plans to produce fibre optic cable in the UK. The opto-electronics associated with fibre optic cables are made in the UK by Plessey, GEC and STC.

III. SOCIAL IMPACT

Because of the technological developments and the structural changes which are taking place in the telecommunications sector it is difficult to forecast changes in employment levels with any degree of certainty. The expansion of services brought about by the convergence of computing and telecommunications may lead to opportunities for new employment. On the other hand, the job-displacing potential of some developments such as teleshopping and telebanking etc. are obvious. The liberalisation of telecommunications may result in the transfer of some jobs currently in BT going to the equipment manufacturing sector if maintenance of peripheral equipment shifts to them instead of BT which carries out most maintenance at present. Some jobs will be created at Mercury although, if BT loses business to Mercury, then some jobs may be lost in BT. It is not clear how privatisation will affect employment levels in BT but unions suspect that there may be larger losses than if BT were to remain in the public sector.

In the telecommunications providers' sector much of the impact will be on jobs and skills in the maintenance area. The newer exchange systems, based on microelectronic components are smaller and more reliable than their electro-mechanical predecessors and require less maintenance and less manpower to maintain them. New subscriber equipment, including PABXs and telephones, telex machines, facsimile equipment etc., also incorporates electronic componentry rather than electro-mechanical components and the maintenance requirements for these types of equipment are lower than before. Skills will inevitably shift from electro-mechanical to electronic as more of the network moves to digital electronic equipment. Sophisticated software and diagnostic skills will be required. Some sources suggest that reorganisation plans together with automation of administrative working being considered by the BT management would lead to the loss of many administrative and clerical jobs if implemented.

In the telecommunications equipment manufacturing sector, employment has always been linked to the investment policy of the state-owned telecommunications concern which takes the vast majority of its output. Over the years the shift from electro-mechanical to electronic and now to digital electronic equipment has resulted in falling or at best stable employment (in times of new orders) because the manufacturing techniques involved are radically different and far fewer people are required. Unless UK manufacturers can attract large volumes of business from abroad

it is unlikely that employment in this sector will increase. In common with many industries the change-over from electro-mechanical to electronic products requires different skills. In particular, there is need for competent design and development engineers and software specialists to develop the digital equipment needed for the future.

The convergence of telecommunications and computer technology is likely to result in far-reaching effects over a wide range of the economy. The potential for change in the way we live our lives is very great but accurate estimates of the effects of these changes on employment overall are impossible to make with any confidence because of the uncertainties about diffusion.

IV. GOVERNMENT POLICY IN THE FIELD OF TELECOMMUNICATIONS

Since the Conservative Government came to power in 1979, it has been their policy to encourage the liberalisation of telecommunications and to encourage developments in the technology in much the same way as they have promoted information technology in general. A serie of pieces of legislation have been pushed through starting with the British Telecommunications Act in 1981. This law has been passed in 1984 to convert British Telecom into a private company and to allow the sale up to 50.2% of its shares on the open market.

Since the liberalisation of the telecommunications sector, BT has responded in various ways. It has set up new sections to handle competitive business, announced plans to introduce a range of new services and an acceleration and expansion of services available to business customers. This is seen as a response to the Mercury Consortium which is aiming particularly for the lucrative business market. BT has also set up a new division, British Telecom Enterprises, to compete in the equipment market. BTE plans to market a range of new office automation products in collaboration with ICL. BT has also opened a chain of 'Phoneshops' to sell and rent telephone sets to the public. Further BT accelerates its modernisation programme so that digital equipment is being introduced at much faster rates than was previously the case. It seems that BT has accepted that it has been privatised and has embarked on a massive advertising campaign on television to promote itself. It also took advertising space in newspapers to counter union allegations that privatisation would result in a worse telecommunications service for the UK.

V. SOCIAL GROUPS

The main union concerned is the Post Office Engineering Union which has the largest membership of all six British Telecom unions. The POEU has always taken a positive view of modernisation of the network, considering that the long-term employment prospects of its members would best be served by the speedy modernisation of the network and the development of new services and continuing expansion in the volume of traffic. The union was in favour of the split of the telecoms and post and Giro parts of the Post Office but is vehemently opposed to the break up of monopoly and the proposed privatisation of British Telecom. POEU members have taken part in a series of industrial actions against the Mercury Consortium, firstly refusing to connect the new network to BT's network and then by blacking the three backers of the consortium refusing to carry out any work for these companies.

Mercury took out injunctions against the POEU, lost the hearing but then won in the Court of Appeal. This forced the union to abandon its action against Mercury. However, the POEU voted to continue its industrial action against the privatisation of BT and all six BT unions formed a joint committee to express their opposition to the plans. The British Telecommunications Union Committee (BTUC) produced a booklet: 'British Telecom: How selling it off will harm Britain', to explain their case. The document suggests nine ways in which privatisation will harm the service provided by British Telecom.

Although in favour of the modernisation programme, the POEU voted to boycott installations of System X exchanges until precise staffing levels had been endorsed. Delegates at the annual conference in November 1983 were told of large reductions in staffing at some exchanges where System X had been introduced.

THE FEDERAL REPUBLIC OF GERMANY *

I. INTRODUCTION

The Federal German Post Office, Deutsche Bundespost, is responsible for the public network. This includes the installation, operation and further development of transmission lines outside private property.

The federal States** have public responsibility for the broadcasting of radio and TV stations and it is the state parliaments which pass broadcasting laws. Interstate regulations, such as fee questions, are agreed in state contracts, negotiates by the Minister Presidents of the states and ratified by the state parliaments. At present programs are only broadcast by two official public broadcasting channels. these are controlled by supervisory broads with members representing political parties, social groups and wage negotiation parties.

II. TECHNICAL AND ECONOMIC ASPECTS OF TELECOMMUNICATIONS

1. Spreading of telecommunications (1)

The telecommunications services provided by the Deutsche Bundespost are currently offered in several different dialling networks. The most important of these are :

- the telephone network (with 24 million subscribers) within which at the same time new services such as telecopying and teletext are offered;
- the Teletex network (with more than 150,000 subscribers);
- data transmission network with line switching (with about 12,200 subscribers) (Datex-L);
- data transmission network with packet switching (with about 6,000 subscribers) (Datex-P);
- the radio network for wireless transmission of radio and television.

The first step towards an integration of these networks was the combining of the sub-networks for telex, Teletex, data transmission, telegram service and direct calling into an integrated text and data network (IDN). This was done in 1977.

The second step is the creation, in several intermediate stages, of an integrated service digital network (ISDN). Within the framework of the concepts agreed at European level concerning bits rate, standardised interfaces and later integration with broad-band services, the Federal Republic has developed its own national system concept for ISDN:

** Länder

* Summary of report prepared by Ms. A. Köchling (under the direction of Dr. V. Volkholz) Gesellschaft für Arbeitsschutz-und Humanisierungforschung, Dortmund.

(1) H. Schön "Die Deutsche Bundespost auf ihrem Weg zum ISDN" Zeitschrift Für das Post- und Fernmeldewesen, N° 6, 1984.

(a) since 1979, the telephone network has been given priority for digitalisation in the present network, maintaining analogue connections to subscribers.
Regional networks started to be digitalised in 1982; as of 1984 the interregional telephone network is also to be digitalised. For this purpose coaxial cable, glass-fibre cable, digital directional radio and satellites are used. By mid-1984 almost 40 % of telephone exchanges will have digital ground line terminuses. This refers to the digitalisation of transmission. The dates for digitalisation of trunk exchanges and local exchanges are the second half of 1984 and third half of 1985 respectively. As from 1990 only digital exchanges will be installed. By the year 2020 at the latest the telephone network should be completely digitalised. By 1990 more than 100 trunk exchanges should be digitalised. This is about a quarter of all the trunk exchanges. This conlcudes the first integration step.

(b) in the digital telephone network, various (old and new) telecommunications services will be integrated. These services will be further developed and improved, e.g. office communication in the business sector; home computers in private houses with trunk lines; better picture definition and more rapid picture build-up for Teletex and Telefax; new performance features of telephone equipment; long-distance applications for alarms, remote monitoring, remote control, meter reading (TEMEX).

In March 1982, the Deutsche Bundespost stated its intention to set up a future integrated service digital network.

In 1985 a two-year ISDN pilot project is planned : setting up of two ISDN digital local exchanges.

As of summer 1984, the Deutsche Bundespost is introducing a model network with high big rate (64 Kbit/ sec) a temporary solution for special applications such as inter-computer communication, rapid facsimile transmission, decentralised printing. The particular aim is for users, manufacturers and network operators to improve their technical and operating expertise in the field of rapid text and data transfer. The development of appropriate terminals should be made easier.

In the mid-70s, the Deutsche Bundespost together with private companies developed a cable distribution network made of copper coaxial cable and amplifier systems designed for radio and TV stations. The original intention was that this technology would be used as required. In 1977, the Deutsche Bundespost was asked by the Federal Government of the time to help to promote the economy by means of unscheduled investment. In response to this the Deutsche Bundespost planned to cable 11 cities with full coverage. After objections had been received from some states the Deutsche Bundespost returned to its original idea : the building up of coaxial distribution networks throughout the country as islands in accordance with demand. As of October 1982, this decision was reversed completely. Cabling was to be started up with an annual investment in advance of DM 1,000 million (1).

(1) H. Schön (1982) op. cit. ; SCS Scientific Control System GmbH Telecommunications Development Plan, study carried out for the state of North Rhine-Westphalia, Essen, 1984.

At present approximately 2,9 million homes are connected to less than 1,000 networks. This gives a supply quota of 10,5 %. The connection is used in 1 million homes. These figures correspond to end 1984.

Cable projects are currently in progress or planned in the cities of Dortmund, Ludwigshafen, Munich and Berlin. The Ludwigshafen pilot cable project was started in 1984 (approx. 7 500 subscribers, approx. 15 000 interested applicants, 150 000 households in the cabling area, 100 applications from private broadcasting companies). The trial is to run for three years. Satellite programs are also to be included. In December 1983, the Landtag of the State of North Rhine-Westphalia passed a law to enable a trial to be carried out in Dortmund : 3 years duration, 30 000 households in the test area with financial subsidies for 10 000 households. The radio programs are to be distributed by the official public radio stations. Private companies are to be excluded. Contributions by non-profit making program makers will also be included, however. In addition, media experiments, including citizen and business communications, are also planned. The pilot project is to begin in 1985.

Videotex trials were started in 1979. A 2 to 3 vear trial was planned. Today Videotext is still in the trial stage. Its future is uncertain. This also applies to cable text which was originally to be tried within the framework of the pilot project for cable TV.

The videoconference network should permit the connection of public video conference rooms belonging to the Deutsche Bundespost and on private premises. A video conference network is offered as a trial network from 1984 onwards, in 1986 the decision will be made - based on the results of the field trial - how the regular service will be implemented.

Within the trial network, 12 cities are to be equipped with public video conference studios The concept is based on the use of an optical fibre video conference network as a precurser to a optical fibre overlay network. In this way, video conference studios would have a pacemaker function.

The Deutsche Bundespost has not yet decided on its video conference technology. The questions of fees will be clarified in the beginning of 1985. Preliminary optical fibre networks for private and commercial communication (BIGFON) are to be established in 7 German cities. The trial phase begins in 1984 and is to run until 1987. The 7 BIGFON test areas will be connected to each other by an optical fibre trunk network (BIGFERN). This runs from Hamburg via Hannover (completion date end 1984) via Dortmund (1985) to Dusseldorf (1985) and then via Cologne, Frankfurt, Stuttgart to Munich (1986). The public video conference studios will be in this path. The net will have national and international connections by access to satellites (telecom 1, ECS 2 and Intelstat V).

III. GOVERNMENT POLICIES IN THE FIELD OF TELECOMMUNICATIONS

The plan by the Federal Government to encourage the development of microelectronics and information and communicationtechnologies was presented by the Federal Ministry of Research and passed by the Cabinet on 14 March 1984.

The concept presents the Federal Republic of Germany as a social system whose positive development is extensively if not exclusively determined by the significant role of information technology in all of its essential sub-system (growth industry, economy, public services, media, jobs).

The following aims have been derived from the analysis : (1)

1. Improvement in the peripheral economic market conditions and thus the competitiveness of the FRG and Europe with particular emphasis on risk capital, market development and innovation-oriented public acquisitions.

2. Motivation of people to face the technical challenge through information about future actions and through intensive attention to information and communication technologies in education.

3. Stimulation of innovation-oriented markets through future-oriented expansion of the communications infrastructure and innovations in the terminal field.

4. Extension of the technology base for long-term safeguarding of the defence capabilities of the Federal Republic.

5. Intensification and concentration of research capacities in the Federal Republic in the area of information technology with the aim of developing an R & D capacity in the public and private sector which can meet the requirements of international competition from a quality and quantity point of view in areas of emphasis.

IV. SOCIAL GROUPS

1. Policies of Employers' Organisations

The employers' organisations have in general criticized the monopoly of the Deutsche Bundespost on the following grounds :

- Premature insistence on an uniform technology. Alternatives should be examined at the same time. New developments should be included. The employers do however not question the general principle of cable networks.

- Limitations of media policy, allocation of broadcasting channels only via official public organisers. There is an increasing demand for the privatisation of the telecommunications system : creation of equality of opportunity for private investors as opposed to the Deutsche Bundespost particularly with regard to the installation and use of BK networks;

- Rejection of full coverage in favour of demand-oriented broad-band cabling (2).

The optical fibre cable manufacturers - Siemens, PKI (Philips), AEG, Standard Electrik Lorenz (ITT) and Kabelmetall - had envisaged setting up a joint factory. The aim was to produce 100,000 km of fibre a year. The German Cartel Office rejected the plan on the grounds that the firms, which already control 90 % of the copper cable market, would strenghten their market

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(1) The Federal Minister for Research and Technology. Information Technology. Concept of the Federal Government for the promotion of the development of microelectronics, information and communication technologies, Bonn, 1984

(2) Scientific Control System GmbH (1984) op. cit.

domination to an unacceptable degree (1).

2. Trade Unions' Policies

The German Trade Union Council's general list of demands for "shorter hours", "decision sharing" and "humanisation " are in opposition to the telecommucations concept of the Federal Government; the Council also opposes the signs of privatisation of radio and television, and the changes in network responsibility and communications monopoly in favour of commercial interest groups. It is calling for an institutional and binding estimate of the consequences of technology and for approval of communication technologies only after the results of pilot projects concerning the effects on the public and workers have been obtained and the effects and possible configurations dicussed in public. To this end the research budget (humanisation and technology promotion budget) should be redistributed appropriately (at the moment the budget for humanisation programmes only makes up 1.4% of the total budget of the Federal Minsitry of Research) (2).

In an expert opinion written for the Civil Service, the Transport Union suggests that the previous network separation be maintained : in concrete terms the following could be demanded :

- the maintenance of the analog telephone network in its present form as it is entirely adequate for telephoning ;
- the extension of the integrated data and telex network (IDN) limited as required to the business sector ;
- the accessibility of all communications services offered in the IDN to the public in post offices;
- the abandoning of the integration of moving picture transmission and instead the distribution of television programmes and channels without cables through the air and via video cassettes.

A network conception of this type would have the advantage that subscibers would only pay for the services they use and that a decisive new rationalization phase through the connection of households and service companies or citizens and administration would not be financed by the public infrastructure (3).

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(1) C. Morwege-Dengg "SEL/Siemens kritisieren Netzstrategie der Post", Computerwoche , 13 July 1984.

(2) DGB (Deutscher Gewerkschaftsbund/Bundesvorstand) : Statement on the new information and communication technologies given on 8 May 1984 Düsseldorf.

(3) H. Kubicek New Media. Part 2 : NEw communications networks and services as motorways to the electronic office and electronic home. Gewerkschaft öffentliche Dienste, Trier, 9183 (mimeo).

FRANCE *

I. INTRODUCTION

The face of telecommunications in France is marked principally by the dominance of the public sector telecommunications agency by the Ministry of Posts, Telephones and Telegraphs. The three key figures in this insentive centralisation are the equipment manufacturers, network administrators and users.

Up to the 1970s, the relations between this triumvirate remained stable and relatively autonomous. Service providers play a dominant role in the organisation and development of telecommunications. In France, the service provider is a public agency. The Ministry of PTT enjoys a national monopoly over the public telephone system but not over terminals nor private systems. A high degree of management independence, particularly with regard to the powers exercised by the Directorate-General for Telecommunications (DGT), enables it to impose public administration rules on the market for producer goods: invitations to tender - approval and certification of suppliers and equipment (type approval procedures). These public bodies truly occupy a "quasi-monopsonist position". (1).

II. TECHNICAL AND ECONOMIC ASPECTS OF TELECOMMUNICATIONS

1. The spreading of telecommunications

The public switched network markets are distinguished by two paramount trends: the digitalization and integration of services. France is furthest advanced along the road to time division switching services. Business subscribers will be hooked into digital network during 1985. The aim is to have an integrated telephone and data network operational by 1990 (Réséau numérique à Intégration de Services - RNIS - of 64 and 144 Kbit/s). This is a priority objective for France, where experts are predicting that the public switched telephone network will shrink by 5% a year between 1982 and 1990.

The progressive digitalization of information systems will make the information highways more accessible to the general public. The synergy established between time-division switching and digital transmission puts a uniform, fully digital network within our technical grasp. The French public telephone system is scheduled to go completely digital by 1992. The dream of a fully "wired-up" nation is getting closer by the day. But new needs are already emerging from business, and beginning to take shape in the public consciousness.

(*) Summary of a report prepared by Mr B. QUELIN (under the supervision of Professor O. PASTRE), Centre de Recherche en Economie Industrielle (C.R.E.I.), University of Paris-Nord.

(1) B. Aurelle, J. de Chalvron, "Le secteur des télécommunications", L'industrie de l'information, IDATE Bulletin NO. 8, 1982.

The expansion of the optical fibres market sounds the death knell for conventional coaxial cables. The advent of total digitalization as the RNIS with wide band comes closer and services proliferate, must leave an increasingly important role for fiberoptics, a field in which France is a pioneer. The "cable plan" provides for 100,000 homes to be tied into the network by 1984, rising to 1.4 million by 1987 and 6 million by 1992. Direct distance fiberoptic transmission has already been experimented with on the Le Mans-La-Fleche and Le Mans-Angers routes. The market for major fiberoptic-based information highways should begin to take off in earnest towards the end of the 1980s as the finishing touches are put to monomode systems. Services through the national cable network should then be available to semi-public corporations on a local basis.

On the market for private telecommunications equipment, emerging needs, particularly business requirements, are the driving force behind the development of specialized hardware (application-dedicated terminals) and the updating of existing equipment (automatic switching systems and telephone sets). This market is experiencing sustained growth, and one of the key issues for the future is the extent to which telecommunications equipment providers will be able to diversify their strategies. Faced with the choice of giving a stimulus to the development of one of the two major growth areas for private communication equipment - the business and home markets - France opted for new products for the individual. The planned aim, then, remains to expand the national market, particularly the market for home information systems and services. But that will depend on the priority attached to popularising the use of any given appliance, the diversification of distribution channels (the development of consumer-oriented telephone peripherals and a wider choice of suppliers).

France's short-term goal is to have an installed base of 3 million videotex terminals by 1986. Government policy is bound to have a key part to play in the diversification of services offered (directories, home telebanking, databank access, videophones, etc...) to bring the advancing information society nearer still.

2. Industry and domestic production

In 1981, the two leading - State-owned - companies in the field, CGE and Thomson, between them had interests in every field in the first-generation telecommunications business: switching, transmission, telephone cables and handsets. But in September 1983, the French Government put forward proposals for reorganizing these two leading nationalized groups in the electronics industry. The aim was to rationalize the activities of the state-owned companies and channel the human and financial resources into the development of new product lines - particularly in the telecommunications field. One of the focal points of the operation is the merger between Thomson Telecommunications and CIT-ALCATEL (a subsidiary of CGE), which is due to take place in January 1987. The outcome of this union between CGE and Thomson will be to give France a leading force on the world communications market. The agreement was attacked by the Ministry of PTT which had consistently argued for maintaining two major suppliers

of telephone equipment. The issue at stake was clear: either preserve the balance on a home market seriously out of synch with developments on the world telecommunications market, or give CGE the chance to move into the international arena, thereby running the risk of opening the French market to European competition without any counterbalancing benefits.

Up to 1982, CGE-Thomson had been a leader on the time-division switching market, a core segment of the telecommunications equipment market. That calls for the capability to put complete technical solutions into operation based on a comprehensive mastery of switching and transmission technology. By a fortunate accident, the development of the company's E10 time division switching device coincided exactly with the deregulation of the American market to provide CGE-Thomson with a toehold in the US market. The size of that market points up the importance for the two groups of coordinating their technical and marketing strategies.

Reference must also be made to the way in which the telecommunications industry has propelled forward the development of the components industry, particularly the silicon sector. The telecommunications industry accounts for a growing part of the market for components. A perceptible shift is occurring in the power relationships between component manufacturers and telecommunications equipment suppliers. The boundaries between components and systems are being re-drawn as the constraints of the future system become a design factor of the components. Telecommunications is gradually becoming one of the major techological nodal points upon which the development of the electronics and related industries depends. And it is upon the control of these spillover effects that the success of the integrated product area plan rests.

3. Trade and trade balance

There are two major areas of competition in the telecommunications equipment market: network equipment and private installations, both with different characteristics, growth rates and their own particular problems.

After the widespread development of the public telephone network, the market for network equipment (public switched network and transmissions) will undergo intensive modernization and expansion at a rate of some 4% a year between now and 1990. Demand will shift toward digital switching and transmission equipment, optical communication systems and satellite communication facilities. Time-division switching will remain the dominant market feature, however. The E10 system developed by CIT-ALCATEL, an early pioneer in time-division switching, and MT.20-25 from Thomson accounted for almost 40% of installed time-division switching systems in 1984, particularly in respect of large-scale switchboard users.

The characteristics of the market for private installations (private switching equipment and terminals) have turned it into both a natural and necessary market. Expanding at the rate of 8% a year, it would appear to be the driving force of growth.

The emergence of a consumer market would multiply the outlets of the information systems and services industry tenfold. But creating such a market demands extensive groundwork; a task which, in France, falls to the DGT: urban cable systems (Biarritz, Montpellier), experiments with videotex (TELETEL-network) and telepayment (microchip card). Supply of new consumer information systems and services will be the dominant feature of market developments until the 1990s. But it is a market which is also cautiously welcoming the arrival of telecommunications equipment manufacturers into the consumer electronics as slowly but surely telephone peripherals and microelectronic technology find their way onto the shelves of the high street shops.

The French communication-related industry is weak on two fronts: its presence in ther international arena, and its inability to make the necessary inroads into the private telecommunications market.
Despite the hopes raised by the relative success of the time-division switchers, their share of the international market remains inadequate (27% of total sales of telecommunications equipment) and geographically concentrated in the developing countries (Egypt, India...).
The CGE-Thomson group's weak penetration of the private telecommunications market points up the missed opportunity to establish itself in an expanding market which could have proved a fertile area for investment. Moreover, compared with the American counterparts, French telecommunications groups appear to lacking in funds.

III. SOCIAL IMPLICATIONS

There are three marked trends dictating the direction of developments in the social arena. The leading purchaser (the PTT authority) has cut back its transmission and switching business to a marked degree. In addition, the transition from electromechanical to electronic devices has shifted part of the value added business towards manufacturers of active and passive components and computer manufacturers. Finally, electronics companies are moving into competition with traditional firms, introducing new lines of telephony products.

In the industrial sector, the crisis ushered in by automation and reorganizations has resulted in large-scale job losses. Between 1977 and 1982, the PTT shed some 28,500 blue-collar posts (1), a wound which could be staunched by export orders, telephone peripherals and a sustained level of public sector orders. As the new technology takes an increasing hold, so the PTT's renewal order level rises.

Orders also contracted by 9.5% between 1977 and 1980, expressed in constant francs, and have remained overall constant since 1982.

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(1) G. de Oliveira: "Evolution des télécommunications publiques de 1970 à 1975, Centre d'intervention sociale et économique, Paris, 1979.

IV. TELECOMMUNICATIONS POLICY

The French strategy stands in marked contrast to developments in America or the UK. In order to maintain its dominant position, the DGT of the PTT administration is staking all it has on the open market for home information services. The public sector initiative is strong in the specialized network field (Transpac) and satellite services (Telecom 1), cable network, fibre optics, computerized money. But French manufacturers must face up to the internationalization of markets, widen their horizon and build up their network operating expertise.

1. Research and Development

Applied research and development takes two forms. Work is either undertaken solely by the companies themselves or part-funded by the DGT.

ITALY *

I. INTRODUCTION

Telecommunications services are managed basically by five entities under public control, two of which belong to Public Administration while the remaining three are corporations controlled by the public body IRI, the largest industrial conglomerate under State control in Italy, through its holding for telecommunications and electronics, STET.

The Ministry of Posts and Telecommunications, under the supervision of the Committee of Ministries for Economic Planning (CIPE), states the guidelines for national policies in the field of telecommunications. The Ministry also has the responsibility of setting the technical standards for systems and terminals to be connected to public networks and for stating other technical regulations for the management and use of the telecommunications services.

As far as telecommunications activities are concerned the Ministry is in fact composed of two different public entities : the telephone service organisation ASST and the P.T. Administration, both having the special status within the Public Administration. ASST, the State organisation for Telephone Services, created in 1925, is responsible for the international telephone services with all European countries and seven Mediterranean countries, as well as for the interurban lines between 37 telephone districts in the national territory. Lacking a unifying authority over telecommunications, ASST acts as the State agency which controls all other service companies, with the dual position of general supervisor and operating company. A department of the P.T. Administration (the other autonomous public entity in the Ministry), the Central Department for Telegraph and Radio-Electric Services manages telex and telegraph services in Italy and Europe.

Outside of Public Administration, the telecommunications services are managed by three corporations of the STET holding: SIP, Italcable and Telespazio.

SIP, the main telephone service company in Italy, manages the network for urban calls and that part of the interurban network which is not managed by ASST. Italcable manages a large part of the international telecommunications services : international telex and telegraph services not under the control of the P.T. Administration, international calls outside Europe and international data transmission. Telespazio is in charge of satellite transmission. RAI, another corporation of IRI, is the public broadcasting company; but recent deregulation disrupted its traditional monopoly and broadcasts are now made by many private companies too.

II. TECHNICAL AND ECONOMIC ASPECTS OF TELECOMMUNICATIONS

1. The spreading of telecommunications

In the postwar years before the first oil crisis, the telephone services had

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* Summary of report prepared by Ms. B. INGRAO, Facoltà di Scienze Statistiche Demografiche e Attuariali, Istituto di Economia, Universita degli Studi di Roma, Roma.

a rapid diffusion in the country : in 1973 the maximum yearly increase in the number of subscribers was reached with more than 800,000 new subscribers.

The first "oil crisis" marked an abrupt turn. The scenario changed quickly in a few years. From 1974 to 1981 SIP went through increasing difficulties, with heavy losses in 1979 (486 billion lire) and 1980 (538 billion lire). In years of high inflation the government, under pressure from the political opposition and the trade unions, long delayed the rate increases requested by SIP. Between 1977 and 1980 the rates were unchanged. With the existing rate system the losses were incurred mostly by SIP, which was then forced to cut investment or to finance investment with debt.

This scenario was not favourable to a rapid growth of telematics. In 1982, at last, the Committee of Ministries for Economic Planning passed an important recommandation on telecommunications. The recommandation indicated the guidelines for rates' policy, and on that same occasion CIPE approved the "National Plan for the Development of Telecommunications Services", drafted by the Ministry of Posts and telecommunications, which was to become the official statement on public telecommunications policies in Italy. The plan emphasizes three basic targets to be achieved in the ten years from 1981 to 1991 : to gradually digitalize the network; to increase R&D effort in telecommunications; to supply new telematic services.

Due to the fast growing technology progress and to the maturing of the experimental phases of some new services, it has been necessary to set up a New National Telecommunications Plan for the decade 1985/1994 which is yet to be approved by CIPE.

The first long distance digital exchanges were installed in 1981, while local digital exchanges were first introduced on a large scale in 1984, when the manufacturers supplied 300.000 digital lines. It is forecasted that by 1989, 98,5 % of the new long distance exchange lines supplied and 100 % of the local will be digital.

See Table 1 for the estimated spread of subscribers' equipment.

	Number at 31.12.84	Forecasted growth 1985-1989	Rate of growth (average yearly)	Number at 31.12.89
Data Transmission (terminals installed)	154,000	136,000	13,-	290,000
Tele-facsimile (terminals)	9,000	29,000	33,-	38,000
Audioconference and videolento (terminals)	400	4,200	65,-	5,600
Paging systems (terminals)	7,000	29,000	39,-	36,000
Vehicle-mounted radio-telephones	6,000	29.000	42,-	35,000

Source : SIP : Programmi 1985 et 1986-7. Proiezioni al 1989, November 1984 (mimeo)

SIP, started a videotex trial service (Videotel) in April 1983, a year later than originally planned.

Initially the programme started with 1,000 subscribers, but the number had increased to about 2000 by the end of 1984 and by the second half of 1986 , the service should become a regular commercial service open to the general public. Subscribers were from both private, family and business sectors.

Videotel is an interactive service. Basically it provides information retrieval services; but the system also allows response frame services (from the users to the information suppliers); mail box services (from user to user); gateway services (connection with other data bases; closed group services. The data base includes an electronic newspaper edited by the Agenzia Italia. There are around 180 information suppliers. The number could possibly increase to 250 by the end of this year.

RAI, the public broadcasting company, started an experimental teletext service in January this year. The experimental stage should go on for seven months.

2. Industry and domestic production

Up to 1982 there were five main manufacturers supplying the telephone companies with public telephone exchanges and network equipment in Italy. In March 1982, the Committee of Ministries for Economic Planning (CIPE) decided to reduce to two the switching systems to be used in the national telecommunications system. When discussed, this decision is usually referred to as the decision to establish two manufacturing groups for switching. The so called "national group" has already been organised: two Italian Manufacturers, Italtel (STET) and Telettra (FIAT) established a joint venture with GTE (GTE,USA) to cooperate for a common unique switching system. Italtel , the main Italian supplier, designed and implemented an electronic exchange named Proteo, which is to represent national technology in telecommunications. As described in another part of the paper, the ambitious decision to start a national project for electronic switching and transmission was taken by the STET group at the beginning of the 1970s. A second generation of the Proteo exchange , the UT 10/3, is currently under production. The problem remaining is who should supply the second system, or who should form the second group, often referred to as the "international group". Here conclusive decisions are still lacking.

Relevant changes are also on the way on the supply side, where the new partnership of Olivetti and AT&T on one side and the quest for partners by STET on the other, may quickly disrupt the traditional market structure of the telecommunications industry in coming years. Olivetti, a European leader in office automation, started a cooperation with AT&T, which acquired 25 % of Olivetti shares. This agreement is an example of the vanishing border between telecommunications and office automation as separate industries and it opens the way to a new quick develop-

ment of the Italian firm into new sectors of the market for telecommunications equipment.

The limited spread of the new products is well illustrated by the sales figures : no more than 160 billion lire for ten new products or terminals equipment : teletext, videotex, paging systems, audioconference, videolento, telematic medical equipment, tele-facsimile, vehicle-mounted radio telephone and a few others. Furthermore, some markets, like videotex and teletext terminals, have been virtually created by the public companies which manage the services. In the traditional telecommunications 'market, sales have been estimated around 2,800 billion lire. These new markets are still extremely marginal.

III. SOCIAL IMPACT

ANIE, the national association of manufacturers, estimated that in 1977 the telecommunications industry employed approximately 300,000 people, of whom some 100,000 manage telecommunications services, around 60,000 manufacture switching and transmission equipment, 36,000 for cable installation and all others in other activities. Employment in the first five companies manufacturing telecommunications equipment reached a maximum of more than 57,000 in 1973. From 1970 to 1973 SIT-Siemens (now Italtel) expanded employment from 16,000 to 30,000 jobs, also with the aim of reducing unemployment, in southern Italy. But employment figures also rose substantially in Face, Fatme, GTE, Telettra. The trend changed sharply after 1973 when, as we said before, the growth of investment and services was slowed down. Now Italtel, the main manufacturer has more than 20,000 employees and is moving towards a reduction to 15,000 in the next 5 years. Face has started its aim to reduce employment by 1,000 units by 1985. At GTE, the unions fear a reduction of 1,300 jobs from a total of 6,300 jobs. On the other hand, employment in the services sector is still growing. Employment increased at SIP from almost 74,000 units in 1982, to 77,000 units in 1984.

It is extremely difficult to forecast future employment trends. The new National Telecommunications Plan estimates that by 1993, with respect to 1983, there will be an over-employment in the national manufacturing sector of about 15/20.000 people, due to a strong negative impact on employment caused by the transition to digital switching and a high productivity growth in other activities.

In the recent past, over-employment in factories that produce telephone equipment has been adjusted by absorbing surplus workers in the telephone services. This strategy has been adopted by IRI (the largest conglomerate controlled by the State) in the Stet holding. Over-employment in Italtel is adjusted by mobility to SIP, the telephone service company, whose employment needs are stil expanding. For the future, the increasing use of electronic systems in the telecommunications services will result in employment of highly qualified personnel, thus impeeding the taking over the exceeding personnel from the manufacturers that is mainly represented by manual workers.

In fact, inside the manufacturing sector, it is estimated that the conversion from electromechanical to electronic technologies in telecommunications will involve a major change in the composition of the work force. ANIE quotes the following reference figures :

Table 2. Change in the composition of the work force in the telecommunications industry

	Electromechanical Technologies	Electronic Technologies
University level	5 %	15 %
Technicians	20 %	35 %
Manual workers	75 %	50 %

Source : ANIE : L'Industria elettronica nazionale nel settore della telematica, 1982 (mimeo)

1. Impact on work organisation

As far as work organisation and working conditions are concerned, the impact of telematics has not yet been widely studied. Discussion about working at home arose in connection with women's employment, since it was considered a risk once again to relegate female workers to an isolated marginal position in social life. On the contrary, is was also emphasized that women, always under pressure from family needs, may enjoy work positions with more flexible time schedules. But the discussion has so far been purely theoretical.

IV. GOVERNMENT POLICY IN THE FIELD OF TELECOMMUNICATIONS

The recommendations on telecommunications which was passed in March 1982 revised, as mentioned above, the rates'policy. The first National Plan for the Development of Telecommunications Services" which was presented on the same occasion specified the policy in the field and considered although partially, the crucial questions of deregulation and management which however are more widely treated in the 1985/94 revision of the Plan.

In a "Special Report on Telecommunications" prepared in 1982 for the Government by a group of independent experts, the following lines were suggested : a public monopoly on networks to guarantee the necessary speed of adjustment to new needs of users and to avoid costly duplication of efforts; a free competitive market for terminals and subscribers 'equipment, with private and public companies; a regulated market for services with open entry for new private competitors, especially in data transmission and processing.

In fact, the deep changes on the way in technologies and market structure seem to increase the difficulty of establishing a clear dividing line between networks and services. While the market for terminals has always been fairly open to private manufacturers, with large amounts of different equipment admitted, the problem arises for private networks, which in a short while could possibly be supplied and managed on the Italian market by private companies. So far, new services like videotex, telefax and

teletext have been managed only by public companies under a strict monopoly regime. Here again the problem of deregulation will soon arise, as it will for the value-added services not yet introduced , but to be developed on the new high-speed data-transmission networks.

The CIPE recommandation of 1982 stated, as we mentioned before, that SIP was to manage the new telematic services and the data transmission networks, but at the same time left to the Post Office the electronic mail, telefax, teletex and telex, thus maintaining overlapping tasks in public companies. Moreover, a new framework for the telecommunications services should concentrate the control and supervision tasks under a new unified authority, within the P.T. Ministry.

The government has to present a bill on the general promised reorganisation of management by the end of June, but the content of the bill to be presented in Parliament is not yet known. By the end of June new arrangements should be signed with the service companies, the contents of which are known only on fairly general lines.

In research and development, two national plans should be approved in a short while for telematics and office automation.

NETHERLANDS *

I. INTRODUCTION

Responsibility for telecommunications policy is traditionally held by the PTT, under the aegis of the Department of Transport and Public Works. Recently, the Department of Economic Affairs has also been involved in representing the interests of the industrie and stimulating technological innovations. The PTT holds the monopoly of telephone and telex networks, including their basic equipment, apparatus, data networks and the long distance broad band transmission cables. Furthermore, the installation and exploitation of local cable networks are tied to the PTT.

II. TECHNICAL AND ECONOMIC ASPECTS OF TELECOMMUNICATIONS

1. The spreading of telecommunications

The Dutch telephone network was started in 1881, and was made automatic in 1930. By 1961 the Netherlands was the world's second in automatic exchanges. In 1982 there were 5.3 million connections involving 7.8 million pieces of apparatus for 14.3 million people, thereby taking the eighth position in the world.

The next step in the innovation process is digitalizing the network, which was started in 1982 in Middelburg. In 1984, transmission as well as the exchange technique of regional exchanges will start to be digitalized.

As far as the telephone network is concerned, the Netherlands has hardly any tradition in the coaxial cable. Instead, a symmetrical cable network is used. Clearly, fibre optics will succeed this system.

Over the next twenty years, the PTT expects to invest 400 million guilders on 9 thousand kilometers of optical fibres. The application will be directed mainly towards connections between central and regional exchanges and coupling with private exchanges and networks.

The telex has its own network since 1965. Since 1930 it worked via the telephone network. At the moment the number of subscribers is 35,000.

Datanetwork is the latest infrastructure set up by the PTT. From March 1982 onwards it had a capacity of 1400 connections. Expansion to a larger capacity is possible through packet-switching without radically changing the exchange technique.

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* Summary of a report prepared by Ms. C. Rottländer-Meyer, Instituut voor Sociaal Beleidsonderzoek, 's-Gravenhage, the Netherlands.

The following new services are offered, or are about to be introduced, by the PTT:
The videotex service - "viditel" - was first unsuccessfully directed towards a large public. However, now it is aimed at offices and industry, it has resulted in an increase in subscribers. Some 9-10,000 subscribers are registered and the PTT expects that this number will increase to 12,000 by the end of 1984.

An electronic mail box service - "vidibus" - has also been introduced. Other services like an electronic mailing system - "memocom" - and a teletex system network are at the experimental stage and will be introduced in 1984 or 1985.

In 1983, 60% of homes were connected to cable TV networks, i.e. 3.4 million. An estimated 50 million kilometers of coxial cable was put underground for broadband emission, for an investment of 1.5 thousand million guilders. It is expected that 85% of homes will be cabled by 1985 for a further 0.6 thousand million guilders.

2. INDUSTRY AND DOMESTIC PRODUCTION

Equipment was until now developed and produced by Philips and the Swedish company Ericson. Ericson has a Dutch branch and therefore PTT almost entirely uses products manufactured in the Netherlands. Other suppliers are G.T.E., and ITT.

A new company has been set up as a joint venture between Philips and the American telecommunications company ATT. This new company (A.P.T.) will market, develop and produce amongst others digital telephone exchanges.

There are no data available on the ratio between national and imported products used by the PTT. As the policy is to develop and buy equipment in the Netherlands, the ratio of imported goods has always been low.

III. SOCIAL IMPACT

Because of the joining of telecommunications techniques and information, new services have been made possible. These have been the subject of research and experiments. The first research work on the new services was the "Interrelated Media-Policy" project carried out by WRR (1).
A more recent investigation is a study by Bordewijk and Arnbeck commissioned by the Department of Education and Sciences (2).
They distinguish between four information-traffic patterns, i.e.

- conversation (individual information-system - individual choice),
- consultation (central info-system - individual choice),
- registration (individual info-system - central choice),
- allocution (central info-system - central choice).

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(1) WRR: Samenhangend Mediabeleid, Den Haag, 1982.
(2) Bordewijk J.L., Arnbeck: Basis voor een Teleinformatiebeleid, Den Haag, 1983.

Each pattern needs its own responsibility structure. Infrastructure-control, and care of the input of information should be distinguished. The mixing of patterns and responsibilities is the cause of a situation that obstructs the national discussion.
The same Department also ordered a study in 'Technology-Assessment'-potential. The study describes the media and telecommunications technologies and concludes that the most important 'Technology-Assessment'-problems are in the area of possible and new communication applications and not in the area of technique and its primary effects.

In cooperation with TH Delft (Polytechnic), an experimental project DIVAC (Digital connection between consumer and central system) was started by Philips and PTT in 1980.
The project, which is financed by the PTT and Philips, is an experimental technical system in which a number of consumer-terminals are combined with professional equipment.

In 1981 CRM authorized Transmedia, the local organisation for cable communication, to carry out an experiment on new forms of communication via cable network.
Transmedia carries radio and TV programmes via this two-way cable network and offers new electronic services to some hundred subscribers.

The objective of the two-way cable experiment Zuid-Limburg can be formulated as follows:

- to determine whether, and to what extend, interest exists in supplying or using info-services that are offered by means of interactive cable TV networks;
- to determine whether there is the willingness and the financial potential to produce or buy these services at a commercially attractive price.

The experiment will take 10 years and involve 98,611 connections, i.e. 90,615 homes and 7,996 companies.

1. Impact on employment

At 1 January 1984, the PTT employed 78,860 full-time personnel and 24,418 part-timers. In recent years, employment hardly increased (1980: 78,094 full-time and 20,402 part-time).
At 1.1.1984, 27,677 of the employees worked in the field of telecommunications (1980: 27,395).

IV. GOVERNMENT POLICY IN THE FIELD OF TELECOMMUNICATIONS

At the moment the discussion on the PTT-policy is centred on the report of the Swarttouw Committee (1). Important changes called for by this Committee concerning the present-day situation have been made by the government:

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(1) Swarttouw Committee: Taak en functie van de PTT, bezien in het licht van de informatie- en telecommunicatietechnologie, Den Haag, 1982.

- The PTT will also, under the same conditions as all other companies, deliver the nontraditional peripheral equipment to the user. In this way a gradual dissolution of the PTT monopoly will take place.
- An investigation will take place into the possibilities and desirability of integrating the cable television networks with the public PTT-telecommunications infrastructure.
- An investigation will be carried out in the near future into the status, structure, authority and control of PTT-companies, in relation to job-possibilities as far as peripheral equipment and services via the telecommunications infrastructure is concerned.
- The existing negotiation with organisations of users and suppliers on the demand for peripheral equipment will be extended and structured by setting up a telecommunications council.

Government responsibility for broadcasting is only indirectly related to actual supply. The main task is regulating the system of broadcasting services. The Government controls admittance to and the division of transmission facilities. The independent broadcasting organisations are responsible for this provision of services.

The Government requested the Scientific Council of the Government's Policy (WRR) to research in depth into the consequences of technical innovations that might lead to new forms of mass-communication for broadcasting and press. Seventeen background studies were done that cover all aspects of the infrastructure policy, and possible supply and demand for new services. The WHC has drawn up recommendations for coming years.
After a long and difficult period of official decision-taking, the Minister of WVC released a point of view. The Government partly follows the advice. The most important changes in policy as far as the broadcasting system is concerned, are:
- Industries get sole rights on pay-TV;
- Broadcasting organisations keep their monopoly in non-commercial broadcasting . Their status remains unchanged, with the exception of the NOS which will be divided;
- Broadcasting parties get more time during daytime but there will be no third TV channel;
- The spending at the broadcasting parties will be drastically reduced;
- Local broadcasting is allowed but no advertising.

The Parliament has not yet decided on the Media-note.

DENMARK *

I. INTRODUCTION

Denmark has four telephone companies: two private joint-stock companies (JTAS and KTAS), one municipally owned co-operative society (FKT) as well as the P&T, which is a government directorate with direct reference to the Minister of Transport and Public Works.

The Danish telecommunications system is thus a semi-private system. The "private" aspects become less obvious, however, when one takes into account that the State owns directly or indirectly about 65% of the share capital of KTAS and JTAS and that the State every five years also has the right to redeem all shares held by others at a price of 125% of the nominal share price. The State also controls the tariff and dividend policy of the companies. The dividend has remained unchanged for 15 years at a level of 8%.

Recently the government granted new five-year concessions to the telephone companies for the period of 1982-87, but recognized the problems of co-ordinating the activities of the three different concessionaires with those of the P&T. The government therefore set up a National Board of Telecommunications (Statens Teleråd). This new co-ordination board replaces former Board of Telesupervision (Telefontilsynet) whose activities are considered mainly to have involved a slack monitoring of frames of activity.

The definition of competence-spheres for the P&T and the telephone companies is based on an agreement concluded in 1950 - the so-called "concordat". The P&T is, according to the agreement, (there are great differences of opinion as to the precise meaning of the contents of the agreement) the carrier of telephone services between the telecommunications regions and abroad, as well as within its own region (see above). The P&T is also the carrier of the following services: data-transmission (over 300 bit/sec), text-communication (telex, teletex, telefax, etc.), the mobile radio system, the radiopaging system, the telemetry services (in its telecommunications region) as well as the national radio and TV system and services.

In July 1984 a commission was set up by the Government in order to present the proposals within three months on how to decrease state involvment in the telecommunications sector (1).

II.TECHNICAL AND ECONOMIC ASPECTS OF TELECOMMUNICATIONS

1. Spreading of telecomunications

In recent years Denmark has experienced a rapid introduction of new telecommunications services in voice-, text-, data- and video-transmission.

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* Summary of report prepared by Dr. A.J. Hingel, IOA , Copenhagen School of Economics and Social Science, Copenhagen.

(1) Berglinske Tidende 27 July 1984.

The Scandinavian digital data transmission network, datex, was introduced in August 1981. This network provides higher quality and faster data communication than the traditional datel service (transmission on the telephone network) which was set up in 1965. The datex service covered in April 1983 more than 1,000 subscribers in Denmark and has more than 6,000 subscribers in the Scandinavian countries. By the end of 1983, a packet-switched data transmission network became available for the datex subscribers.

An automatic mobile telephone system was introduced in January 1982. It is part of the Nordic Mobile Telephone System (NMT). This new service has met with unexpected great success. Between January 1982 and July 1983, it is estimated that private companies invested DKr 200 million in mobile radio equipment. At the end of the first year, there were 7,000 subscribers. At the end of 1983, 15,903 subscribers were linked up to the system. The former system, the manual mobile radio system, experienced in 1982 a decrease of 7.6% in the number of subscribers. The manual system had at the end of 1982, 13,586 subscribers.

In 1983 the P&T introduced an automatic radio paging service (a one-way communication system for contacting people who are away from their telephone), the so-called OPS (Offentlig Personsøgetjeneste). This service is available to a limited number of geographic areas (Copenhagen, four big provincial towns and a part of South Jutland). It is planned to cover the whole national area in 1986. The system had about 1,700 subscribers by the end of 1983.

The Teletex, the so-called supertelex (high-speed text-communication - 50 times faster than traditional Telex), was introduced in April 1984. The P&T expects the number of subscribers to be about 200 by the end of 1984 and to be equal to that of Telex subscribers in six to eight years.

The telephone companies are planning in 1984 to introduce a nationwide service for distance-alarms, remote-control sensors, etc.. the so-called telemetry services. This service will be transmitted by the packet-switched data transmission network, Paxnet, of the companies. It will also be the Paxnet, will also carry data from the POS-terminals (Point-of-sale-terminals), which will be set up in the towns of Helsingør (October 1984) and Vejle (July 1985) on an experimental basis.

Denmark has one of the highest densities of telephones in the world (after Switzerland and Sweden). In 1982 there were 447 subscribers per 1,000 inhabitants. The number of subscribers is still growing but the yearly increase has been falling since the beginning of the 1970s. The number of cancellations due to arrears in payments has been increasing and amounts for the KTAS to 20% of the total number of cancellations of subscriptions in 1982 (16% in 1980).

The modernization of the central and local exchanges in the telecommunications network was carried out relatively late in Denmark. The automation of the telenet took place mainly after 1953 and the fully automized network was not set up before 1978. The digital switching was the next step to take and the first digital switching exchanges were introduced on an experimental basis in February 1980 in inter-city exchanges in four towns. In 1983 these new exchanges went into full service together with two other digital exchanges.

Optical fibre cables were first applied by the JTAS, which in December 1979 signed a contract of sale with the Danish company NKT (Nordisk Kabel - og Traadfabriker) for 6,000 km of optical fibres. By May 1984, six inter-city and four city optical-cables were in full service in Denmark.

As to the future diffusion of telecommunications, the P&T expects the number of telephone subscribers to increase by 2.5% per annum during the next five years (1). The number of telefax subscribers will increase fourfold, mainly through a spectacular increase in the number of subscribers to the faster group of telefax (group 3: less than one minute per page). The group 4 telefax, the so-called datafax (less than 10 sec. per page) will be set up in 1985. The teletex services, which were started up in the beginning of 1984, will spread extremely rapidly and have 2,700 subscribers in 1988. But the traditional text communications sytem, i.e. telex will also increase. The number of telex subscribers is thus expected to grow by about 6% per year (11,530 subscribers in 1984 and 15,180 subscribers in 1988. The P&T further expects, by 1988, to have 2,700 subscribers to the teletex services, 40,600 mobile telephone subscribers, 16,500 subscribers tothe radiopaging system (ten times the present number) and 2,300 telemetry subscribers.

Within the field of data transmission, the P&T expects a 10 - 20% increase in the number of subscribers per year. The total number of subscribers to the datel and datex services should in 1988 amount to 40,540 against 20,200 in 1983. There will be a changeover the faster datel transmission groups (more than 4,800 bit/sec) and towards the datex and packet-switched datex services. The majority of data transmission subscribers, however, will by 1988 still be connected to the datel service (25,540 subscribers).

The most extensive plans concern the introduction of a system of broad-band transmission on a national level applying optical fibre cables.

The existing broad-band network consists of a public distribution network of radio links, a network of coaxial cables, and a great number of community antenna associations (about 8,600) with 1.1 million members. The first steps towards a future national broad-band network based on fibre optics should, according to the recommendations of the Media Commission (the Prime Ministers Office) be taken by modernizing the present system of radio links and by setting-up a national (trunk) network of optical cables which will be related to the coaxial cable networks of the community antenna associations. This "hybrid network" would be able to carry up to 24 TV programmes. It would involve the setting up of more than 6,000 km of optical cable networks and would, according to estimates of the TV cable companies, require investments of Dkr 2,750 thousand million. The hybrid network would reach all communities of more than 250 households (about 400,000 households would therefore not be connected to the network, and could be on-line before 1990. In order to set it up the cable TV administration requires a Government decision that regulates the activities of the community antenna associations, and not least a decision that guarantees the maintenance of the P&T monopoly on receiving satellite signals. The government is expected to present a bill in the Parliament in Spring 1985 (2).

(1) Telestyrelsen: Tele 5 - års PLAN 1984 - 1988, København, 1983
(2) Mediekommissionens betænkning nr. 4 Betænking om kabelproblematikken og fremførelse af udenlandsk fjernsyn, Betænkning nr. 974, København, 1983. De Danske Teleadministrationer Rapport om tilvejebringelse af hybridnettet, vol. 1, Nov. 1983

2. Industry and domestic production

The Danish industrial telecommunications sector employes about 7,400 persons in about 65 companies (1). The largest national suppliers of telecommunications equipment are:

- Nordisk Kabel- og Traadfabrikker, NKT, which is the only domestic supplier of telephone cables (supplies 50% of national consumption) and which is now also producing optical fibre cables on the basis of a licence from NEC. (employees: 2,400 (1982), turnover: DKr 1,125 million (1982)).

- Standard Electric Kirk, SEK, which is a Danish subsidiary of ITT and the main domestic supplier of publicswitching equipment, PABCs and telephone sets. (employees: 1,250 (1982), turnover: Dkr 518 million (1982)).

Mention should also be made of Storno A/S, GNT Automatic, RE Instruments A/S and the Danish subsidiary of L.M. Ericsson.

The level of national competence (2) varies considerably from one telecommunications technology to another. National competence does not exist in the field of large public exchanges. Small PABXs are produced by GNT-A and by SEK but all larger systems are imported. All coaxial cables are imported (Felten/Guillaume), whereas cables for the subscriber network are produced by NKT. A certain competence has been developed by NKT in the field of optical cables. Telephones and terminal equipment have been the sole products which almost exclusively have been supplied by national producers (SEK and GNT-A).

3. Trade and commercial balance

The trade deficit in telecommunications equipment amounted in 1982 to DKr 150 million. The following years are expected to show an increase in the deficit due to the planned investments in switching equipment.

III. SOCIAL IMPACT OF DEVELOPMENT IN TELECOMMUNICATIONS

The future development of a national broad-band telecommunications network has throughout the last two to three years been the subject of passionate debate.

The Minister for Public Works spoke in May 1983 in favour of the viewpoint that "the broad-band network will open up a world of communication as yet unknown to us, which will change our daily life in a radical way". The Minister further stressed that the Government would pay great attention to "general assessments of the varied types of impacts the broad-band network could have for various parts of the population" (3).

Knowledge about the new "world of communication" is, however, despite the numerous contributions to the debate, still very limited. The debate has to a large degree stayed on the level of pamphlets, campaigns and articles on general awareness.

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(1) Nortel Indkøbspolitik, innovation og markedsdannelse - telesektoren Forlag for Samfundsøkonomi og Planlægning, RUC, 1984 (forthcoming)
(2) The following elements are taken from Nortel (1984) op. cit.
(3) Fortryk af Folketingets forhandlinger (670) 107111/12,10/5 1983.

A certain number of surveys and social experiments have, however, been started up involving the application of future telecommunications services at community level. It would, however, be premature to present any experiences or results.

1. Impact on employment

The employment situation in the Danish telecommunications sector has clearly been marked by the substitution of electro-mechanical systems by microelectronic and digital systems. The employment level in the industry which, in 1974, amounted to 8,100 employees, fell in six years to a level of about 7,400 in 1980 (1).

The employment levels in the telephone companies have been almost stable during the previous five years: but the number of employees per 1,000 subscribers has fallen from 6,6 in 1979, to 5,9 in 1983 (the case of KTAS).

P&T expects the level of employment to increase by 2% a year during the next five years (1984-88) (2). The main future employment problem will thus be related to the sharing of telecommunications services between the various service providers.

As to the effects of the setting-up of a national broad band network on employment in the telecommunications industry, the telephone companies estimate the demand for labour to be equal to 3,200 man-years. They further estimate the demand for modernizing the existing tele-broadcasting network of the community antenna associations to amount to 7,800 man-years (3). The telecommunications companies consider that the setting-up of a broad-band network can be undertaken by the already existing work-force in their companies (4).

IV. GOVERNMENTAL INNOVATION PROGRAMMES IN TELECOMMUNICATIONS

Development of the telecommunications sector has been the subject of governmental attention in all the industrial promotion schemes of recent years.

The Council of Technology has presented a proposal for a comprehensive national programme for the promotion of information technology in the main industrial sectors in Denmark: the so-called "Technological Development Programme" (5). The Council of Technology recommended the allocation to the programme of DKr 1,525 thousand million over four years.

Of special interest to the subject of the present report is the fact that telecommunications is mentioned as the "product field" to be promoted. The Council of Technology proposes to allcoate DKr 285 million in order to promote: (i) the setting-up, for demonstration, of technological systems and sub-systems in the telecommunications sector (products related to the needs of the tele-administration), (ii) the development of technological devices related to optical cable systems, and (iii) the development of basic technologies in the field.

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(1) Nortel (1984) op. cit.
(2) Tdestyrelsen (1984) op. cit.
(3) Danske Teleadministrationer (1983) op. cit.
(4) ibid.
(5) Industriministeriet/Teknologistyrelsen Et teknologisk udviklings-program, December 1983

In the state budget of 1985, which will be presented in the Parliament in the autumn, DKr 250 million have been allocated to the programme. The Technological Development Programme is therefore likely to be launched by the beginning of 1985.

V. SOCIAL GROUPS

The trade unions and the employer organizations have only to a limited degree been engaged in the discussion on the development of new tele-communications services.

The trade unions as well as the employers are represented in the government media-commission in which the national broad-band network has been discussed, and they both backed the recommendation for - as a first step towards a broad-band network - the setting-up of a broad-band network

The Central Organization of Salaried Employees and Civil Servants in Denmark, FTF, has drawn conclusions from the debate on the broad-band network. They express the wish for a general debate on the future "electronic infrastructure" in society before a final decision on a broad-band network is taken. The FTF wants the decision to be taken on the basis of the following principles: (1)

- The decision on the setting-up of a hybrid and broad-band network should be integrated in a total plan of national development projects in order to choose the most urgent.

- Social groups which are especially exposed to the future challenges - women, children, old people and information-disabled persons - should benefit from special measures.

- Alternative development plans for information technology in society should be presented together with an evaluation of their impact.

- People should benefit from equal economic and physical preconditions for access to telecommunications signals.

- The setting-up of a broad-band or hybrid network should be applied to a strategy of decentralizing the decision-making structures and responsibility in society - it should not promote centralized structures.

- Resources for community activities in the field should be allocated.

The professional association of private companies and public institutions in communications, DANMEDIA, has clearly expressed the general viewpoint of the industry: "Our present standard of living would not have been of the same level without a tele network, and without a continuous development of telecommunications Denmark will not be able to play any role in the future global information society which everybody expects to emerge before the year 2000" (2). There is a broad understanding in the industry and in the tele companies on the need for a clear and rapid governmental decision on the setting-up of a national hybrid network "which would place us among the most advanced countries in the field" (3).

(1) FTF Teknologi er ikke neutral - en pjece om telekommunikation betalingsformidling og medbestemmelse, København
(2) Mogens Boman Fremtidens elektroniske kommunikationsmuligheder, DANMEDIA, Copenhagen, October 1983
(3) El&energi, vol 79/6, 22 March 1983

BELGIUM *

1. INTRODUCTION

The Regie des Téléphones et Télégraphes (RTT) is the Belgian public agency with the monopoly on the technical infrastructure of the national telecommunications network. As such, it is the sole initiative-taking body in that field.

The RTT embarked upon the process of modernizing its infrastructure by investing in the replacement of its outmoded electromechanical telephone exchanges. It should be pointed out that with the installation of a network of such exchanges in the sixties Belgium was ahead of its European neighbours in automation of the public telephone system. In 1970, however, the RTT began installing semi-electronic exchanges and is now committed to a policy of replacing electromechanical exchanges by satellite-linked and digital exchanges. This modernization will cover a relatively long period of time (between ten and fifteen years) and the cost is so high that it has been referred to as the "contract of the century". Its political ramifications are highly important.

2. TECHNICAL AND ECONOMIC ASPECTS OF TELECOMMUNICATIONS

The number of subscribers was 2.72 million in 1982, a figure which should rise to 3.02 million by 1985 and 3.5 million by 1990. At the end of 1984 there were 29.7 telephones per 100 inhabitants.

The 22 800 terminals connected to the telex system by 1982 are expected to increase to 26 000 by 1985, with a further jump to 30 000 by 1990.

On 1 December 1982, the RTT inaugurated its packet-switched Public Data Network, christened DCS. This network is linked with similar networks in a large number of other countries within and outside Europe.

In the field of telephone switching, the first digital exchange was brought into service in December 1983 and it is expected that the rate of digitalization of lines will reach 8.1 % by the end of 1985, rising to 32.5 % by 1992.

As regards transmission, it is estimated that the rate of digitalization of the network will be 35 % by 1990 and between 80 and 90 % by 2 000. The first fiberoptic links were brought into service in 1984. There are plans to install 200 km of fiberoptic cables per annum.

Existing services are being modernized and new ones gradually developed, such as the TELEFAX, facsimile transmission service, by means of which any document of standardized format can be sent instantaneously. A group 2 TELEFAX (transmission time : three minutes per A4 page) was introduced in 1983, followed by a group 3 machine (transmission time : one minute per A4 page) in 1984, while a high-speed telecopier (ten seconds) is expected to be brought into service in 1986/87.

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* Summary of a report prepared by Dr. Louis Lohlé-Tart and Mr. P.M. Boulanger, ADRASS, Ottignies, Belgium.

Since the end of 1984, the RTT has had on offer an electronic message service known as the DCS-Mail, using the packet-switched data transmission network (DCS).

The DCS-Mail service offers to each of its subscribers access to an "electronic mailbox" reserved for him and intended for the exchange of messages between users of the service. The service was designed to provide the basic functions of writing, sending and receiving messages.

The Videotex system linking the telephone and a television screen and enabling a subscriber to access databases, send messages and so forth will be available on a limited basis in the course of 1985. It will be fully operational by the beginning of 1986.

Mention should also be made of the audiovisual experiments christened PERCEVAL which have been carried out in the Liège area by the RTBF (Belgium s French-Language television channel). These involve a teletext service which is also available over the cable television network (hence the name "cabletext"). This scheme is likely to find itself in competition with the RTT's plans for certain services.

All these projects call for a significant level of funding, and the RTT has been investing Bfrs 20 to 23 billion annually. Easily the lion's share of this is earmarked for the modernization of telephone exchanges (8.9 thousand million in 1983 or 42 % of the total). This is followed in descending order of importance by : local networks, terminals, transmission systems, data communication and in-house data processing. These investments are the life blood of an industry with an annual turnover approaching Bfrs 25 billion , 50 % of which is earned on export sales.

It is estimated that telecommunications account for 13 % of all public sector investment and that between 40 and 50 % of all research and development grants in the general field of mircoelectronic technologies go to telecommunications-related projects.

3. SOCIAL IMPLICATIONS

Changes in the RTT's workforce : at the end of the seventies, the RTT employed some 28 000 persons. This figure has not increased since and has even declined slightly as a result of natural wastage. In view of the need to contain public spending, this decline will continue or even speed up in the next few years. From the qualitative point of view, there has been a relative increase in the number of highly skilled technicians employed. The report by the working party on telecommunications set up by the National Council for Scientific Policy[1] says that : "One of the results of technological advances will be to reduce the ratio between the least-skilled worker and the higher-skilled".

Employment in the telecommunications industries : it is estimated that some 20 000 people work in Belgium's private telecommunications sector. Of these some 10 % are employed in small and medium-sized companies, with the remaining 90 % concentrated in a handful of industrial giants, located mainly in the Flemish part of the country : Bell Tel., ATEA, Siemens and, to a lesser degree, ACEC, TELINDUS and MPLE (a Philips subsidiary).

[1] Conseil National de la Politique Scientifique : Les conséquences socio-économiques du développement de la mico-électronique en Belgique, sub-group 9 : "Telecommunications".

Surveys carried out by FABRIMETAL (the metal manufacturers' federation)[1] indicate that the total workforce in the sector is 10 % smaller than it was in 1975, falling from 22 065 to 20 740 in the space of four years. However, not all categories of workerswere affected equally, manual workers being hit harder than others (11 791 in 1979 as compared with 14 129 in 1975), while the number of white-collar workers actually expanded rising from 7 836 in 1975 to 8 949 in 1979.

In terms of the economy as a whole, however telecommunications could become a focal point for both development and job creation. That is the view vigorously put forward in a report dating from November 1982 and put before the Senate in mid-1983[2]. Entitled "TELECOM BELGE", it sets out a development plan for sector which, in the author's view, could be the driving force behind an economic expansion comparable to that brought about by the development of the railways in the 19th century.

The centrepiece of this plan is to have every one of the country's some 4 000 000 buildings linked to a high-rate network.

Basically, this plan proposes to set up at a very rapid rate wide band integrated services digital network. The author of the report maintains that rather than go to the trouble and expense of laying two-wire cable now at a cost of Bfrs 4 000 million a year, only to have to replace it in ten years' time, an immediate start should be made on coaxial-based local networks (already in use by cable TV companies) and the use of fiberoptic cables to hook up central exchanges.

If the RTT intends to develop videotex services as part of its modernization policy, using the telephone service, it should not overlook the potential offered in this field by the coaxial cable network operated by the cable television companies - inter-communal companies with close ties to the Traction- Electricité company and the electricity companies. More Belgian homes receive cable television than have a telephone - a cover rate of 80 % for cable television as against 36 % for the telephone.

As part of the European Community's RACE programme the RTT is studying the setting up of an IBC (Integrated Broadband Communication) pilot experiment.

The only trial actually running is the PERCEVAL experiment, a set of audio-visual experiments organized by the Liège studios centred on a teletext service using information provided by the Belga press agency. Terminals and decoders are installed in a selected number of public places in a sampling of households.

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[1] IBIDI cf also : Centrale Générale des Services Publics, FGTB : l'impact de la micro-electronique sur l'emploi dans le secteur des télécommunications, Brussels, April 1981.

[2] For a summary of the plan (in French) see : "TELECOM Belge : un rapport du Sénateur E. Poullet", OI INFORMATIQUE, N° 745, April 1983 (a weekly computer magazine).

The results of these experiments have not yet been made public, but there can be no doubt that, Belgium being the most "cabled" country in the world, it is closer to an interconnected video network than any other country and that the technical potential here is considerable. The main question is to determined whether there is a real public demand for videotex and teletext (or cablotext) services.

IRELAND*

I. INTRODUCTION

Before 1979 a government department had responsibility for running the country's telecommunications services. At that time no major investments were made in this area and profits made were sometimes transferred to other sections of the economy. The service was considerably weaker than those provided in other European countries. There was a long waiting list for the existing services and severe congestion existed on the network. Because of financial constraints the Department of Posts and Telegraphs was obliged to allow some users to develop their own communication and data transmission facilities.
In 1978 a Review Group was commissioned by the Government to look at ways of halting and reversing the rapidly deteriorating quality of the service. Subsequently funding for an 'Accelerated Development Programme' was approved to modernise and expand the network. The programme outlined the proposals for the future of Irish telecommunications (1). These proposals identified the Irish telecommunications requirements for the period 1980-1984 and specified ways of fulfilling them. At this time the Department of Posts and Telegraphs decided to employ digital technology in the Irish telecommunications network.

In 1983 the Postal and Telecommunications Services Act 1983 was passed, a provision of which was the transfer of responsibility for telecommunications in Ireland to a state owned company. The company, Bord Telecom Eireann, was established in January 1984 and employs 18,000 people in the country. The new company was given the exclusive right to provide telecommunications services and networks in Ireland. This privilege, however, ends at the wall of the user's premises, with full and open competition on the supply of users equipment.

Suppliers of subscriber equipment will require a license, the granting of which will be dependent on their ability to demonstrate that they have the resources to supply, install and maintain their products. They must further demonstrate the longterm viability of their business.

II. TECHNICAL AND ECONOMIC APECTS OF TELECOMMUNICATIONS

1. The Spreading of Telecommunications

To date, the majority of the projects in the "Accelerated Development Programme" have been completed. Of the eight key exchanges which will constitute the Main Digital Trunk Switching Network, five are already in service, one is in the course of installation and the other two have been ordered. At the next level, of the eleven Secondary Switching Centers required to complement the main network, three are already in service, two are being installed and the remainder are on order or bein specified. At present 5% of subscriber automatic exchanges are already digital and this number will increase steadily to 50% within the next two years. The objective of a fully automatic service by the end of 1984 is still achievable.

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* Summary of a report prepared by Professor M.E.J. O'KELLY, University College of Galway, Ireland.

(1) National Board for Science and Technology : Telecommunications and Industrial Development, 1980.

On the trunk transmission side, three coaxial cable routes have been changed to digital systems. A further seven routes are scheduled for conversion in the coming year. These will provide approximately 20,000 trunk circuits. Three optical fibre cables have been installed and a further eight routes are planned.

The construction of an earth station in Elfordstown, Co.Cork was opened this year, 1984. All transatlantic satellite traffic, which was formerly routed via an earth station in the United Kingdom will now have direct access to this Irish earth station.

As to telecommunications services (1), an automatic mobile telephone system is planned to be introduced before the end of 1984. Other services are considered and expected to be provided within the coming five years : Teletex, Telefax, electronic Mailbox and Telemetric services as well as a Radio Paging System. In the field of the transmission of data, Ireland is about to introduce a packet-switched data network. Telecom Eireann's packet-switched services, EIRPACK, will be available for commercial operation in late 1984.

Recognising this emerging need for on-line information systems and identifying Videotex as the key, a Videotex trial was establised during the last year by the CII (Confederation of Irish Industry) in conjunction with the IIRS (Institution of Industrial Research and Standards), ACOT (Council for Development in Agriculture and the NBST (National Board for Science and Technology) and the Department of Posts and Telegraphs in the past year. The trial demonstrated the technical possibilities but extensive research is needed with particular emphasis on the nature and content of databases before its commercial viability can be assesed.

2. Industry and Domestic Production

It has proved to be difficult to develop viable enterprises for the small volume production required by the Irish telecommunications market. A significant number of the world's leading manufacturers, however, are present. More than 90% of the work force in the Irish telecommunications industry are employed in the eleven multinational companies - 1,880 out of the 2,066 employed in the sector (1983).

The major suppliers of telecommunications equipment in Ireland are : GEC, Ericsson, GTE, and ITT.

Different type copper cables are manufactured in Ireland as are switching and transmission equipment, telephone instruments and other subscriber terminals. Many of these items are exported either to the parent company or other administrations.

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(1) SEC T. Callender : The Introduction of New Telecommunications Services, a paper presented at the Communications Conference, 1983 (mimeo).

III. SOCIAL IMPACTS

Direct employment by Telecom Eireann in providing its service is of major importance to the country. Because of the wide-spread location of its 18,000 employees throughout the state, it contributes substantially to the economy of country towns. This is further added to by the employment of many small contractors for ducting and cabling works.

In July 1981 the NBST (The National Board for Science and Technology) published its report, 'Microelectronics : The Implications for Ireland'. The report discusses the likely impact of new technology throughout the Irish economy up to 1990. In preparing the report, the NBST (National Board for Science and Technology) conducted detailed examinations on all sectors of the economy. With regard to Telecom Eireann they predicted

"the expansion of the network will necessitate the recruitment of more than 8,000 technical staff but the introduction of automatic exchanges could reduce the number of telephone operators from about 5,000 to 1,000 by 1985".(1)

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(1) National Board for Science and Technology : Microelectronics - The Implications for Ireland, 1981.

GREECE *

I. INTRODUCTION

Telecommunication services in Greece are supplied by the government-owned and operated Hellenic Telecommunications Organisation S.A. (O.T.E.).
This Organisation provides services in the area of telegraphy, telex, telephone, ship-to-shore communication, and international broadcasts and facsimile.

II. TECHNICAL AND ECONOMIC ASPECTS OF TELECOMMUNICATION

Telephone density increased by 69.79 % between 1973 and 1982, from 18.67 telephones per 100 inhabitants to 31.70 telephones. This telephone density is based on the total number of telephones, i.e. main connections. PBX extensions, extra-to-main and manual. This density series understates the real density because from 1974 onwards O.T.E. has allowed the free purchase and installation of extra-to-main telephones. Thus, the 1982 number of extra-to-main telephones which was 239,019 is considerably smaller than the real number of such telephones.

The national trunk and international telephone circuits have increased by 137 and 254 % respectively between 1973 and 1982. The increase in the national trunk telephone circuits is mainly due to the increase of the underground coaxial circuits which increased by 592 % over the same period.

In the period 1973-82 the installed capacity of automatic and manual telephone exchanges increased by 80.5 % (2,87 mill(1982)). Coverage of installed capacity was 88.8 % in 1973 : it reached its peak in 1987 with 92.3 % and by 1982 it returned to the 1973 level.

The number of local telephone exchanges decreased by 11.6 % over the same period. This is due to the decrease in the number of manual exchanges. From 2,963 exchanges (1973) to 2,080 (1982). There has been a gradual substitution of automatic for manual exchanges. The number of automatic exchanges has increased by 48.3 % and that of the manual has decreased by 29.8 %.

The number of outstanding applications for new telecommunication connections is expected to pile up in the years to come because satisfaction of these applications will require additional infrastructure. At the end of 1982, the time required to satisfy the very last application for a main connection was 6.38 years against 6.32 for the previous year. The number of outstanding applications reached its peak in 1982 with 769,449 applications outstanding. It should be noted that the increase of new telephone connections will come from the rest of the country and to a much lesser extent from the Athens-Pireus-Suburbs area. The number of outstanding applications between 1973 and 1982 increased by 376 % in the Athens-Pireus-Suburbs, whilst in the rest of the country it increased by 512 %. For the ten-year period the number of applications submitted in the Athens-Pireus-Suburbs area was 923,159 whereas in the rest of the country it was 1,415,214.

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* Summary of a report prepared by Professor M. NIKOLINAKOS, I.M.E.O., Athens.

At present, the Thermopylae Earth Station has three antennas providing satellite communication with most countries of the world. Work has already been started on the second satellite communication centre which will be located in Nemea. Greece has joined the Eutelsat system and the feasibility of installing an Earth Station connected with the Nemea Centre of Satellite Communication is being examined.

1. Industry and Domestic Production

Telecommunications equipment is manufactured in Greece mainly by multinational companies or companies in which foreign shareholders hold substantial interests. However, it should be noted that the manufacture of telecommunications equipment primarily involves assembly and to a smaller degree production of parts. Some of the equipment manufactured are : switchboards, telephone sets, coin operated telephone sets, telephone sockets, telephone headgears, coils etc. O.T.E. with the Hellenic Bank of Industrial Development, has established the Hellenic Electronics Industry S.A. for the purpose of manufacturing telecommunications equipment. At present the new company is in search of a foreign company that will supply the knowhow.

The main suppliers of telecommunications equipment are : ITT, Philips and Siemens.

2. Trade and Commercial Balance

Imports of telecommunications equipment in 1982 reached 2,431,311,4 drachmas and exports reached 840,532,519 drachmas. Exports represent orders from the parent company of multinationals or their subsidiaries.

III. SOCIAL IMPACTS

In 1982, the number of employees in the Hellenic Telecommunication Organisation, OTE, amounted to 31,148 - 5.8 % of these were employed on a temporary basis. In 1973, 22,885 were employed in the organisation.

Between 1973 and 1982 there was an increase in the "technical" and the "general duties" categories from 41.5 % and 4.4 % to 48.2 % and 7.3 % respectively. Finally, the "special tasks" category underwent a substantial decrease from 21.9 to 14.6 %.

The percentage of women in the total personnel dropped from 24 % in 1973 to 18.3 % in 1982. This was due to the drastic fall of women in the special tasks and temporary personnel categories which more than offset the increase in the other categories.

OVERVIEW OF NATIONAL TELECOMMUNICATIONS COMPANIES AND ORGANIZATIONS

United Kingdom

- British Telecom (Since 6 August 1984 a public limited company. "Privatisation" took place by November 1984).
- Hull Telephone Company
- Mercury Consortium (First private telecommunications carrier created on the basis of the Telecommunications Act of 1981)
- OFTEL (The Office of Telecommunications) Set up by August 1984 in order to control the activities of all telecommunications companies.
- Licences to run mobile telephone systems have been given to: Racal-Milicom, Telecom Securicor Cellular Radio, and Mobilephone.

Italy

- ASST (Azienda di Stato per i Servizi Telefonici)
- SIP (Societa Italiana per Esercizio Telefonico)
- Italcable (under control of the STET holding)
- Telespazio (set up by the STET holding)
- The Post Office runs a number of telecommunications services i.e. electronic mail box, teletex, telefax and telex.

West Germany

- Deutsche Bundespost

Denmark

- P&T (Post- og Telegrafvæsenet)
- KTAS (Københavns Telefon Aktieselskab)
- JTAS (Jydsk Telefon Aktieselskab)
- FKT (Fynsk Kommunale Telefonselskab)
- Statens Teleråd (Set up in 1983 in order to control and co-ordinate the activities of the telephone companies)

France

- DGT (Direction Générale des Télécommunications)

Belgium

- R.T.T. (Régie des Télégraphes et des Téléphones)

The Netherlands

- P.T.T.

Ireland

- Bord Telecom Eireann

Greece

- O.T.E. (Helenic Telecommunications Organization)

THIRD PART

TERMINOLOGY

BIBLIOGRAPHY

TELECOMMUNICATIONS TERMINOLOGY - FOR NON-SPECIALISTS

ANALOG TRANSMISSION: transmission of signals (e.g. voice) without changing its (oscillation-frequency) form. This is the traditional mode of transmission (see DIGITAL TRANSMISSION).

ANTIOPE: a French TEXT-TV system.

BIGFON: a German trial of integrated broadband services.

BILDSCHIRMTEXT: a German VIDEOTEX system.

BROADBAND NETWORKS: communication network which can carry all radio and TV broadcast signals and a variety of telecommunication services for voice, picture and data.

CEEFAX: a British TEXT-TV service.

COAXIAL CABLE: the traditional type of cable with a central conductor within a tube, both made of copper or aluminium (see OPTICAL FIBRE CABLES).

CONFERENCE-TV: see VIDEO-CONFERENCE.

DATABOX: a Danish ELECTRONIC MAIL-BOX service.

DATAFAX: a high-speed TELEFAX transmission service ("group 4") that can transmit one A-4 page of text in less than 10 seconds.

DATEL: traditional data-transmission by telephone network using MODEMS to "translate" the computer signals. The new data transmission network is called DATEX.

DATEX: the modern network for data-communication. This network is becoming PACKET-SWITCHED in order to increase its capacity.
- National packet-switched DATEX networks: TRANSPAC (F), ITAPAC (I), PAXNET (DK), D.C.S. (B), EIRPAC (Irl).

D.B.S. (Direct Broadcast by Satellite): TV-transmission directly transmitted from satellites (DBS-Satellites) to private homes or cable TV distributors.

D.C.S.: the Belgian Packed Switched DATEX network.

D.C.S.-Mail: a Belgian ELECTRONIC-MAIL-BOX service.

DIGITAL TRANSMISSION: transmission of signals (voice, data, video) in digital form (see ANALOG TRANSMISSION).

E.C.S. Satellites (European Communication Satellites): broadcasting satellites which send signals to central reception stations linked to BROADBAND NETWORKS.

EIRPAC: the Irish Packet Switched DATEX network

ELECTRONIC MAIL-BOX: personal central computerized "mail-boxes" which can be dialled up over the telephone net and consulted by means of a computer terminal.
- National Electronic Mail-Box services: VIDIBUS (Nl), D.C.S.-Mail (B), DATABOKS (DK).

EURONET: the former European packet-switched DATEX network, now replaced by the interconnection of the national networks.

INTEGRATED SERVICES DIGITAL NETWORK :I.S.D.N., a NETWORK that integrates all types of telecommunication networks: telephone, telex, data; in French: RNIS

ITAPAC: the Italian Packet Switched DATEX network.

LEDs (Light-emitting-diodes): a technical device for emitting laser signals (e.g. in OPTICAL FIBRE CABLES).

MINITEL: French VIDEOTEX service.

MODEM (MODulator/DEModulator): a technical unit that makes it possible to transmit and receive computer-data on the relephone network.

MOBILE TELEPHONE SYSTEMS: a radio system for "telephone" calls, available in each country.

NMT (Nordic Mobile Telephone System): this automatic MOBILE TELEPHONE system has been introduced in the Scandinavian countries.

OPS (Offentlige Personsøgetjeneste) : the Danish RADIO PAGING system.

OPTICAL FIBRE CABLES: these cables are made of glass-fibre and will be an alternative for COAXIAL CABLES. The optical fibre cables transmission can have higher bandwidth, they are immune to interference from outside signals and they have a very low loss of signals (see COAXIAL CABLE).

OPTO ELECTRONIC TRANSMISSION: laser-made light-signals using OPTICAL FIBRE CABLES. This type of signals generated by miniature lasers - the "light-emitting-diodes (LEDs) - takes the place of traditional electric signals.

PABXs (Private Automatic Branch Exchanges) these private electronic exchanges are delivered in all sizes from a few extension lines to many thousands.

PACKET-SWITCHED TRANSMISSION: a technique for routing data in discrete quantities ("packets") whereby each call does not alone occupy a circuit.

PERCEVAL: a Belgian VIDEOTEX system.

PAXNET: the Danish Packet-Switched DATEX network.

PCM (Pulse Code Modulation): a method of converting ANALOG signals into digital form for DIGITAL TRANSMISSION.

POSTFAX: a Danish TELEFAX service set up between post offices.

PRESTEL: a British VIDEOTEX system.

RADIOPAGING: a system for contacting people by means of a small light-weight receiver, which can receive - according to the type of system used - a variety of messages sent by radio: a simple "bleep" or several lines of message.
- National Radiopaging Systems: OPS (DK).

RNIS: the French designation for INTEGRATED SERVICES DIGITAL NETWORK (ISDN).

SUPER-TELEX: see TELETEX.

SWITCHED-STAR NETWORK: a type of network-architecture where signals are sent down TRUNK LINE CABLES to switching centres from where a "star" of lines radiates to subscribers. This is the architecture used in the telephone network.

SYSTEM X: a British digital telephony switching system.

TELEDATA: see VIDEOTEX.

TELEDATA: a Danish VIDEOTEX system.

TELEFAX: distant-copying via the telephone network. According to which "telefax-group" (grp. 1-4) one uses, the transmission of one A-4 page of text or picture takes between 3 minutes and 10 seconds.

TELEMETRIC SERVICES: this is a telecommunication service for distant alarms, control sensors, etc.
- National Telemetric Services: Red Care (UK).

TELETEL: a French VIDEOTEX service.

TELETEX: An international standardized high-speed communications system for the transmission of text, between terminals, about 50 times faster than telex.

TELETEXT: the former designation for TEXT-TV.

TELEX: international standardized communication system which transmits text. See TELETEX

TEXT-TV (TELETEXT): a one-way information system. Text is broadcasted together with the television signals and can be received by a TV set equipped with a decoder.
- National Text-TV systems: CEEFAX (UK), ORACLE (UK), ANTIOPE (F).

TRANSPAC: the French packet-switched DATEX system.

TRUNK-CABLE: the main cable lines in a telecommunications network. The "highways" of the network.

VIDEOCONFERENCE (CONFERENCE-TV): a telecommunication service that permits two or more parties at distance to hold meetings, where they "see" and "hear" the other party.

VIDEOTEL: an Italian VIDEOTEX SYSTEM.

VIDEOPHONE (VISIOPHONE): a telephone set equipped with a camera that permits subscribers to both see and hear each other.

VIDEOTEX (VIEWDATA, TELEDATA): a two-way interactive information-system that permits the transmission of text and data via a telecommunication network using MODEMS and a TV set equipped with a decoder or a special terminal.

- National Videotex systems: PRESTEL (UK), MINITEL (F), TELETEL (F), VIDITEL (Nl), Bildschirmtext (D), PERCEVAL (B), Videotel (I), TELEDATA (DK).

VIEWDATA: see VIDEOTEX

VIDITEL: a Dutch VIDEOTEX system.

VIDIBUS: a Dutch ELECTRONIC MAIL-BOX system.

WIDEBAND NETWORKS: see BROADBAND NETWORKS.

ORACLE: a British TEXT-TV service.

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1985 — 86 pp. — 21.0 x 29.7 cm

DE, EN, FR

ISBN 92-825-4587-3

Catalogue number: CE-NC-84-002-EN-C

Price (excluding VAT) in Luxembourg:
ECU 3.32 BFR 150 IRL 2.40 UKL 1.90 USD 2.50

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Price (excluding VAT) in Luxembourg

	ECU	BFR	IRL	UKL	USD
Supplement: Telecommunication	3.32	150	2.40	1.90	2.50
Annual subscription					
Social Europe (General review)	15.43	700	11.20	9.25	12
Social Europe (with supplements)	44.07	2 000	31.90	26	33

ISBN 92-825-4587-3

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