Teleliberalisation in Denmark

Studies in e-commerce

One of the most interesting e-commerce cases between the 6 main cases discussed during the fall semester 1999 on the e-commerce line at the IT University in Copenhagen was the NetCologne case [1]. To me it raised the question:

Would it be possible to transfer the successful outcome of the German case to Denmark?

Taking my background in the recent liberalization of the Danish telecommunications sector I decided to explore the possibilities of Danish companies to use this new challenge to promote the e-commerce on the global Internet market, and also to look into the future development of the Danish Internet sector. I will not discuss the e-commerce in general but use the liberalization of the Danish telecommunications sector as my basis for a discussion on the future growth in the Danish use of Internet to do e-commerce.

The development in the area is going very fast and even thought the companies annual reports from 1997 and 1998 give a picture of the trends in the area, we have to wait for the 1999 reports to get the right picture. Many different companies are working on the utilisation of the fixed telecommunications network in their wish to be an active player in the Danish telecommunications sector, but contacts to persons in leading positions in the companies showed that - with a few exceptions (e.g. Tele Danmark, Telia and LIC) - they have no interest at all in publishing information about their plans for the future. Even comments on results from 1999 were difficult to obtain.

My study of the Danish telecommunications sector and some interesting discussions I had with key staff in some of the companies I wanted to be covered by my study ended up with a lot of information about the present situation within the sector, which I could collect and present as a whole. However, unfortunately I was only able to get very little verified information about the future plans of the companies' involvement in the e-business. With a few exceptions, it is my impression that the established companies look upon the future possibilities in the e-commerce sector as being too risky.

1. History of the Danish Telecommunications Sector

In Denmark since 1897, the Act on Telegraphs and Telephones made telecommunications a State monopoly and until 1991 it was administrated by way of the State granting a single concession to the Tele Danmark company. A small part of the monopoly was broken in 1991, when the State licensed a new operator on the market, Sonofon, to operate on the GSM900 mobile market [9].

Prior to the enactment of the 1897 legislation, there were 57 different telephone companies in Denmark. Typically, they operated within a geographically limited area, in other words, in a monopoly scenario. Today, Denmark has got almost the same number of providers, but now the scenario is a competitive one since customers in some cases can choose between several different providers within the same geographical area.

A characteristic feature of the market is that the new providers have been on the market only for a short period. In that respect the situation in Denmark resembles the pattern seen in the United Kingdom and Sweden, two countries which along with Denmark belong to the group of EU member nations that have carried out major liberalization initiatives earlier than the deadlines set up by the EU. [9]

At the initiative of the Minister of Research and Information Technology, a broad political agreement was reached in April 1995 with the scope of a liberalization of the Danish telecommunications sector. The agreement laid down the following objective of Danish telecommunications policy:

"The objective is to ensure Danish users the world's best and cheapest telecommunications services by the year 2000."

The agreement, moreover, established genuine competition in all fields of the Danish telecommunications sector as the means to achieve the political goal of "best and cheapest". Liberalization of the Danish telecommunications sector was to be achieved in two <u>stages</u>.

Furthermore, the agreement stipulated that liberalization was to take place in two <u>steps</u>, and

- o that liberalization of the right to establish and provide broadband networks in local areas was to be introduced already in 1995;
- o that operators should have wider access to establish their own networks;
- o that Tele Danmark's broadband tariffs should be reduced by an average of 65%; and
- o that mobile companies should be ensured access to direct interconnections with foreign countries as well as better and cheaper terms for their interconnections with the incumbent Tele Danmark.

Subsequently, the Minister of Research and Information Technology presented, in July 1995, a discussion paper on how to implement the objective of ensuring Danes the world's best and cheapest telecommunications services.

Another broad and politically based agreement was made in December 1995. The agreement constituted a framework agreement on how to proceed with the total liberalization of the Danish telecommunications sector, and at the same time it advanced the date of liberalization by 18 months, from 1 January 1998 to 1 July 1996.

Additional legislation was passed in 1998 explicitly on bundling the local loop and laying down rules on collocation and service provision. Consumer protection has been enhanced in 1999, detailed provisions concerning administration of the number resources have been added and so has a new Act on the Co-utilisation of Masts for Radio Communication Purposes. [7]

In most of the world, the telecommunications sector is undergoing a highly dynamically technological and market-related development. The early liberalization in Denmark means that the Danish telecommunications sector in many respects at the cutting edge of this development.

In June 1999, the Ministry of Research an Information Technology presented a review of telecommunications policy aims entitled "Fair Competition and Real Freedom of Choice". One of the aims of the review is to set goals for the future telecommunications policy. According to the review, the goal for the coming 5-10 years should continue to be based on the vision to give all Danes access to the world's best and cheapest telecommunications services. [9]

2. Relevance of the Case

These years, great upheavals are taking place in the telecommunications sector, pari passu with the liberalization of the sector. However, liberalization in itself does not guarantee effective competition.

Structurally, the telecommunications sector has moved from basically one provider, in the form of a public service monopoly, to a large number of providers. Considering the size and nature of the Danish market, it is in itself remarkable that as many as four large operators are making major infrastructure investments in Denmark, namely Tele Danmark, Sonofon, Telia and Mobilix.

It also bears mention that resources from the so-called alternative infrastructure are put into competitive play to a very great extent in Denmark. That is the case speaking of cable television and with the existing telecommunications resources of Banestyrelsen (the National Railway Agency), Storebæltsforbindelsen (a bridge consortium), Vejdirektoratet (the Road Directorate), the power companies and certain municipalities.

The Danish liberalization framework also enables service providers to enter the market and compete with existing networks providers by leasing capacity in the operators' networks. Already, there are a large number of service providers in the Danish market for fixed network telephony. [9]

Political

The political objective of the Danish telecommunications market as introduced in 1995 is "Best and Cheapest before year 2000". In order to measure whether we are approaching our goal we might ask the question: **Is the Danish telecommunications market moving towards or away from world class?** Since competition in the Danish market has now gained a sustainable foothold, broader policy issues have recently been taken up, such as the vital role

of he sector in relation to Danish economy and to the furthering the development of the information society.

The latest IT initiative on the political arena in Denmark was the project "Det Digitale Danmark - omstilling til netværkssamfundet" which joined all the experts from the Danish IT world headed by the wife of the Prime Minister, herself an experienced politician and Member of the European Parliament for the Social-Liberals.

The report contains a lot of significant statements from which I will choose a few which underline the importance of the development of the Danish telecommunications sector. (Page no. indicated at the end of each quote in {}).

There are no natural limits to the beginning and end of IT politics. You will find IT progress and IT politics in everything - from the education of children at school to the flexible working hours of their parents and at the same time to their grand parents' gradual retirement from the labour market. {6}

Denmark is moving quickly towards being a network society where an incredibly rapid technological development makes it difficult for even the best technician to look just three years ahead. {7}
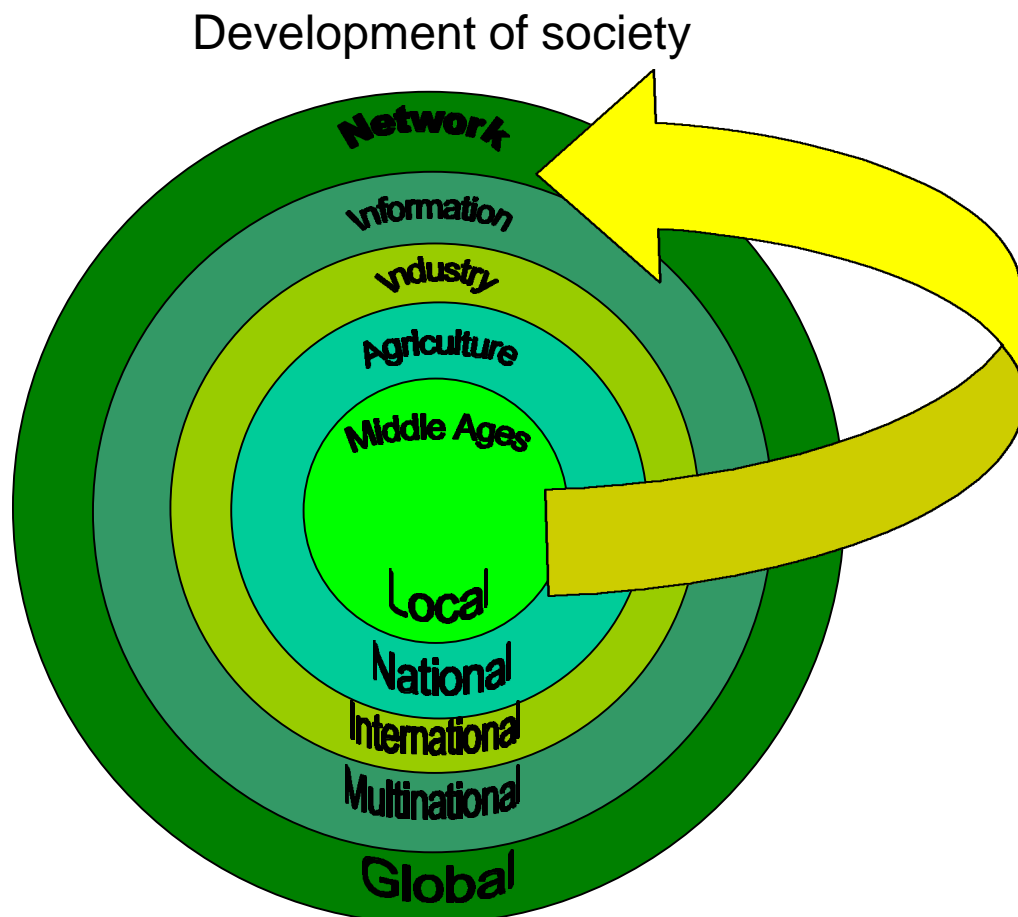
Development of society (freely adapted from [2].
Originally drawn by the study group behind the book "Slip danskerne løs"). {20}

The digital economy has a growth potential about 50% of the global GNP. The countries whose companies establish themselves amongst the first on the Internet will share the growth. {8}

Denmark must be amongst the five countries in the world that has by 2003 achieved the most considerable pro capita e-commerce turnover, and Denmark must be able to offer competitive framework conditions for the companies in the network society. {8}

Increased and focused research efforts must increase our knowledge of the social perspective of the network society. {15}

A public IT-network with separated political, administrative, and technical levels and with the participation of both the state, the counties and the municipalities must be established. {16}

The technological development and the new forms of communication return our life and the world we know upside down. A new social order with new possibilities and new problems has already announced its arrival. Some people call it society of knowledge, others the society of information. We have chosen to go a little beyond that and call it the society of networks since in our opinion it will be the networks to seriously change the world. The electronic network of cables and computers bind people together in new ways. {20}

The Internet is the central nervous system of the network society. Almost every third Danish household has got access to the Internet, a figure, however lower than that of the USA, Iceland, and Sweden which all have a household coverage of 42%. {38}
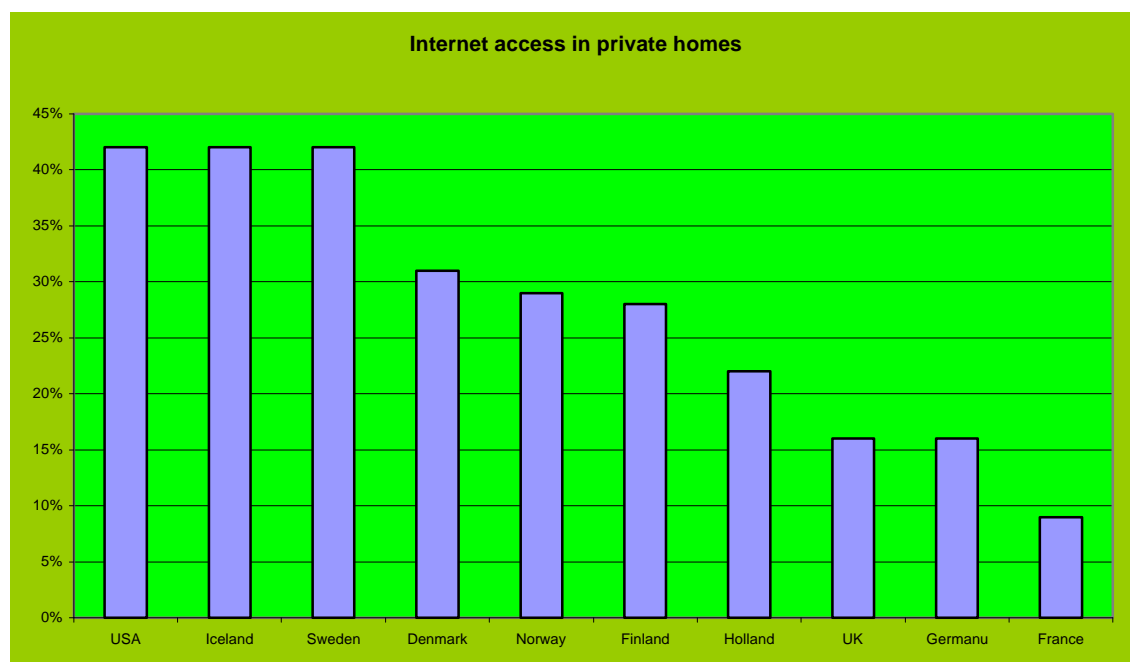

Broadband connections are necessary if the citizens and the companies are to have access to send considerable amounts of data and to use Internet services with sound and live pictures. The diffusion of broadband connections and the prices to be paid in Denmark for such connections dos not come up to the development in the 3 to 5 countries in the world which have taken the lead in this field. {10}

Internet access in private homes
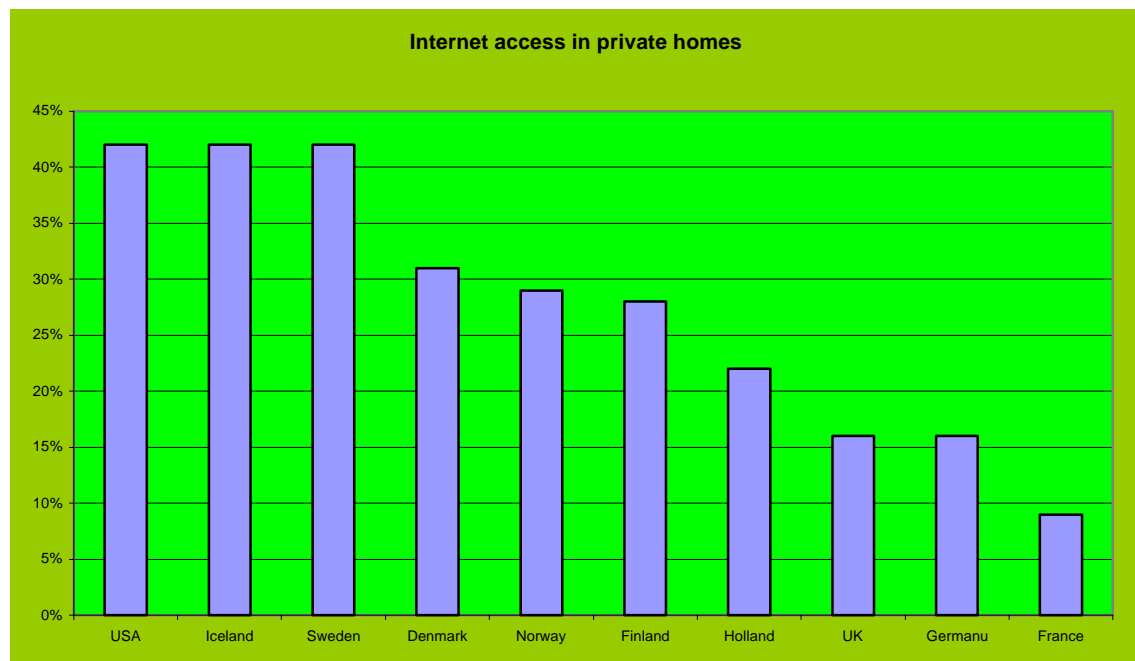
The range of telephone products available, there quality and the prices for acquiring and using them are fundamental factors in the information society - and at the same time to a high degree competitive factors.

A comparison of the prices, which Danish customers pay today with the prices they paid in 1990 or 1995, shows quite clearly that liberalization has made a difference.
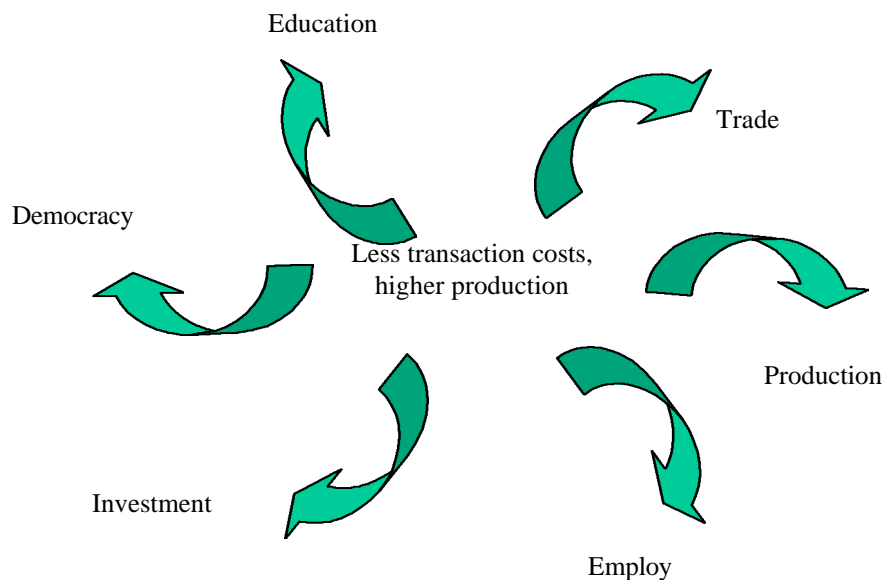
The network economy of the future drawn by Kim Møller. [3]

As background for my choice of tele companies to be included in my study I have made use of the information given in "Orientering om År 2000-paratheden I den danske telesektor" from the Ministry of Research and Information Technology. [14]

We experienced extensive changes within the tele area these years. The tele sector holds an essential potential for growth and welfare in society, and the future development within the tele sector is expected to decisively influence a long number of social and commercial circumstances. As an example we might mention the way we communicate with each other, the way we negotiate with each other and even the way we will be entertained in the future.

The globalisation is already a fait accompli seen in the light of the development of the Internet among other things. Another example is the mobile area where the mobile companies have begun to establish international networks thus making their customers part of regional and global networks rather of national networks. This demands to a increasing extend a shift of focus from a national and regional perspective towards a global perspective.

The global character of the telecompanies caused by mergers and alliances/partnerships across frontiers form part of the globalisation. Also services are becoming increasingly global. It is no longer necessary to have a national affiliation to the tele company, which as an example owns the cables in Danish soil. The same telecompanies are former monopolies on their home market and acting at the same time as new competitive providers on foreign markets. [12]

Literature

The literature used in our study of e-commerce only touches slightly on the problem of the network hardware, and even if the word "network" is used very often, it is in its logical meaning of connecting people. During the course "Systems to e-commerce" we have been working with the security and transaction process, but also in this connection it is taken for granted that the telecommunication network functions as a basis for the e-commerce. "Designing Systems for Internet Commerce" written by G. Winfield Treese and Lawrence C. Stewart, however, has got some interesting points about the subject.

Daily news

The newspapers - especially Børsen and Berlingske Tidende - had written a lot of articles about the teleliberalization, and Berlingske Tidende has focused strongly on their impression that the politicians fear a real liberalization, which might support the open competition too much.

As a side effect the companies within the tele-communication sector have increased the advertising in both newspapers, and magazines, and television. Within the last few weeks WorldOnline have been running an advertising campaign for their Internet connection and carrier service with full-page adverts in colour in all the leading daily newspapers.

To ourselves

As students on the CBS and ITU it is interesting to note that as responsible for the telecommunications in Ørestad Telia have planned to establish a unique IT and telecoms infrastructure focused on effective communication solutions for residents in the new Ørestad. Telia are installing optic fibre cables to all shops and offices and residences, which in principle give unlimited transmission capacity in the locality.

3. Market overview

Outline of the telecommunication turnover of the six largest providers and numbers of selected customers [9]

	Turnover			Customers		
	1997	1998		1997	1998	Pr. 30/6 99
Tele Danmark	20,226	21,031	F:	3,339,000	3,400,000	3,566,000
			M:	871,000	884,000	1,068,518
Sonofon	1,952	2,347	F:			55,880
			M:	551,000	610,000	572,752
Telia	511	1,430	F:	70,418	150,000	444,101
			M:		10,000	156,191
Mobilix		98	M:		10,000	186,512
Tele2	166	465	F:	120,000	190,000	388,000
Debitel	14	187	M:	22,000	60,000	186,512

Turnover in DKK million
F: Fixed network
M: Mobile network

Telia have been represented on the Danish market for several years with services such as PABX solutions, data communication and, starting in 1996, voice telephony based on a carrier selection code (1010). In addition, Telia have acquired several Danish companies, including Telia Stofa, which gives Telia access to roughly 145.000 Danish households in Århus with cable television subscriptions.

Mobilix, like Telia, obtained a DCS1800 license in 1997. Mobilix started commercial operations in March 1998. Mobilix is in the process of establishing a number of activities in the fixed network area. Backbone network sections are being established on the basis of The National Railway Agency's existing fibre-optic cables and routes. In addition, Mobilix is constructing a metropolitan area network in Copenhagen by buying access to facilities belonging to the Municipality of Copenhagen.

Mobilix is partly owned by France Télécom (86%) and the Danish National Railway Agency (14%).

In the fixed network area, two networks (Telia and Mobilix) are under construction to compete with Tele Danmark's network as far as the backbone network elements are concerned. In addition, certain power companies have joined forces in the Powercom Company, which is also in the process of constructing a backbone network structure. This network, however, is not primarily being constructed for Powercom's own use, as is the case with Telia's and Mobilix's networks. Rather, the aim is to resell transmission capacity to third parties.

As the table shows, it may be generally concluded that the operators are mainly foreign-owned. This indicates a switch from the period before open competition was introduced, where the telecommunications infrastructure was predominantly Danish-owned.

	Ownership
Tele Danmark	41,6% Ameritech 7,0% Brandes Investment Bank, USA >5,0% Bank of New York 0,6% Employee stock
Sonofon	53,5% GN Store Nord 46,5% BellSouth, USA
Telia	100% Telia, Sweden
Mobilix	86,0% France Télécom, France 14,0% the Danish National Railway Agency
Tele2	100,0% Tele2, Sweden
Debitel	100,0% Debitel, Germany (Daimler-Benz)

The opening of competition in Denmark is designed in such a way that a company is not required to build its own infrastructure in order to offer telecommunications services. It is possible to lease capacity on the networks from others.

Tele2 was first to really break Tele Danmark's monopoly in the fixed-network area. That happened when Tele2 as the first market player, after having made an interconnection agreement with Tele Danmark in 1996, began offering voice telephony on October 21, 1996, based on a carrier selection code (1001). In only ten weeks, Tele2 had 30.000 customers.

In the fixed network area there are several other providers, primary among them Global One, Telepartner and RSL. In addition, there are a number of so-called callback companies on the market.

The examples show there is scope for competition in Denmark for service providers without a network of their own and that providers are utilizing this.

In the Internet area, a number of providers have distinguished themselves in terms of size. Apart from the ones already mentioned - Tele Danmark, Tele2 (get2net and UNI2) and Telia - the most prominent ones are CyberCity, Web A/S, and Image Scandinavia, which all provide service at local rates nationwide. All in all, there are about 50 Internet service providers in Denmark, of which the majority operate exclusively within a locally defined area.

The rapid development is illustrated by looking back to 1995 where there were a mere three Internet service providers, namely DK-net, UNI-C, and Cybernet. At the end of 1997 the number had grown to 44 national providers. It bears to mention in this connection that, during 1997 and 1998, a series of changes took place, partly as mergers and acquisitions and partly due to continuous emergence of new providers.

The trend in the United States shows that the local providers, in particular, do surprisingly well. However, analyses performed by Andersen Management International and IDC Scandinavia show that, where Denmark is concerned, it will mainly be the largest, most consolidated providers that will survive in the future, despite the continuing, strong growth in the market.

So far, Telia have been the most progressive company regarding the introduction of Internet based voice telephony.

Outline of selected providers of Internet access (September 1998):

Largest provider	Tele Danmark Internet
Second largest provider	Tele2 (get2net and UNI2)
Other major providers	CyberCity, Web A/S, Telia
Other nationwide providers with local rates	Image Scandinavia, Telepartner, Mira, Chili-NET, DIFA, TeleMetro, Canvas Interactive etc.
Local providers	More than 30 local providers

The bottleneck in the fixed infrastructure - as in most other countries - is the access network to the end user. [5]
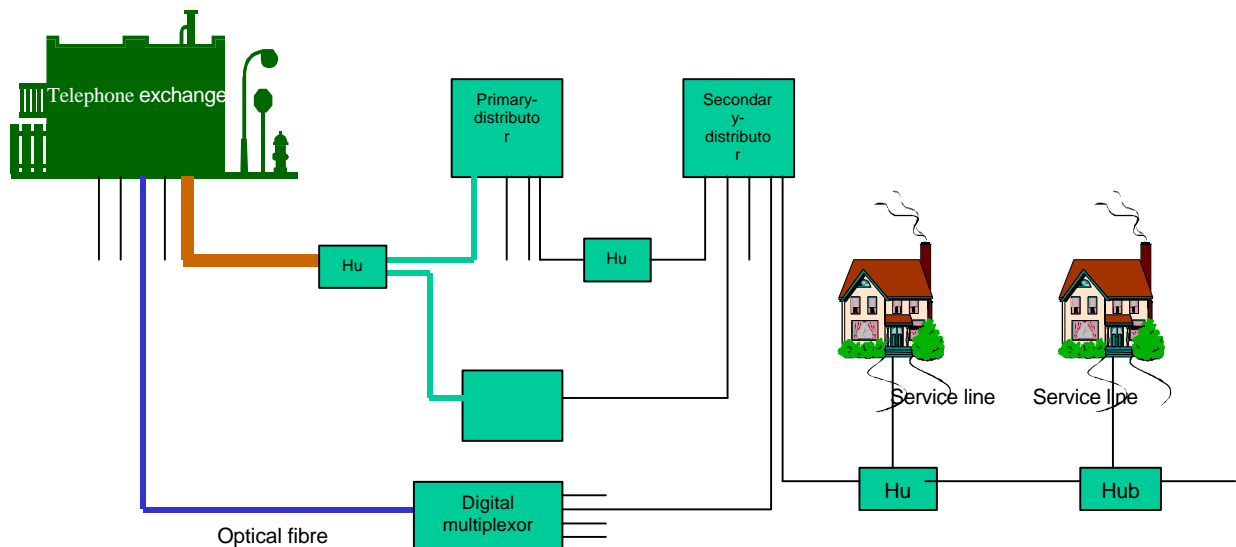
Tele Danmark is the owner of the only nationwide access network in Denmark. The access network on the mass market today is mainly used for voice telephony and, to a lesser extent, Internet access.

New operators, however, also have alternative means of reaching the end user with access networks of their own. One such alternative is to use the cable television networks to carry telecommunication services.

There is a total of 1.260.545 subscribers to cable-TV as of December 31, 1997 by the two largest providers Telia Stofa (39%) and Tele Danmark (61%) and the percentage is 36% of direct household connection and 64% via community antenna systems. [5]

The previous sections briefly described the players on the Danish market, the scarce resources that are the conditions for their operation, as well as the infrastructure they have constructed or are in the process of constructing. It is now relevant to examine the marketing parameters that the providers put into play.

The providers on the Danish market generally aim to market themselves based on a broad range of parameters, frequently also with a wide range of different combinations. Following the liberalization of the telecommunications sector, a prominent new characteristic has been the substantial increase in advertising. New providers, in particular, have to make considerable efforts merely to build up awareness of the company and its products.

Another characteristic is the considerable increase in the number and importance of distribution outlets.

Tele Danmark is in a very strong position and the new providers have a difficult time breaking through. At the same time, the results also reveal that the most successful products are the ones that play on the parameter of price. That is the case with Tele Danmark's Duet service, Mobilix's calling cards and Debitel's price package with their major subsidies of mobile terminals. This snapshot of the current situation is far from unique, however, as price conditions have played a big part as competition increased. [6]

In the fixed network area, Tele Danmark has continually been following the price development.

Tariffs in current for domestic calls have remained on the same level for a number of years. When taking into account the increase in consumer prices in general, it corresponds to a real term decrease in tariffs of 15% from 1990 to 1997. [9]

The total liberalization has made it possible for all operators to establish themselves as providers of telecommunications networks and telecommunications services in Denmark without any license or declaration being required.

Class license - in the fixed-network area:
Basically, Danish legislation does not set any limitations on the provision of telecommunications networks and services. Providers of telecommunications networks and services are under no obligation to obtain individual licenses or submit any declaration.

As a consequence, there are no central registers of providers of telecommunications networks and telecommunications services in Denmark.

Free ownership:
Like the class licence system, the basis of Danish legislation is that no restrictions should be placed on aspects such as the nationality of the ownership circle behind providers of telecommunications networks and services operating in the Danish telecommunications market. So access to the market is not restricted, but free.

The Danish National Telecom Agency, amongst others, has considered the unbundling of the local loop to be of great interest with respect to the possibility of various providers offering combination products no matter whether these are based on the fixed network or on mobile services, and not least in connection with the provision of new services such as ADSL.

During 1997 and 1998 a topic of frequent discussion was the practical scope of the legislation at the time as it was stipulated that providers were allowed, on certain conditions, to lease facilities in the telecommunications networks of dominant providers.

For this reason, the Danish National Telecom Agency made a decision in February 1998, in connection with a specific case, ruling that access to lease of infrastructure capacity included access to leasing the "raw copper", i.e. unbundled access to the last connecting link in the direct access to the customers. The decision of the NTA was brought before the Telecommunications Complaints Board from where a ruling stated that the interconnect law itself at the time did not explicitly allow the "raw copper" to be included under the interconnect regime.

On the Danish National Telecom Agency s recommendation, the legislative basis was subsequently extended by Act No. 470 of 1 July 1998 to explicitly include the unbundling of the local loop, i.e. providers wishing to lease stretches of existing physical infrastructure. Concerning this matter, the Act specifies that lease of infrastructure capacity also includes access to lease of copper (the unbundled local loop); "raw" fibre (i.e. dark fibre) and coaxial cables. Thus, the entire capacity of the local loop as such is included under interconnect product.

The price of the local loop (exclusive of VAT of 25%), irrespective of its length, is DKK 740 per year (i.e. approximately EUR 100), which presently amounts to approx. 72% of the price of the average annual subscriptions fee for a telephone line. [7]

Real players

Tele Danmark is the largest company in the market, in 1998 representing nearly 85% of the turnover of the ten most important telecommunications providers. In all major areas of service, Tele Danmark has the largest market share. Tele Danmark's market share varies from 85% for national voice telephony (1997: 95%) to 47% of the market for mobile communication (1997: 60%). Tele Danmark offers a large number of services that are not provided by anyone else at the moment, and is still the main player in the market for ISDN, radio paging and IN services and the company is the largest provider of Internet access.

Ameritech owns 41,6% of Tele Danmark. The Danish State no longer owns any part of Tele Danmark but private Danish investors own a small part.

Telia will be described later in the report.

Sonofon broke Tele Danmark's monopoly of mobile communication, when it launched a GSM900 service in 1992.

Initially the company offered rates at the known level for mobile telephony but implemented a number of discount schemes. In the service area, the competition meant that Denmark at the end of 1993, as the first country in the world, had two nationwide GSM900 networks. Furthermore, Sonofon's entry into this part of the market meant til introduction of a number of new services, such as mobile voice mail, new solutions in mobile data communication and advanced customer service round the clock. On the distribution side, a variety of new outlets were explored, including mail order, supermarket and television retailers, substantially improving customer access.

Moreover, with its campaigns Sonofon brought a new marketing style to Denmark, and the company succeeded in increasing customer recruitment by lowering its rates during the campaigns. That in turn led to Tele Danmark Mobil intensifying its marketing by launching its own campaigns, initially over the Christmas shopping season of 1993, when Tele Danmark Mobil and, to some extent, Sonofon both provided major subsidies for the sales of terminals. In the period that followed, until 1997, this type of marketing dominated the market. Competition, thus, was expressed in lower prices of mobile phones and, to a lesser extent, in the operators' network tariffs.

Sonofon has continually expanded its product range. An example is the concept of the "cheap zone", where a mobile user located in his home area gets the benefit of rates approximating rates on the fixed network. Another example is voice telephony in the fixed network area

using the carrier selection code 1015. Finally, Sonofon, as the first provider on the Danish market, offer prepaid call cards.

Sonofon accounted for nearly 10% of the turnover of the main players in 1997, but had roughly a 45% share of the actual GSM market.

Sonofon is owned in part by GN Store Nord (53,5%), whose shares are again owned partly by foreign investors including BellSouth (46,5%).

Mobilix, like Telia, obtained a DCS1800 licence in 1997. Mobilix initiated commercial operations in March 1998. Mobilix's market share on the market for mobile telephony is about 8%. In early 1999, Mobilix launched fixed network telephony using carrier select code 1026. Mobilix has taken over WEB A/S, an Internet provider, and is now the seventh largest provider of Internet access.

France Telecom and the National Railway Agency in Denmark own Mobilix. Furthermore, a number of financial investors have joined the company's group of owners. These are GE Capital Structured Finance Group, Paribas Affaires Industrielles, Part'Com Société de Financement, Capital Communications DDPQ and Media Tel Capital FCP.

Tele2 was the first company to really break Tele Danmark's monopoly in the fixed network area. As the first provider, Tele2 signed an interconnection agreement with Tele Danmark in 1996. On the basis of this interconnection agreement, Tele2 on 21 October 1996 offered voice telephony using carrier select code 1001. By 30 June 1999, Tele2 had about 388,000 customers, who used the carrier select code for telephony or Internet dial-up. Tele2 is the second largest provider of Internet access, only surpassed by Tele Danmark.

NetCom Systems AB in Sweden own Tele2.

Interesting small players

CyberCity are becoming candidate for the group of large scale providers. CyberCity had an estimated turnover of about DKK 100 million in 1998. CyberCity is the third largest Internet provider in Denmark and the company offer Internet access on fixed network via ISDN lines.

Global One Communications A/S are like CyberCity on their way up. The company is selling ordinary international telephony via carrier select code 1009, and via 1022 the company is selling prepaid call cards for international telephone calls. In addition to international telephony, Global One Communications A/S also provide data communications and Internet services to end-users and other Internet providers.

The three large operators, Deutsche Telekom, France Telecom, and Sprint Telecom, own global One Communications A/S on a joint basis.

World Online have since the buying in of Image been fighting for market shares and are offering the lowest prices in Denmark for Internet access. They use carrier selection code 1049 and offer students' minute prices down to 0.027 DKK.

Lærernes Indkøbs Central (LIC, The teachers shopping Centre) is a Swedish company with 2 shopping centres in Denmark. The shopping centres are only open to their 160.000 Danish members who get a discount of 10-20% compared to the open market. In addition the members can buy at a 5-25% discount in about 1,200 affiliated shops. LIC in 1997 offered a

10% discount on mobile telephony. It has been a good source of income for the company and they have decided to go into the fixed net business from the beginning of this year offering their members 10% discount on tariff rates.

The company has already a "simple" e-business solution on the Internet for members but they are studying the possibilities of using the new telephone service to extend their offers to members especially the many members who live far away from the two shopping centres.

Forbrugsforeningen af 1886 is the largest and oldest purchase association for public employees with 110,000 members and more than 2,000 associated shops. This organization is absolutely suitable for e-commerce but the association sees no reason to extend their business to new areas, even though they are trying with letting out of holiday homes in Denmark and abroad. It might be an interesting case to follow up on with a serious proposal for extending their services to also comprise e-commerce.

Kaj Dige Bach, a marketing company (the magazine Idényt, delivery of heating oil to private homes) are on their way to offer access to the fixed network. They have signed a contract with Tele Danmark, but the company does not wish to give any further information to outsiders.

4. The Telia case

Telia have, as mentioned, been represented on the Danish market for several years with services such as PABX solutions, data communication and, starting in 1996, voice telephony based on a carrier selection code (1010). In addition, Telia have acquired several Danish companies, including Telia Stofa, which gives Telia access to roughly 145,000 Danish households with cable television subscriptions.

Moreover, Telia is in the process of constructing the backbone elements of a fixed network in Denmark. This is being done by utilizing cable laying rights, co-location and existing routes belonging to the Road Directorate, Storebæltsforbindelsen (a bridge consortium), the power companies and the Municipality of Copenhagen, among others.

Company overview

Telia's Danish operations are owned by a holding company, which is a fully owned subsidiary of the Swedish parent company, which again is 100% owned by the Swedish state. [9]

In 1997, Telia obtained a licence to construct and operate a network following the DCS1800 standard, which in many ways resembles a GSM network but uses a different frequency band (1800 MHz). Telia started commercial operations on this network in 1998, and it is estimated that during the first six months of their existence, Telia have attracted nearly 10,000 customers. Telia's DCS1800 network is under ongoing construction. Telia has reached an agreement to use Sonofon's network, by means of which Telia's customers will also be able to get GSM services in areas not covered by Telia's own network. Such use of another operator's network is called national roaming.

Key figures for Telia's physical infrastructure	
Exchanges	2
Fibre kilometres	10,000-20,000 km
Path length of transport network	Approx. 1,000 km
Cable TV connections (Telia/Stofa)	175,000

Position on the market

Telia had about 440,000 customers who used the carrier select code for telephony or Internet dial-up. In 1997 Telia obtained a licence to construct and operate a network, and the company started commercial operations on this network in 1998. Telia's market share on the market for mobile telephony is about 7%. Telia are the fourth largest provider of Internet access.

Telia have a backbone network, which has been established within the last year or two. The network is structured as a large cross from Copenhagen to Esbjerg and from Ålborg to Hamburg. In addition, the network also comprises a city ring in Copenhagen. Through Stofa, Telia have a cable TV network, predominantly located in Jutland. Telia are until now mostly basing its fixed access to end-users on Tele Danmark's access network.

Market strategy

Telia is the market leader for use of carrier select codes and the company will use its market position by making the best possible use of the new regulations whereas it is no longer necessary to key the carrier select code to use an alternative telecommunications company. This means that it will be easier for the consumers to make use of the facilities offered by the liberalization of telecommunications.

Customers in Denmark using carrier select codes (prefixes), end of year			
1996	1997	1998	1st half 1999
31,505	196,928	501,667	1,169,311

And as the following table shows, it is mostly Telia and Tele2 that make use of the possibility of getting customers via carrier select codes.

Percentage distribution on companies of registration for the use of carrier select codes, by 30 June 1999	
Telia	38%
Tele2	33%
Other companies	29%

It is the strategy of Telia to be the best alternative to the market leader by way of offering the highest degree of customer service (the weak point of Tele Danmark). It is expected that Telia's involvement in the Ørestad will be the conclusive factor.

5. Has Telia learned from NetCologne?

The NetCologne case [1] shows how NetCologne, a medium size private telecommunication and Internet service provider on the liberalized German telecommunication market, have prevailed against established competitors and gained a leading position as regional service provider on the German telecommunication market. NetCologne is one of a few companies in Germany that have set up its own subscriber network of about 40,000 "fibre-kilometres" for its services within the city of Cologne.

The way in which NetCologne focus on their customers, is reflected stringently in the internal structures and processes of the company. As the maxim 'customer first' implies, the company concentrates on internal needs and demands *only after* reliable basic services for the customers have been ensured.

Beside the German Telekom, NetCologne is the only telecommunication service provider operating in Cologne in possession of its own cables in the underground. Hence, it was one of the first new providers on the market to offer business and private customers the entire spectrum of telecommunication services on a regional basis at comparatively low prices.

Since 1996, the German telecommunication market has been deregulated in a step-by-step approach.

Since January 1998, private and commercial customers in Germany may freely select their telecommunication service provider.

The liberalization of the market attracted many new players and, as soon as summer in 1998, more than 200 licences were granted to 120 organizations being given permission to operate a private telecommunication network offering public telecommunication services.

On the liberalized German telecommunication market, NetCologne offer communication products and services tailored to the individual customer, reaching from 'simple' telephony to professional Internet solutions, implementation and management of corporate networks, and broadband communication networks. In co-operation with the Bertelsmann Broadband Group, it is the first company in Germany which intends to offer interactive media services via a TV cable network before the end of 1999.

In June 1999, NetCologne's customers amount to 38,000 within its telephone business, amongst them 4,500 business customers.

Since its foundation in October 1994, NetCologne has been aware of a powerful network as crucial for all telecommunication services to be offered. Hence, in 1995, the company laid the ground for City|Net|Cologne - a glass fibre network for the Cologne area. [1]

Under my study I found that the German company and its story was not known by the Telia people responsible for the development of Telia's strategy even though in many ways they used the same strategy. In fact they could use the statement of the NetCologne company as their own by replacing the word Cologne with the Ørestad:

> *NetCologne provides innovative information and communication technology*
> *for the media city Cologne. We are Cologne's innovative city carrier for*
> *telecommunication and Internet services. As a Cologne company we improve*

> *local economic conditions to ensure the city's competitiveness on the market of the future.*

Try to compare (quotations from [1]):

- ❖ Stringent focus on the customer,
- ❖ its own subscriber network,
- ❖ *NetCologne has been aware of a powerful network as crucial for all telecommunication services to be offered,*
- ❖ NetCologne's main business objective was to provide flexible services with a transparent price structure at high quality,
- ❖ since mid 1998, NetCologne participate in Cisco's Powered Network Program (Telia have Ericsson as partner),
- ❖ *The particular strength of NetCologne is its regional orientation, which enables the company to react to and focus on local needs and demands faster and more flexibly than the global players,*
- ❖ NetCologne's web sites are the company's interactive interface to the customers, one of NetCologne's most valuable assets is its own network,
- ❖ NetCologne's broadband TV cable network also increases in importance,
- ❖ recently, NetCologne decided to watch the business environment and its specific market for additional business opportunities (Telia already have the companies Telia InfoMedia A/S, Telia Net, Telia IT Service A/S, Chili A/S and Egmont Online A/S),
- ❖ NetCologne lead the official Internet pages of Cologne (Telia have the same arrangement with Ørestadsselskabet).

The question **Have Telia learned from NetCologne?** could not be answered in the affirmative, but if the Telia people tell the truth, they have produced the same ideas a year or two later. It looks as if their project in the Ørestad will have the same success as we see in Cologne for NetCologne.

Pilot project in the Ørestad

Following the tendering of competitive bids to Ørestadsselskabet in March 1999 for IT and telecommunications in the Ørestad, Telia were chosen as the preferred cooperation partner in the Ørestad project. The cooperation agreement which Telia and Ørestadsselskabet have made covers shared marketing of IT and telecommunication services in the Ørestad. An important part of the agreement is cabling, and the creation of a unique IT and telecom infrastructure focused on effective communication solutions for companies which have moved or are planning to move to the Ørestad.

Telia is to contribute to creating the Ørestad, a place which meets the demands and wishes of the people who work, live and/or spend their spare time in the Ørestad. With flexible and easy to use telecommunication information based on services, Telia have the vision to contribute to developing and strengthening quality of life, the environment, and the competitive power of the Ørestad.

Telia want - as part of their telecommunication strategy - to place people at the centre. A powerful and intelligent high-speed network will provide all the familiar telecom services –

fixed telephony, Internet, data communication, TV and mobile telephony – at the highest and most stable quality. It also provides the potential for many new, simple and useable telecom services.

Speed and time to market are crucial factors for the competitive strength of a company, and ultimately for the individual's quality of life. The plan for Telia's IT and telecom infrastructure in the Ørestad is based on state of the art technology including IP and ATM which both give customers great flexibility and effective access to many new Internet based services, and offer a differentiated Class of Service/Quality of Service.

In the Ørestad Telia is installing optic fibre cables to all businesses and residences, which in principle give unlimited transmission capacity in the locality. Telia creates an IT and telecom infrastructure to meet the needs of the future, based on an open architecture so that new services can be quickly implemented.

The services for the future
The modern company has replaced clocking in and out with flexible working patterns. Today's organizations work in projects, processes and with products which are spread around the globe, instead of working according to traditional functions and on the basis of country and regional divisions: Work is carried out when you want, where you want and with whom you want. Regarding communications services in the Ørestad, Telia will offer the traditional services that several companies are already using today, as well as services for the future. We will see a strong integration of voice and data, fixed as well as mobile, opening up countless opportunities for new services where multimedia will play an increasingly important role. At the same time resources will also become centralised, so that everybody will have access to all relevant information regardless of where they are. The keywords for Telia's communications services in the Ørestad will be higher bandwidth, flexibility, mobility, integration (convergence) and security.

Telia's new building in the Ørestad
Telia have established a technology centre that will serve as an international focal point in Ørestad.

From here the network in the Ørestad is linked to Telia's backbone-net in Denmark. Telia's Scandinavian Ring, Viking Ring and transatlantic cable are also linked to the technology centre in the Ørestad. The Scandinavian Ring connects the major cities in Sweden, eastern Denmark and Oslo in Norway. The Viking Ring is Telia's European backbone covering cities such as Copenhagen, Hamburg, Frankfurt, Paris and London. The intelligence in Telia's multi-service net, Single-Net, is also located in the Ørestad. From here the multi-service net is controlled in the rest of Denmark as well as Hamburg, Frankfurt and Paris. Thus the Ørestad will become a high technology centre with international connectivity to the rest of the world.

The strategy for Telia's project in the Ørestad
- Telia will make it easier for companies in the Ørestad to establish effective home-based workplaces for their employees, so they can work when they want. Bandwidth and flexibility makes this possible.
- Establishing a new domicile and at the same time ensuring that the company's IT and tele-infrastructure is prepared for future services, is a strategic decision and most often means sizeable investments.
- IT and telecommunications infrastructure in the Ørestad will be accessible commensurately with the influx of companies and residents to the Ørestad.

- The planned capacity of Telia's net is approx. 960 Gbit/s or the equivalent of 11 million simultaneous telephone calls.
- Telia have also prepared the net for Dense Wave Division Multiplexing technology, which can increase accessible capacity up to 32 times. That means a net capacity of up to 30,720 Gbit/s.
- The network is built with redundancy, which gives the best security.

6. Conclusion

No doubt, the liberalization of the Danish telecommunications sector is an important step on the way to open up for the use of e-commerce in Denmark, but there is still a long way to go and I'm not certain that Denmark will be amongst the five countries in the world that has by 2003 achieved the most considerable pro capita e-commerce turnover.

Some companies have seen the light, but to reach their goal: to benefit from e-commerce, the politicians must think in quite new and untraditional ways in connection with all the other problems related to global trade. I might mention as just one example the VAT taxation.

Liberalization of the communication on the fixed network is not enough to catch the interest of the customers who want the lower prices. There are other means of connecting to the Internet than the existing cables; perhaps the future natural solution for Internet access will be TV cable network, the existing supply net for electricity, mobile radio communication, or satellites.

7. Further activities

In 10 years more than a quarter million Danes will be able to supplement their traditional work at the workplace with hoe-based telecommunication work. Close on a third of today's Danish municipalities, counties and private enterprises have experience in telecommunication work. Data security is one of the most significant objections to telecommunication work today; whereas the taxation of PC equipment and free telephone are not seen as significant barriers.

This appears from an analysis performed by Andersen Management International A/S for the Ministry of Research and Information Technology. The definition of a home-based IT telecommunication workplace is a workplace where at least 20 percent of the work is carried out from the home and where it is possible to have electronic access to the enterprise. This means in practice that telecommunication workers are in contact with their normal place of work via the telephone, computer and modem.

The finding of the analysis is particularly surprising in the light of the fact that only about 9,000 Danes are estimated to be home-based telecommunication workers. The introduction of telecommunication work will open up for more flexible planning of work, which will benefit both staff and employers and, consequently, family life and the workplace. Furthermore, increased use of telecommunication work will mean new opportunities for the elderly and disabled on the labour market.

It is expected that the potential for telecommunication work will be most significant in the public sector as well as the finance and insurance sectors. Other service areas and in particular the educational sector are areas where telecommunication work is also expected to become generally used. The analysis shows that the highest potential with regard to professional

groups is to be found among employees with high academic education and office staff. These are groups, which already to a large extent make use of IT equipment in their daily work.

And this will only be possible with the best technical solutions on the network site. Let us hope that the liberalization of the Danish telecommunications sector really leads to a boom in the use of computers also for the man in the street so we will meet new challenges within the area of e-business when we have finished our study in the year 2001.

Appendix a
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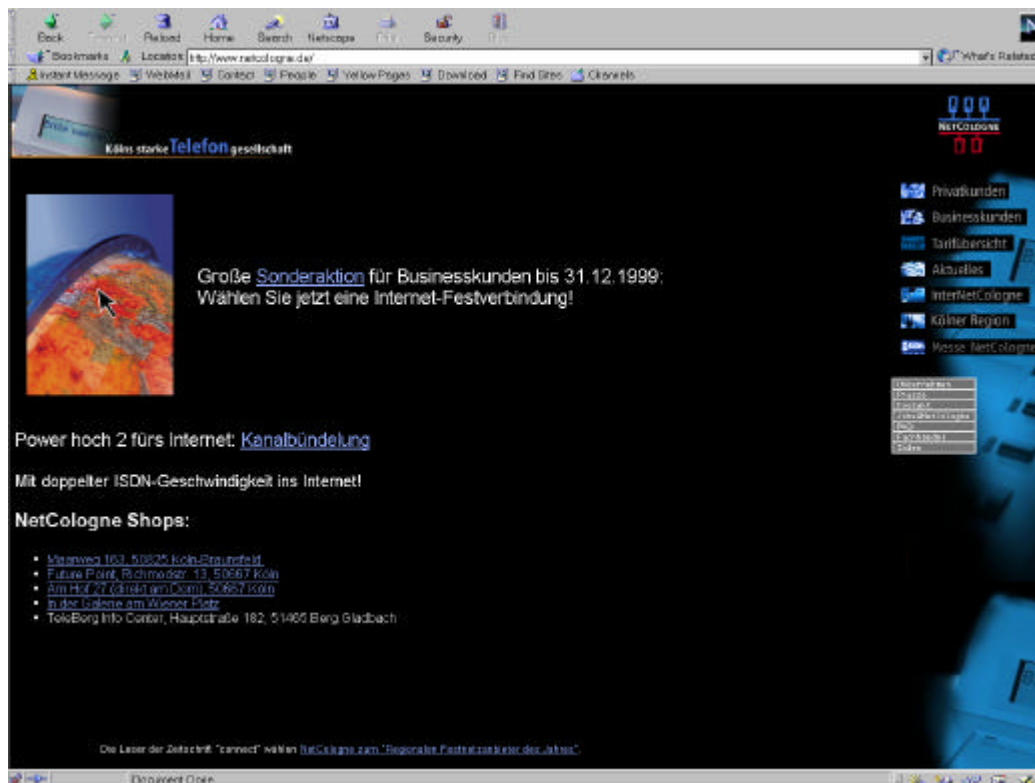
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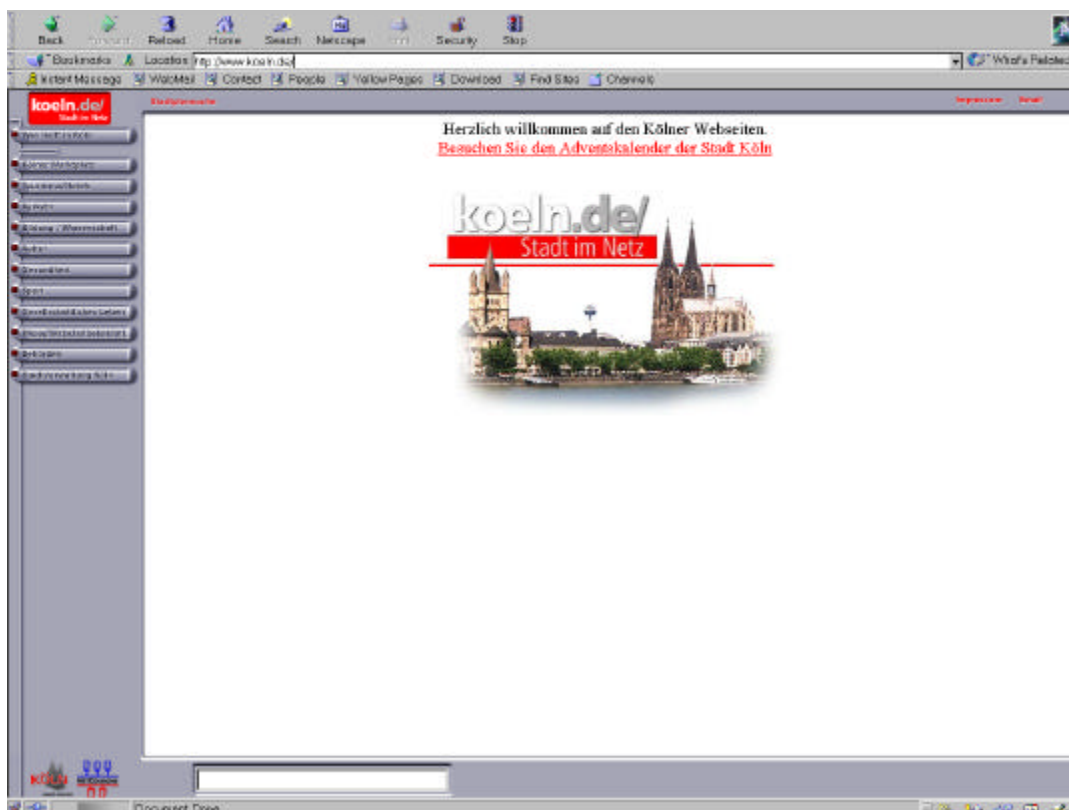
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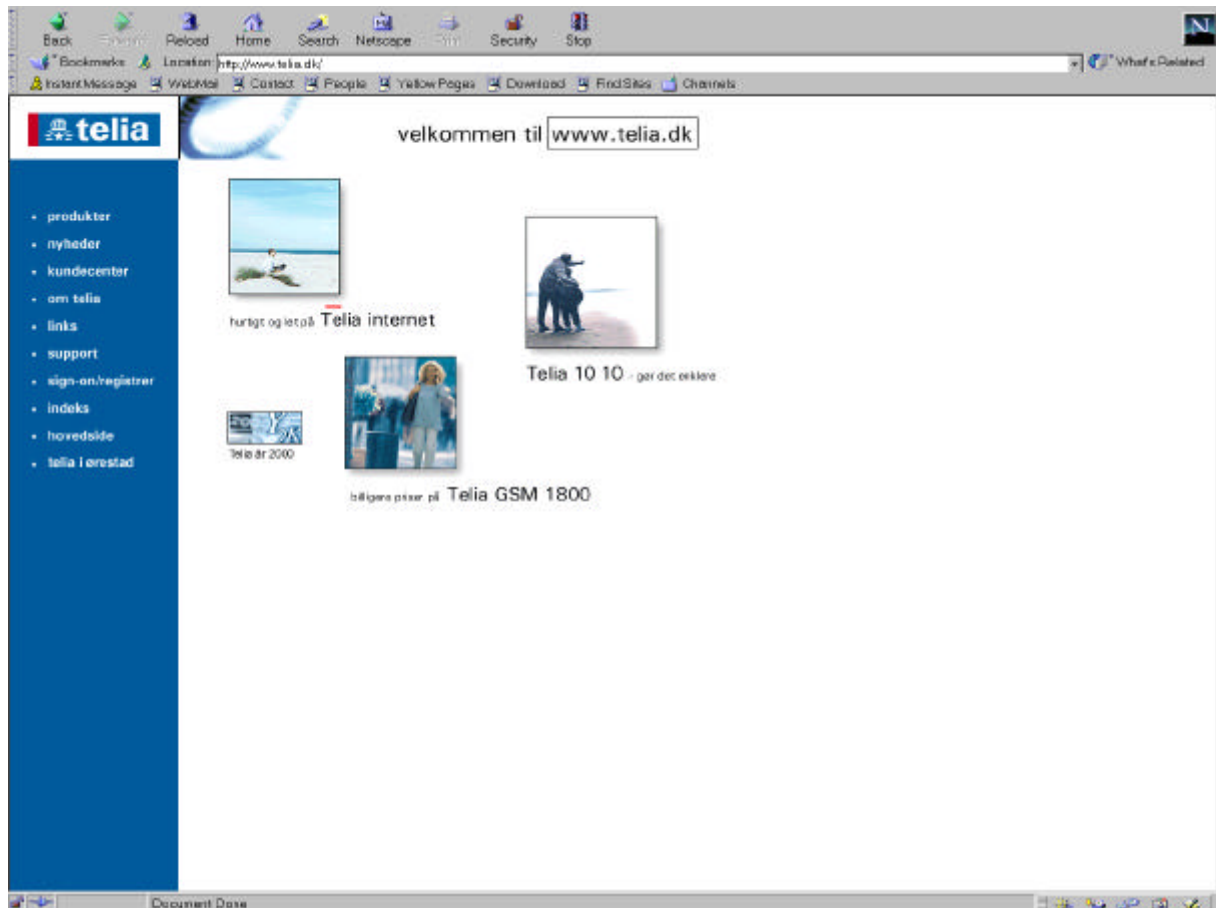
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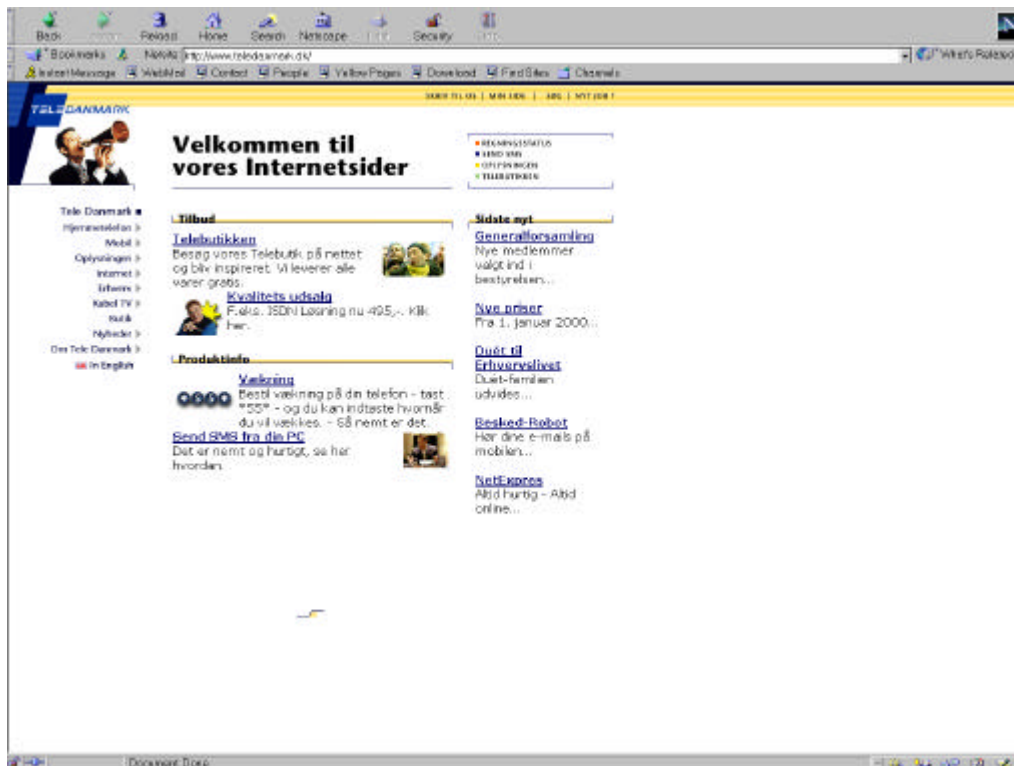
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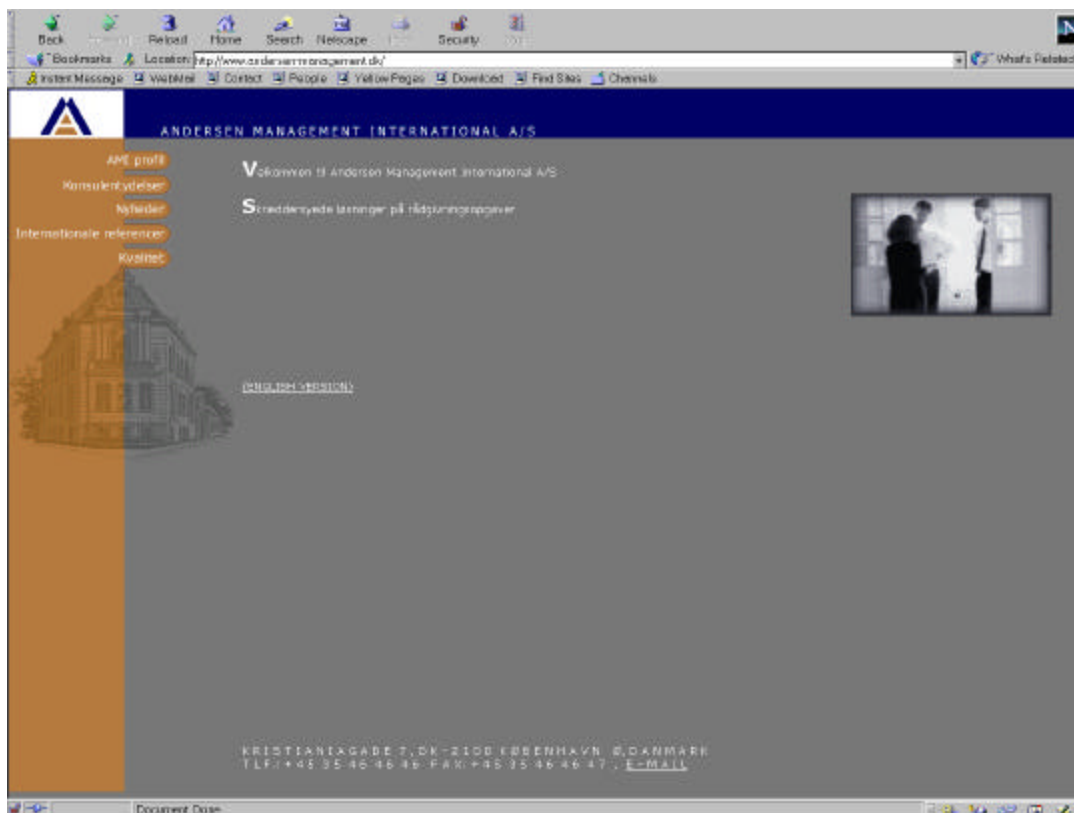
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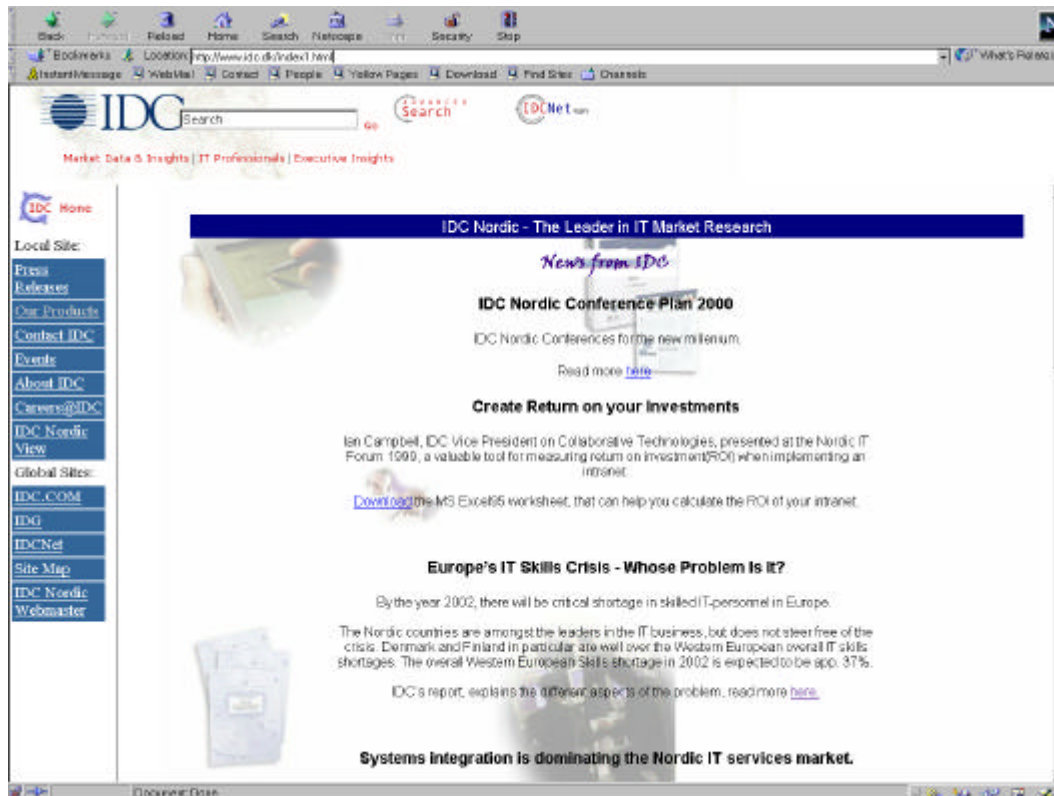
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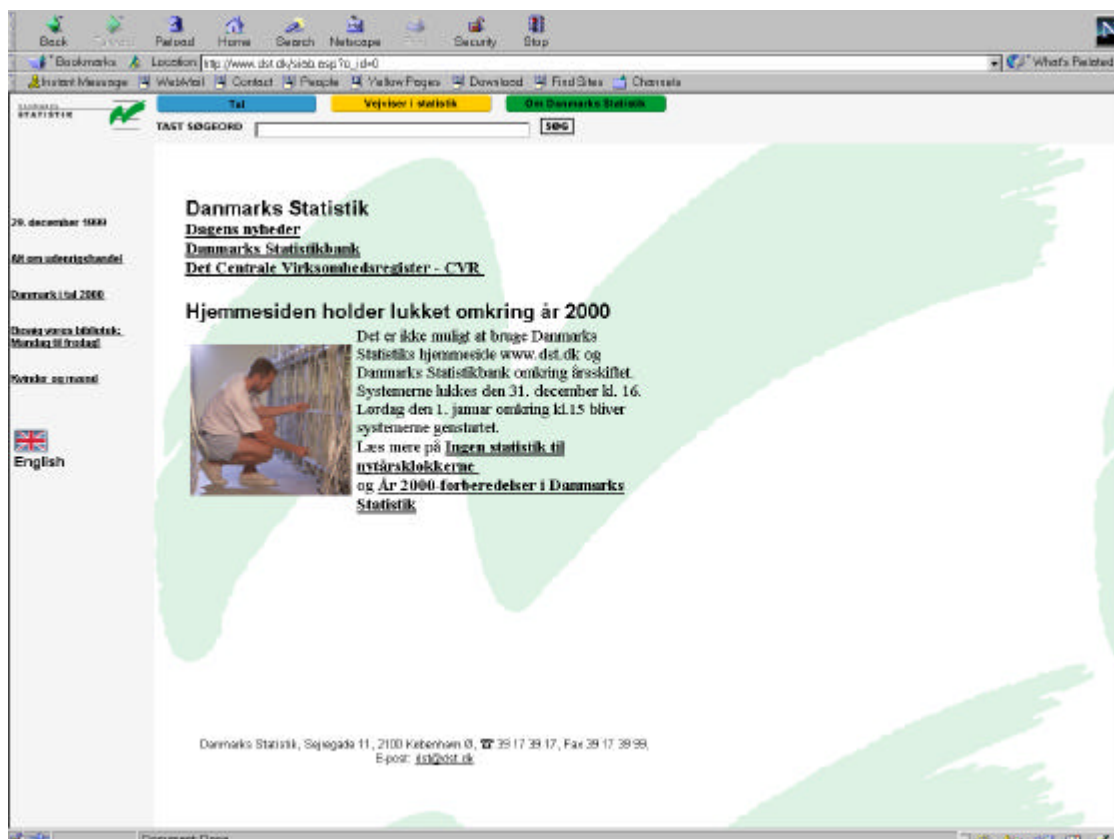
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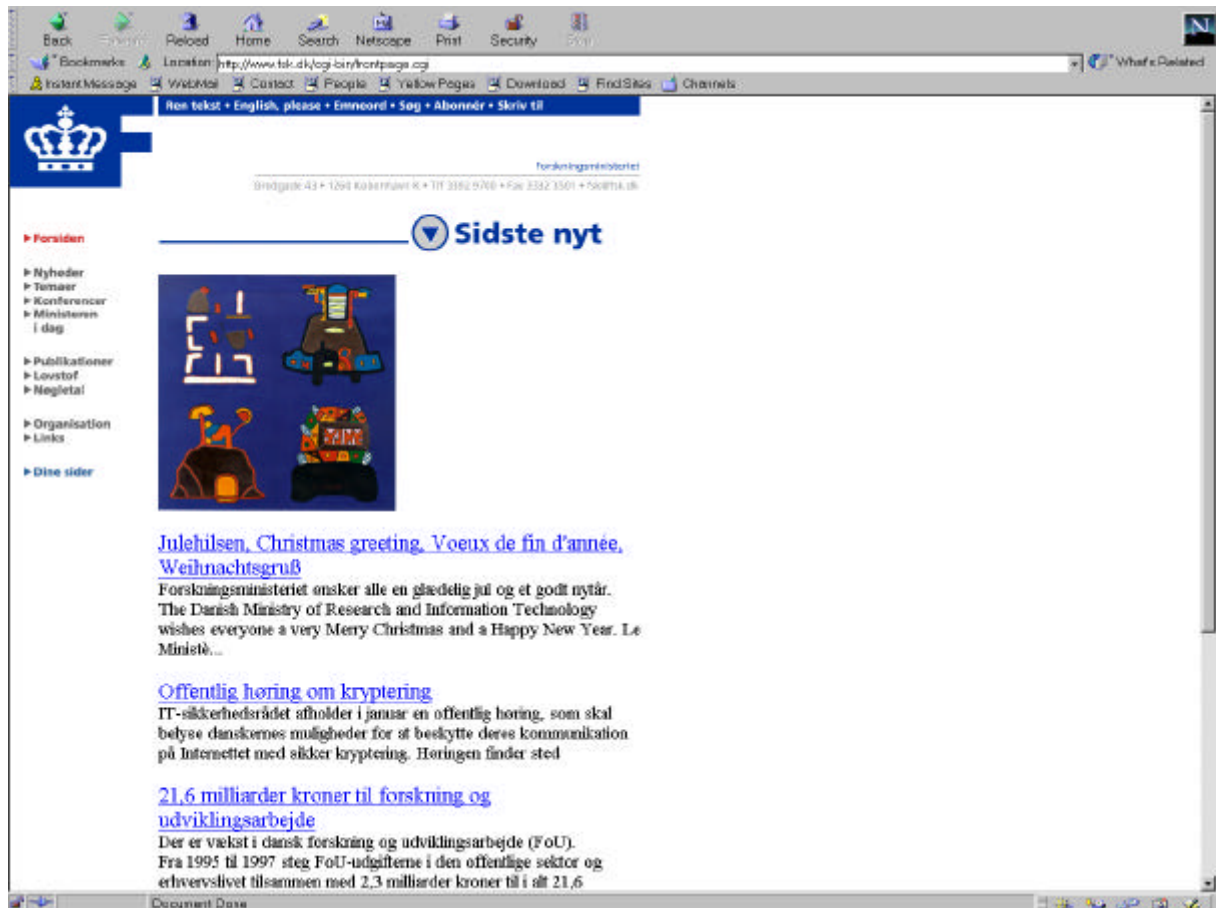
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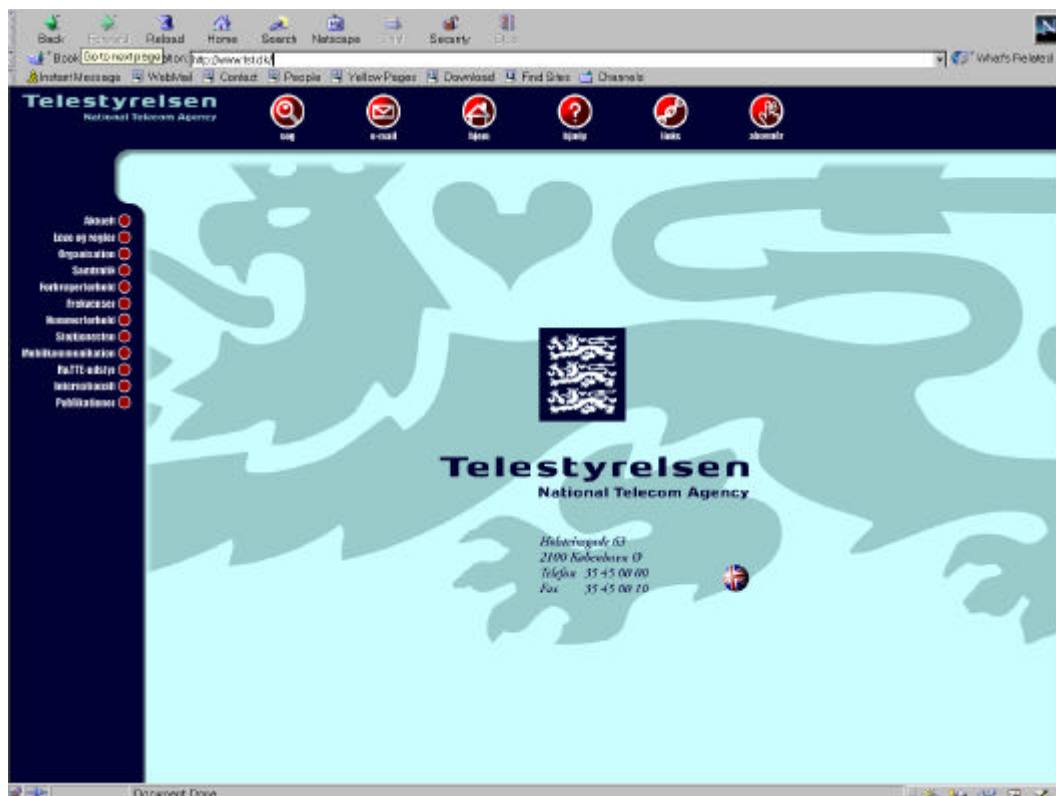
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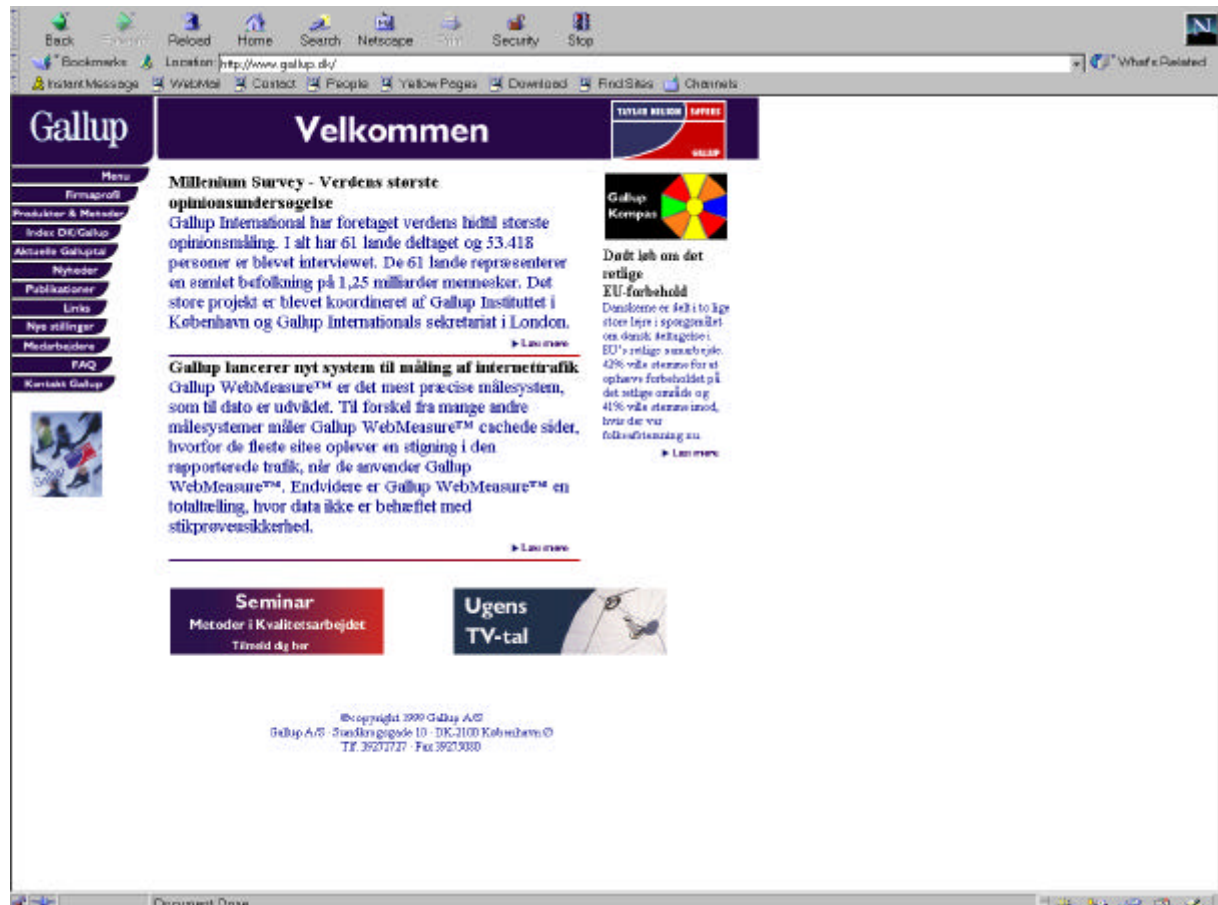
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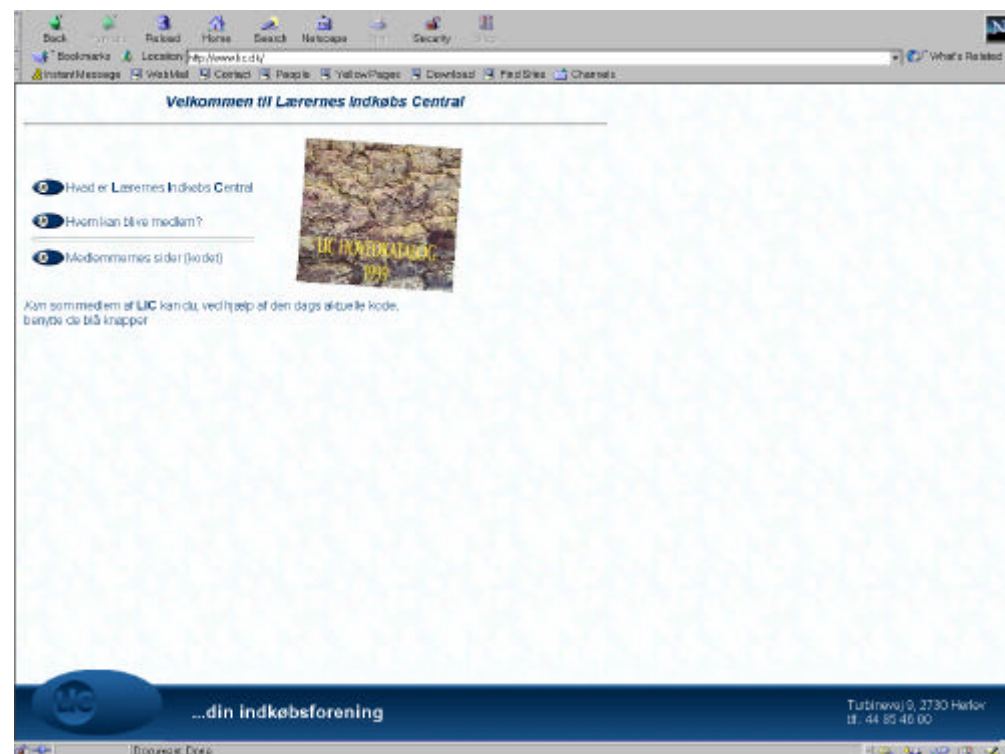
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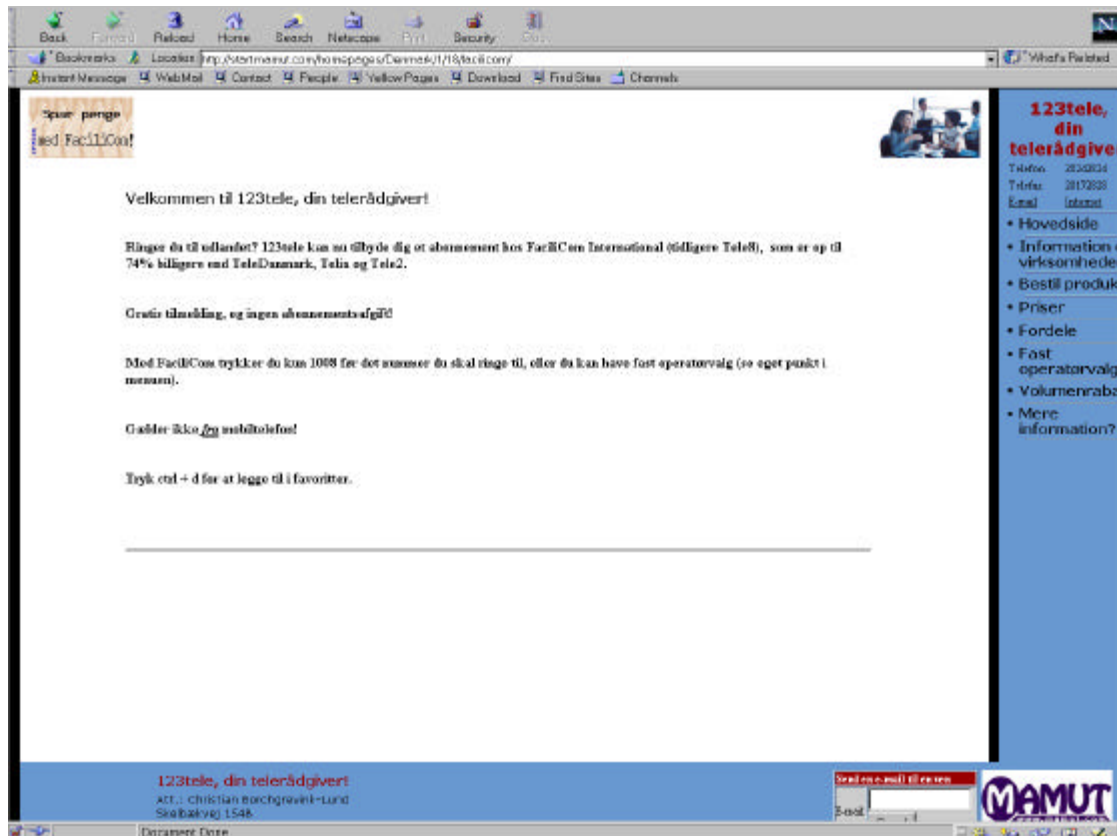
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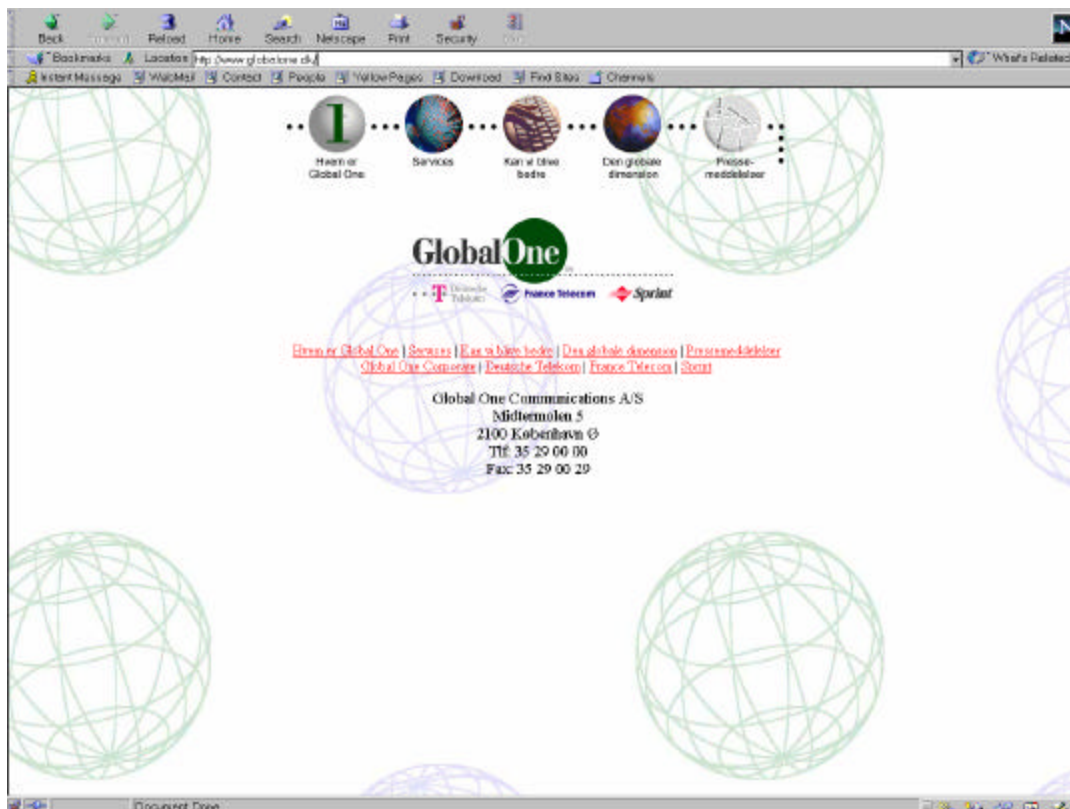
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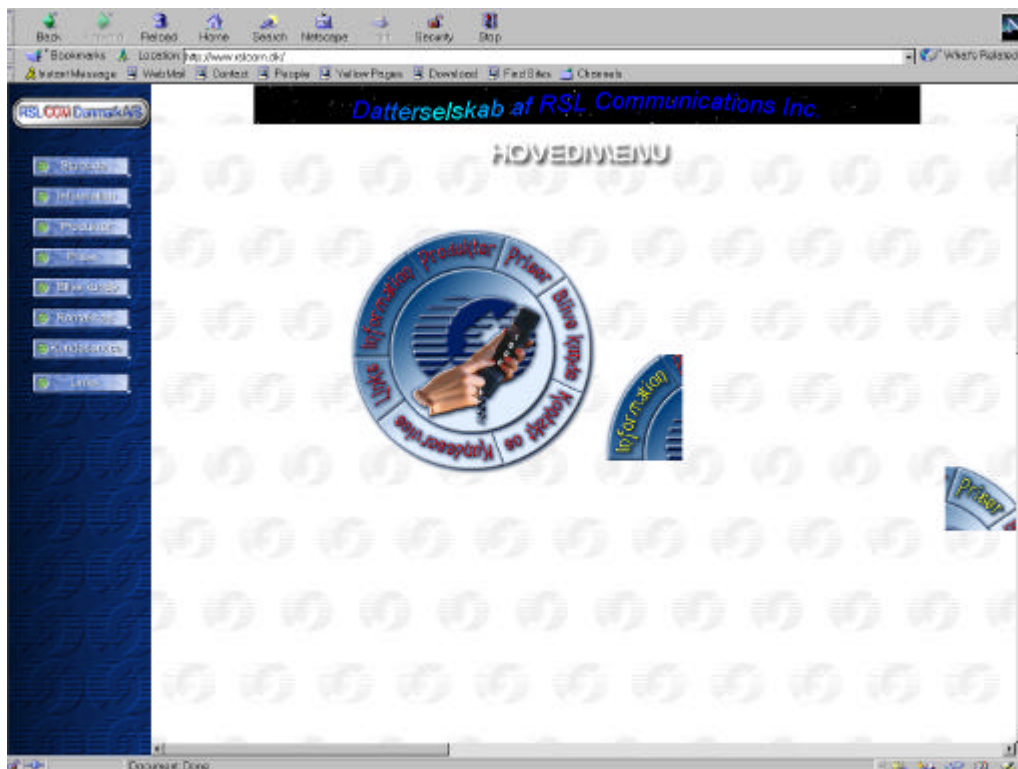
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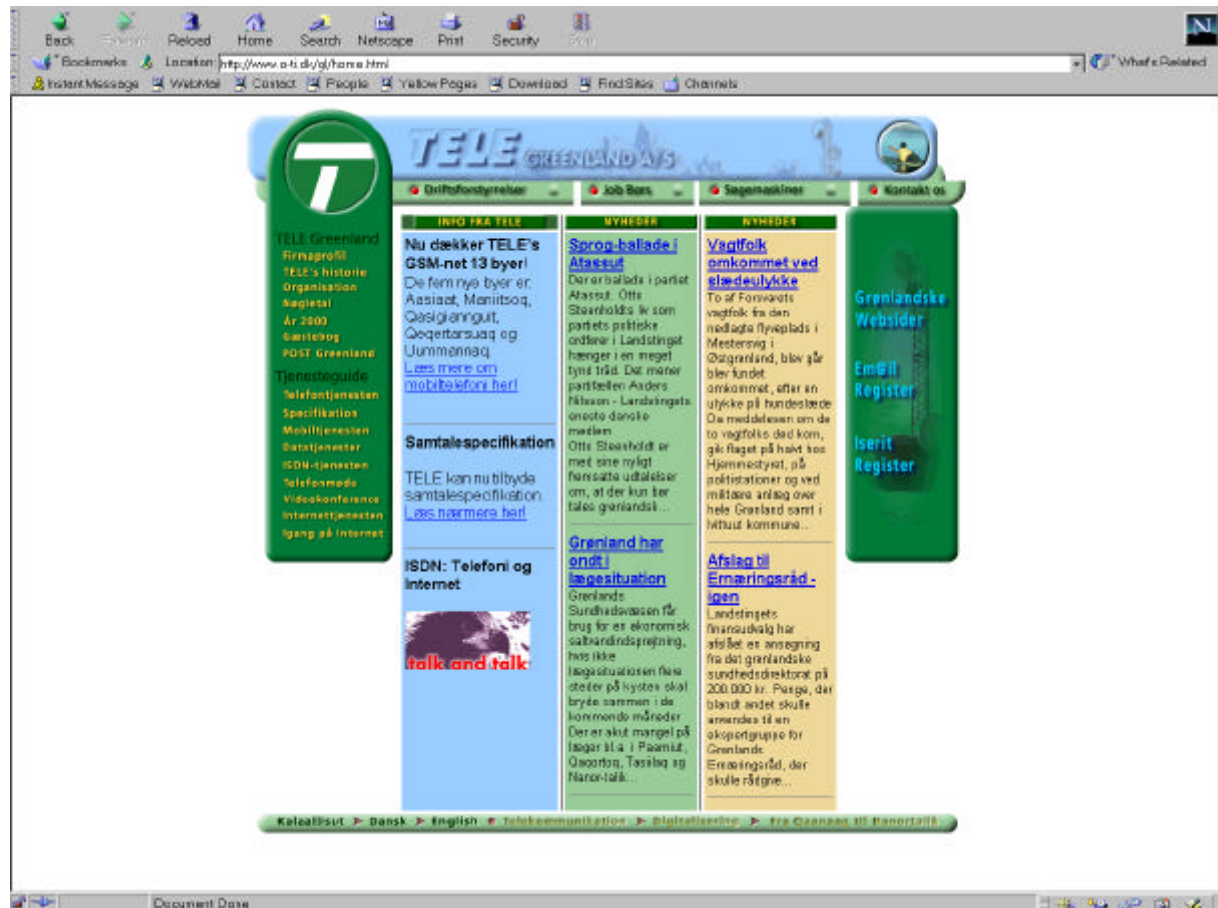
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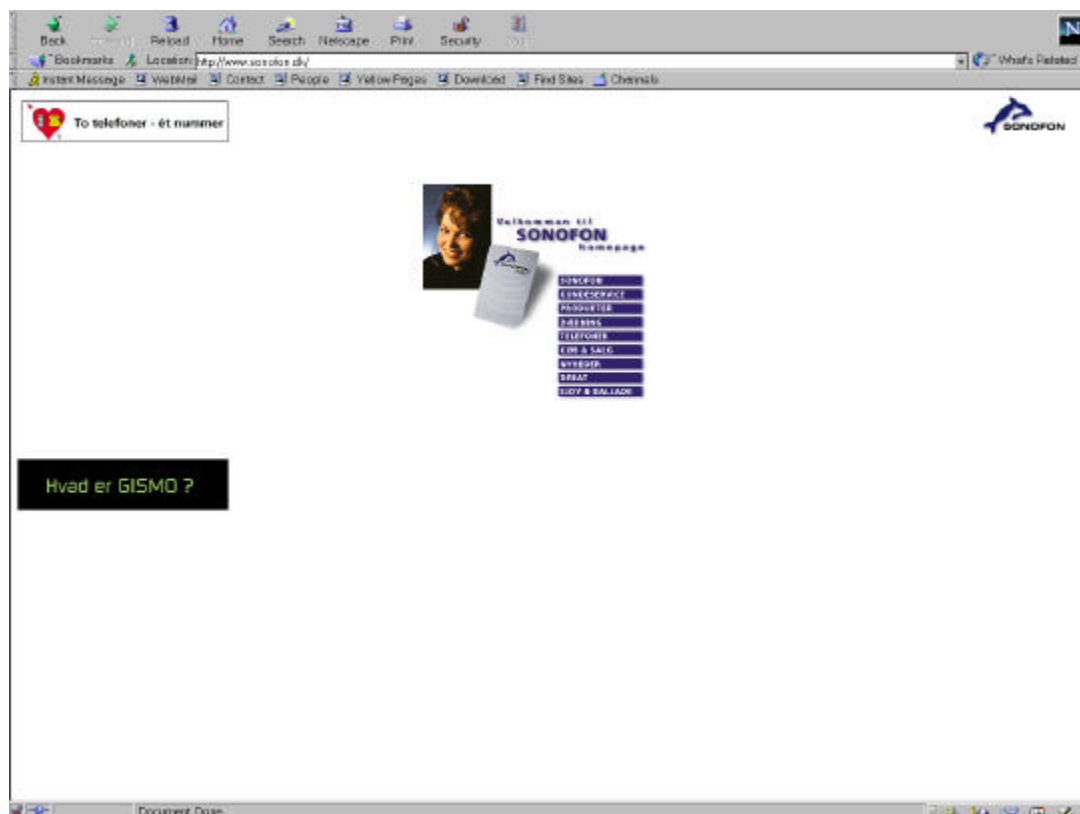
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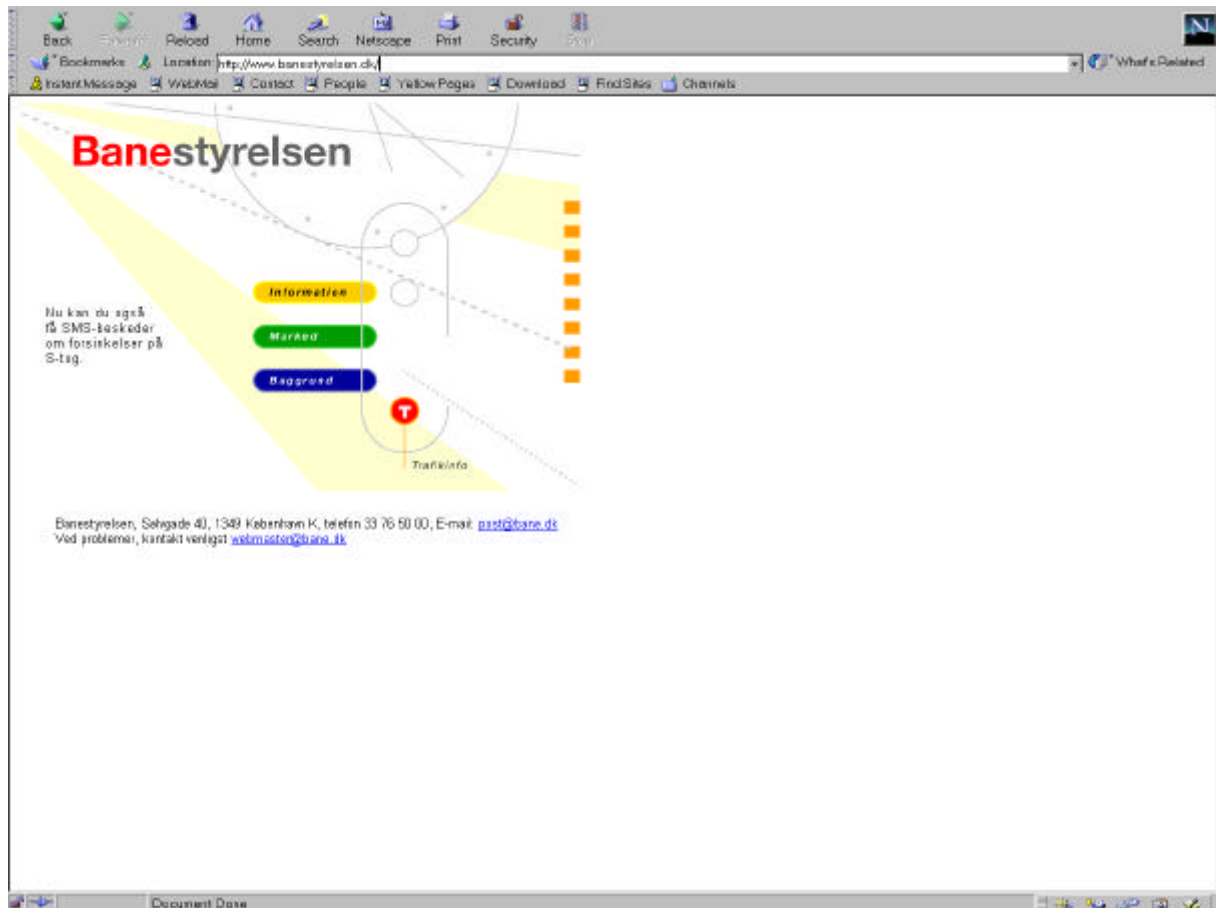
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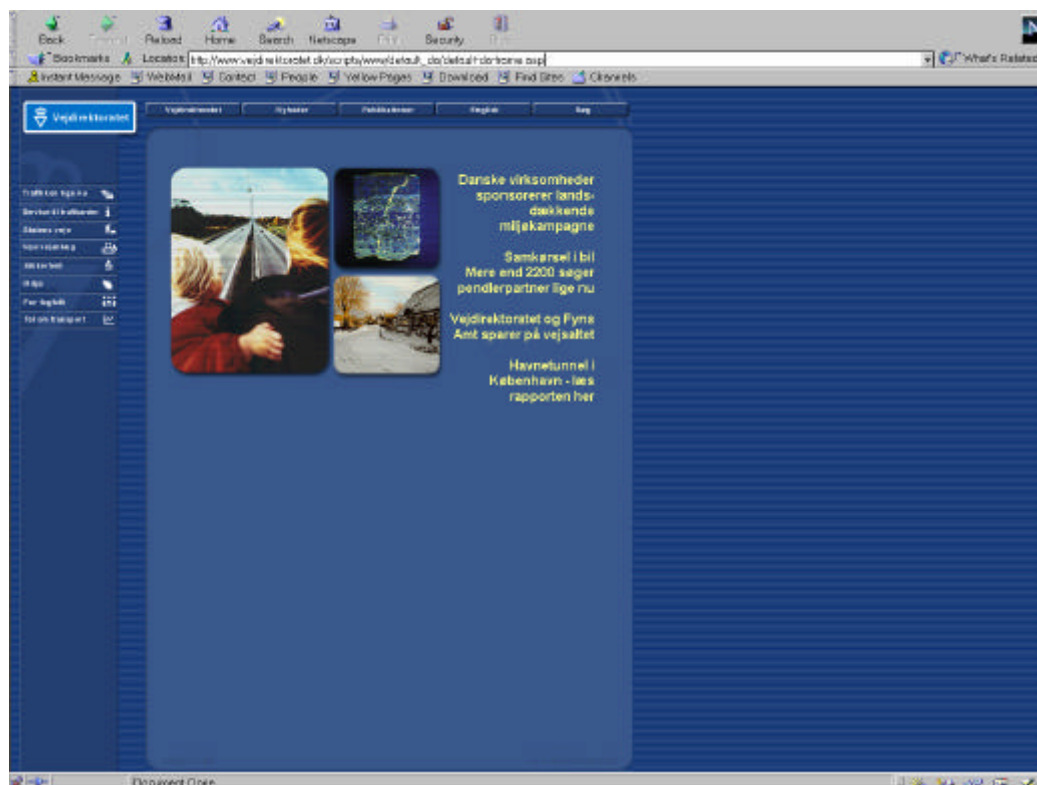
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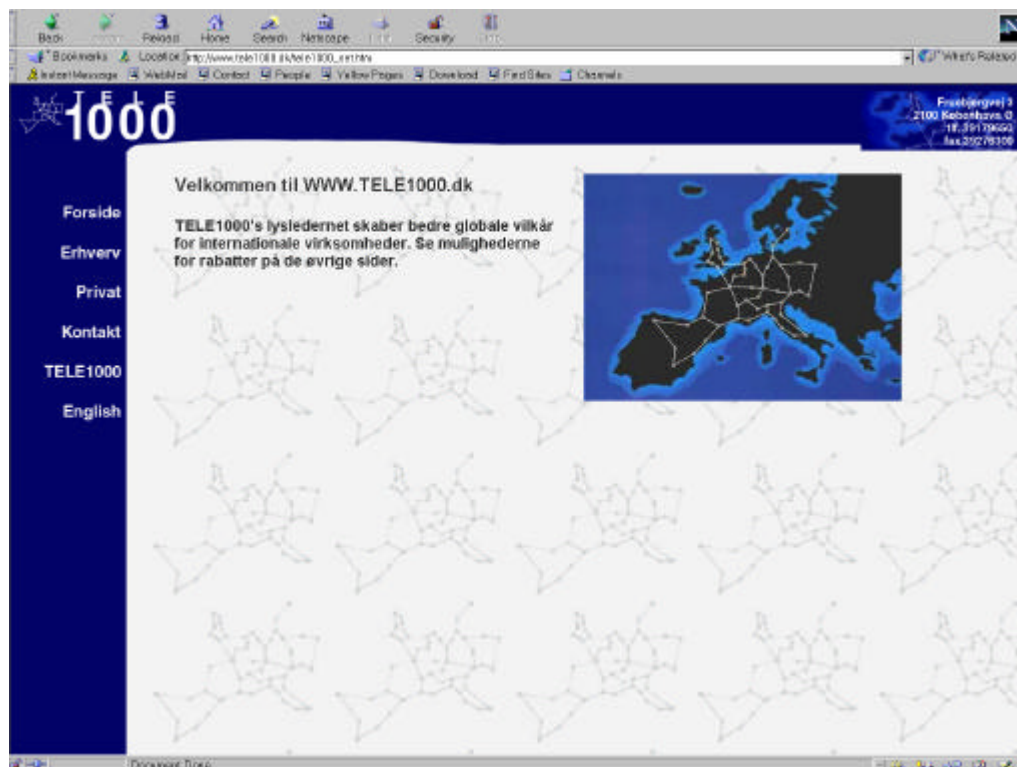
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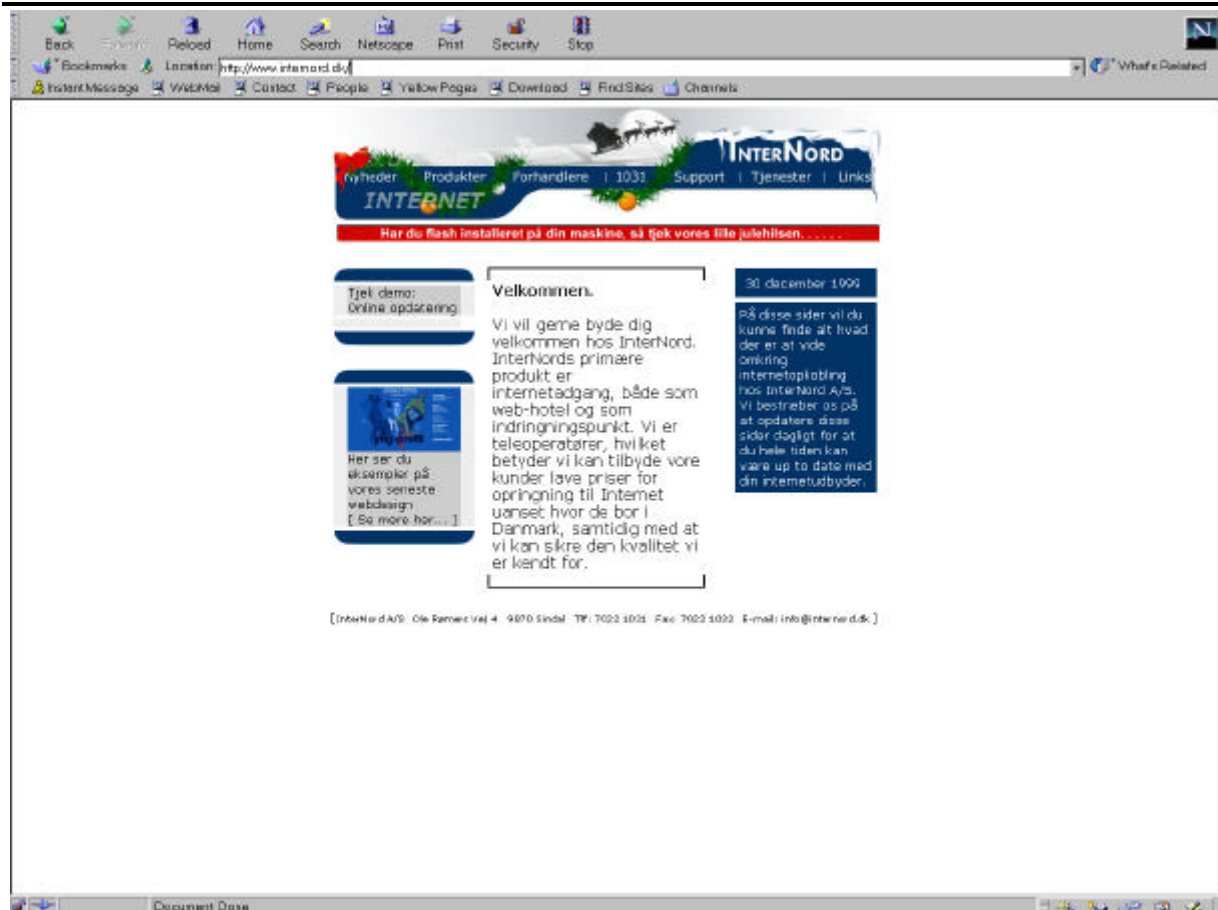
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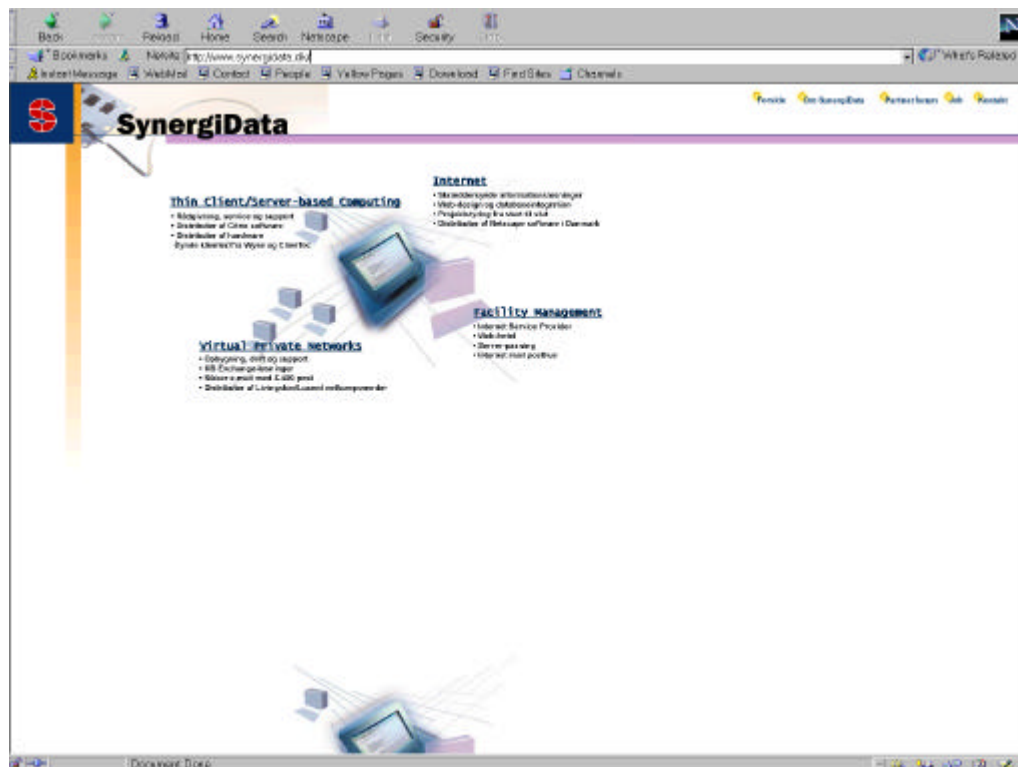
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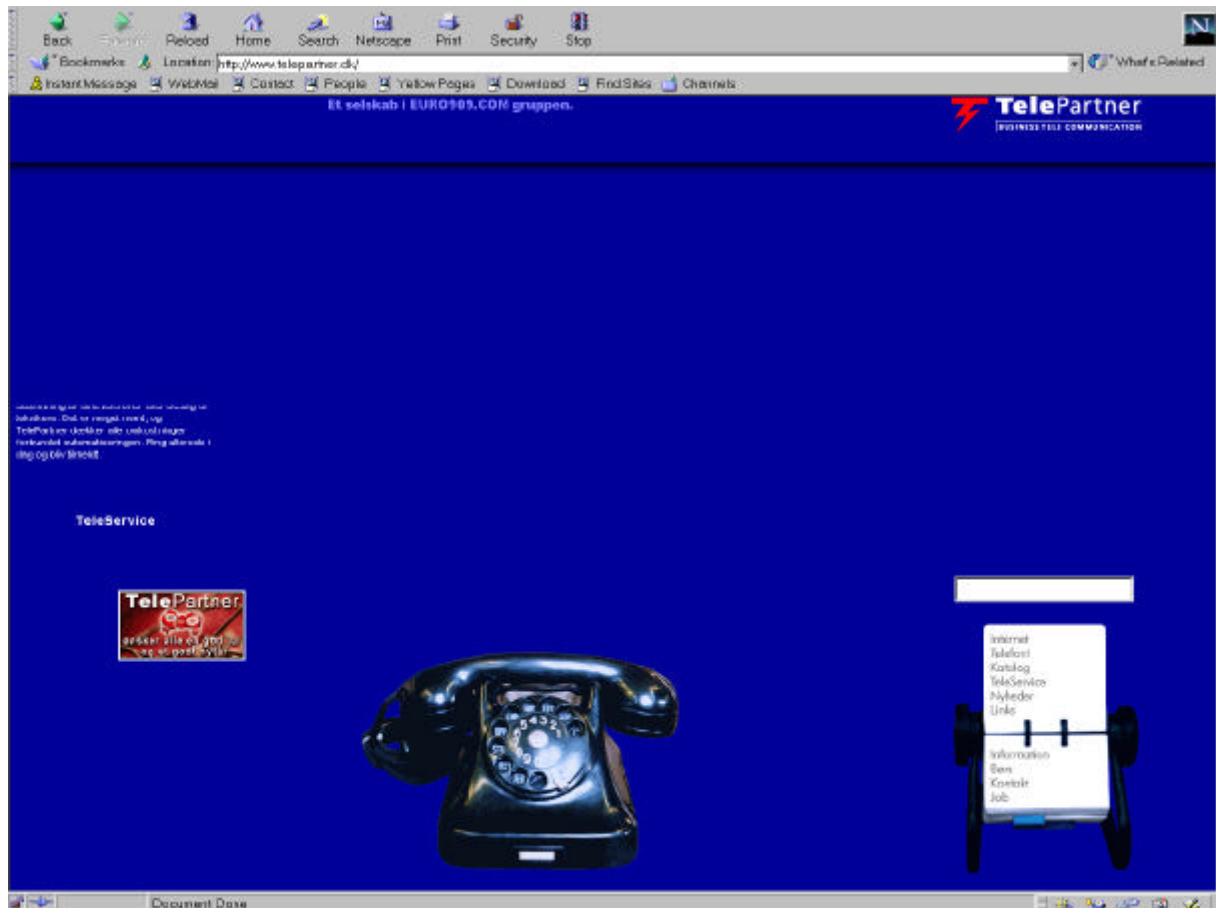
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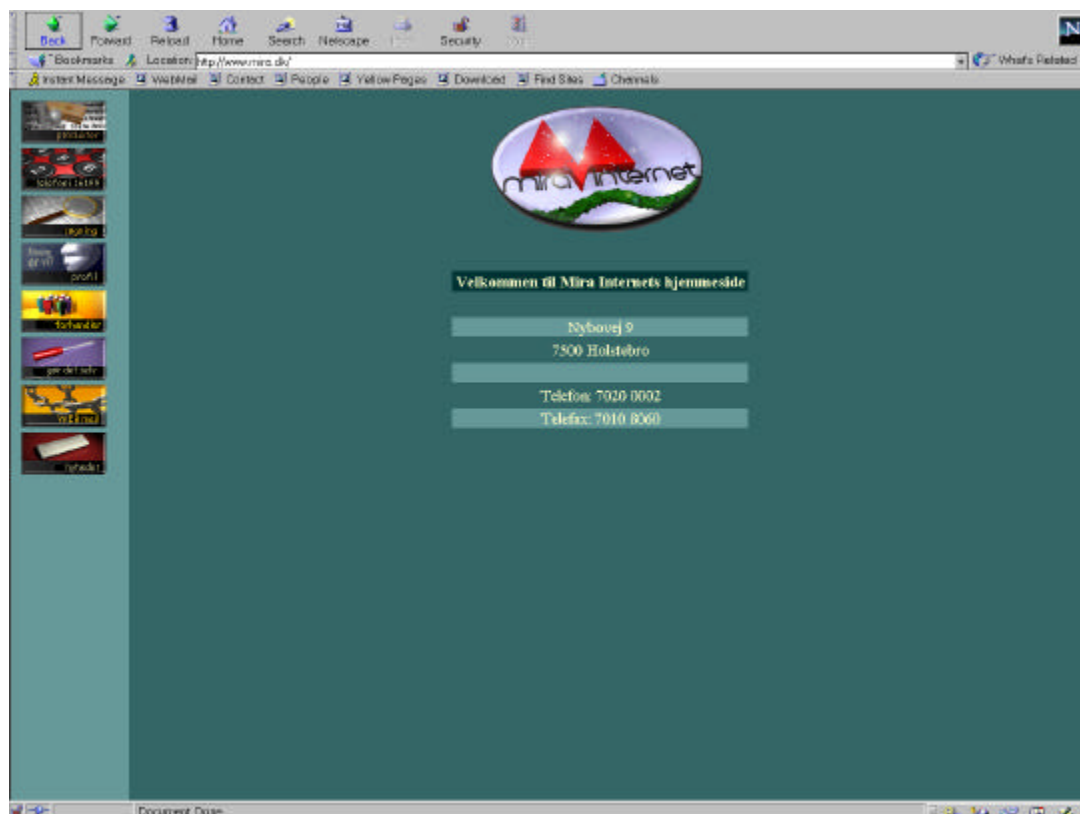
Appendix b
Glossary and abbreviations

Glossary and abbreviations

Source: [8] and WEB.

ATM	Asynchronous Transfer Mode. ATM enables direct subscriber connection on a broadband basis with a flexible bandwidth.
Broadband	Broadband infrastructure. Transmission equipment based on coaxial cables, fibre-otic cables or radio systems, capable of transmitting 8 Mbit/s or higher.
CBS	Copenhagen Business School.
Convergence	Convergence refers to the situation in which several services are approaching each other in nature. For example the mixing together of telecommunications, IT and media.
DCS1800	Digital Cellular System in the 1800 MHz frequency band using GSM technology. The system is also known as GSM1800.
GSM	Global System for Mobile Communication. GSM is the name of a land mobile pan-European digital cellular radio communications system.
IP	Internet Protocol Network
ISDN	Integrated Services Digital Network. ISDN is a public global network capable of transmitting voice, data and images at speeds up to 2 Mbit/s. The digital technique can transport more signals on the same telephone line than the traditional analogue technique and enables a range of new services.
ITU	The IT University of Copenhagen.
NTA	The National Telecommunications Agency
PABX	Private Automatic Branch Exchange. The PABX is a private telephone exchange located at the subscriber and connected to the telephone network. It ties together telephones, fax and data systems in a company and connects these to the network. The new generation of switchboard systems combines computer and telephony systems in integrated solutions that support the telephone service of a company.
Service provision	A telecommunications company providing services on service privision terms offers a range of services without having a network of its own. Instead the service provider is buying minutes on the network from a regular network operator.
WAP	Wireless Application protocol

Appendix c
Supplementary statistics

Supplementary statistics

Source: Telecom statistics - first half of 1999 [18]

Main figures for the Danish telecommunications sector

	1. H 1999	1998	1. H 1998	1997
Subscriber lines in Denmark - fixed network (1,000)	3,566	3,496	3,402	3,341
Subscriber lines per 100 inhabitants- fixed network [1] [2]	67.0	65.8	64.2	63.1
Customers using carrier selection codes [1] [3]	1,169,311	501,667	383,087	196,928
Mobile subscribers in Denmark [1]	2,290,780	1,931,101	1,574,182	1,444,016
Mobile subscribers per 100 inhabitants [1] [2]	43.0	36.3	39.7	27.3
Outgoing mobile traffic (1,000 minutes)	1,085,210	1,621,464	758,764	1,301,430

1) End of year period.

2) Number of inhabitants in Denmark as per 1. July 1999: 5,319,111.

3) Reservations are made to the fact that figures are not directly comparable since the present statistics include a greater number of companies.

Fixed network and mobile subscribers per 100 inhabitants 1997-1999
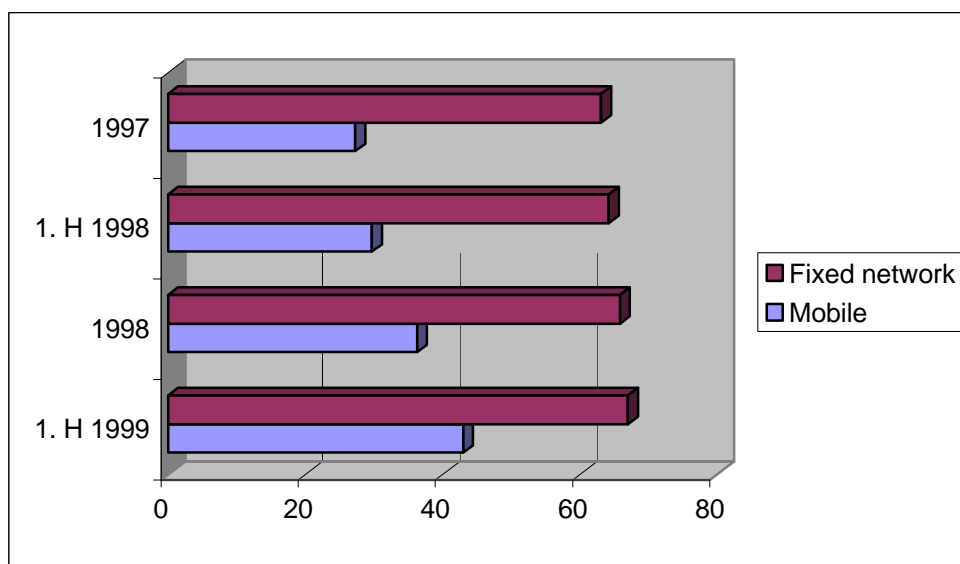
Telephony on fixed network, subscriber lines in Denmark (1,000)

	1. H 1999	1998	1. H 1998	1997
Ordinary telephone connections	3,034	3,086	3,106	3,104
Switched customer connections	2	2	2	2
ISDN-2	173	113	79	56
ISDN-30	5	4	3	2
Total	3,566	3,496	3,402	3,341

Customers in Denmark using carrier selection codes for telephony or Internet connection

	1. H 1999	1998 [3]	1. H 1998 [3]	1997 [3]
Customers [2]	1,169,311	501,667	383,087	196,928
Net increase	2667,644	118,580	186,159	165,423

1) It is not possible to separate the number of Internet and telephony customers for all the companies (e.g. Telia, Tele2)
2) End of year/period
3) Reservations are made to the fact that figures are not directly comparable since the statistics include a greater number of companies

Customers using carrier selection codes for telephony or Internet connection, 1st half 1999

Telia	Tele2	CyberCity	Sonofon	World Online	Others	In total
444,104	388,000	137,000 1)	55,880	49,586	94,741	1,169,311
38%	33%	12%	5%	4%	8%	100%

1) Carrier selection code used primarily for Internet connection.

Revenue in the Danish telecommunications sector

	1. H 1999	1998	1. H 1998	1997
Net revenues (DKK million)	14,599	25,193	12,308	23,003

Companies comprised by the statistics for revenue in the Danish telecommunications sector

	1. H 1999	1998	1. H 1998	1997
Canvas Interactive	X			
CyberCity	X			
Debitel	X	X	X	X
Facilicom Int. (Tele8)	X	X	X	
Global One Communication	X	X	X	
Internord	X			
Interroute Danmark (Tele 1020)	X		X	X
Mobilix	X	X	X	X
Net 4you Aps	X			
Netmaster	X			
Powercom	X	X	X	X
RSL COM Danmark	X	X	X	X
Sonofon Holding	X	X	X	X
Tele Danmark	X	X	X	X
Tele1	X			
Tele 1000	X		X	
Tele 2	X	X	X	X
TelePartner	X		X	X
Telia	X	X	X	X
Uni-Tel Europe			X	
World Call Danmark	X			
World Online Denmark	X			

Subscribers and traffic on the Danish telecommunications network

	International traffic (mio. min.)	National traffic (mio.)	Subscribers
1996	569	4,300	3,251,124
1995	529	4,209	3,193,412
1994	485	4,118	3,123,026
1993	449	3,930	3,059,806
1992	425	3,812	3,004,944
1991	400	5,497	2,950,756
1990	368	4,467	2,911,198
1989	335	4,614	2,847,873
1988	296	4,560	2,791,740
1987	271	4,343	2,711,691
1986	240	4,141	2,628,371
1985	217	3,955	2,543,291
1984	190	3,689	2,465,993
1983	172	3,528	2,403,245
1982	159	3,404	2,351,452
1981	145	3,246	2,288,634

Carrier selection codes for telephony or Internet connection, 1st half 1999-market shares.

- Telia
- Tele2
- CyberCity
- Sonofon
- World Online
- Øvrige