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Development of Digital TV in Europe

2000 Report

Denmark

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1 Digital TV market overview

1.1 Roll-out of digital services

In July 2000, the number of digital TV households in Denmark was about 150.000 compared to 70.000 in July 1999.Thus, while the current figures are still low, the digital TV market experiences considerable growth and it is expected to become a significant part of the Danish media landscape in the years to come.

- ✓ **Digital Satellite TV:** Introduced in Denmark in autumn 1998[1] with the provision of Canal Digital's digital satellite service. VIASAT, the other satellite TV provider in Denmark, has started provision of digital services in April 2000.
- ✓ **Digital Cable TV:** Began in Denmark with the launch of Tele Danmark's digital cable TV service in spring 1998. STOFA, the other major cable TV operator in Denmark started its digital services in part of its network in late 1998. STOFA provides only premium pay-TV services in digital form, but it plans to introduce regular digital TV services in the beginning of 2001.
- ✓ **Terrestrial digital TV:** Is not available in Denmark yet, but a digital TV pilot project was initiated in November 1999.

1.1.1 Satellite digital services

At the end of 1999 there were 530.000 DTH households in Denmark (22% of Danish TV households) and the number of households who subscribed to satellite services was 345.000 (14,7% of Danish TV households). In July 2000, there were about 60.000 digital satellite subscribers in Denmark; all of these belonged to Canal Digital.

The digital satellite market in Denmark is shared between Canal Digital and VIASAT. To avoid piracy, Canal Digital turned off the analogue distribution of its main premium pay-TV channel, Canal+, in February 1999, and offered free digital set-top-boxes to its 15.000 subscribers for a one-year period. The only precondition was that the subscribers agreed to continue the subscription to Canal+ in 1999. Canal Digital expects to have more than 100.000 Danish digital subscribers by the end of 2000[2]. This includes both free-to-air[3] and pay-TV channels.

In September 2000, Canal Digital and the interactive TV-channel eTV announced a three-year contract that outlines a joint effort to introduce a new interactive channel. Canal Digital will have the exclusive satellite distribution rights, and it is to combine the interactive features eTV launched in Sweden in February last year with music, film trailers, and reports from the entertainment industry. The channel will be introduced in the beginning of year 2001, and will cover the entire Nordic region. Bo Blåeldh, vice-director of eTV Broadcasting predicts

[1] Canal Digital started transmission and marketing of their new digital services in June 1998, but the provision of services started first in October 1998

[2] Canal Digital press release, 11/05/00

[3] i.e. households equipped with a Canal Digital decoder but no longer subscribing to a Canal Digital Pay-Package, and therefore receiving only free-to-air satellite channels

that the new channel will be able to reach up to one million viewers and potential customers by the end of 2001.

VIASAT began digital transmissions on the 25th of April 2000, and from the 1st of June, it has not been possible to buy analogue packages from VIASAT. In late 2000, VIASAT plans to invest more than € 80 million on interactive digital TV in order to become the dominant digital provider in Scandinavia. This will be realised by VIASAT's plan to give away around 350.000 set top boxes to the existing subscribers of premium packages in Sweden, Norway and Denmark. 70.000 of these are targeted to Danish subscribers. Another attempt to strengthen the digital presence is undertaken by Viasat's parent group Modern Times Group (MTG), by launching the Internet portal Everyday.com in July 2000. Everyday.com is a joint project with Netcom and it is going to be introduced on VIASATs digital platform as Everyday.TV.

The solution is modelled after the British SkyTV's interactive portal for digital TV. This means that viewers will have access to the following interactive services:

- e-mail, chat rooms and SMS
- EPG (Electronic Program Guide)
- news, sport and weather
- games
- on-line shopping
- interactive commercials

The movie channels TV1000 and Cinema expand to six channels to enable viewers to see the movies at different times (NVOD[4]). The interactive possibilities will also affect other areas such as sports, where it becomes possible to watch one channel and see the goals made in a football match shown on another channel.

As regards the most popular channels, both DR1 and DR2 have been available on digital satellite (Canal Digital) since 1996. TV2 will not be available on satellite, as it is regionally based. The new TV2 ZULU, instead, has been available on satellite since October 2000. Finally.

TV3[5] and TV3+ have also moved to digital form and are proposed on the VIASAT offer. TV3 and VIASAT are both parts of the same group, MTG.

The digital satellite market in Denmark is therefore becoming increasingly relevant for the Danish viewers. However, the inclusion of the most popular channels does not represent any real development for the TV market as a whole, as they are already available in analogue form. But the increase in the installed base of set top boxes will give the way to new service content.

[4] Near video on demand
[5] TV3, established in the UK, transmits programmes in Danish language under British legislation.

1.1.1 Cable digital services

At the end of 1999, 1,335 Danish households (56.8% of TV households) subscribed to minimum one cable TV service. The number of home passed cable households at the end of 1999 is not available and it is estimated to be almost the same as year before (about 1,7 million). The number of digital cable TV households (home passed) is 1,15 million (47.6% of Danish TV households). The exact number of the subscribers to digital services is not available, but it is close to 90.000, with 85.000 subscribing to Tele Danmark and 5.000 to STOFA in July 2000.

The market for cable TV in Denmark is characterised by the two major network providers Tele Danmark and SOFA, and a large amount of smaller independent operators who acquire their contents independently and offer services that vary considerably in terms of quantity and standards.

Tele Danmark Cable TV has digitised all its networks and has introduced interactive services under the brand I-TV. I-TV comprise services on-line services provided by the public service channel DR-TV, a TV Guide, on-line browsing of products, language packages, and e-mails and chat-rooms.

The DR-TV services includes overview of programs, access to on-line news and weather, and information regarding cultural arrangements.

The TV Guide provides a search function and a description of each program, which gives direct access to the relevant program. The ‘Nu&Næste’ (Now&Next) function displays information concerning the watched program. It shows the title, when the watched programme commenced and when it will finish. Further, it can show the same information for other channels together with the title of the channel number and the current time. The intention is that this function will allow for ‘zapping’ without actually changing channels.

The on-line browsing services include at present the D-I-Y chain Silvan, the on-line clothes retailer Ellos, Travelmarket and the booking agency BILLETnet. At present, these allow for browsing only, while transactions have to be carried out over the telephone or the Internet. The language packages service provides special packages centred around certain languages such as Arabic, French and Polish, which are not covered in the general range of channels.

Connecting the phone line to the set top box facilitates the e-mail and the service is similar to the SMS text messages on mobile phone. According to Tele Danmark, the chat service is amongst the first in the world. It allows viewers to access Selector chat rooms, as well as Internet chat rooms that are connected to the IRC network.

STOFA, the other major cable TV provider, started the digitisation of its network in late 1998. STOFA is the Danish cable TV subsidiary of the Swedish tele-information group Telia. It has approx. 500.000 households in its network of which 50.000 households had access to digital services by July 2000. Out of these, around 5.000 subscribe to digital premium pay-TV services. At present, STOFA has no additional interactive services to digital TV. Instead, the digital network is used for providing premium pay-TV channels. The subscribers of the premium pay TV channels have been given the opportunity to move to digital TV without additional costs. In the areas where the network has been digitised, these channels are only transmitted in digital form and consumers’ analogue proprietary boxes have been replaced by digital ones. STOFA does not have a centralised distribution network. Instead, services are provided through local head ends. Furthermore, STOFA has various different agreements with independent organisations concerning the supply of TV, Internet services and the expansion of the networks.

About 670.000 of the households using cable TV are connected to cable networks owned by the local authorities and organisations, which manage their services independently, or outsource the service management to either STOFA or Tele Danmark cable TV. The majority of these are small in scale. Large investments in digital networks would therefore result in considerable increases in costs for the individual household. It therefore seems unlikely that digital cable TV will cover all cable households with the current network ownership structure.

1.1.2 Situation of MMDS

MMDS is non- existent in Denmark.

1.1.3 Situation of XDSL

ADSL in Denmark is marketed primarily for high speed Internet connection. There are no indications of using ADSL for transmission of digital TV services[6].

1.1.4 Situation of terrestrial digital television

Reports delivered in September 1998 by a working group formed by the Ministry of Culture recommended the introduction of digital terrestrial TV in Denmark as soon as possible using frequencies reserved for this purpose by the political 1996 Media Agreement. Recommendations in the report included a pilot phase to gain technical and organisational experience.

The focus of the political discussions following the report, however, shifted to a debate on the priorities in the use of the reserved frequencies, i.e., whether to use them for digital transmission or to expand the capacity for existing analogue services. This was provoked by a political disagreement on whether it was acceptable that one of DR's two analogue services, DR2 – defined as a 'rather narrow cultural/ debate programme' - remained transmitted only via satellite and cable. The problem of transmission of DR 2 in the analogue terrestrial network, has been partly solved by assigning the channel some of the unused local TV frequencies. Another issue on debate is the long term relevance of the Digital Terrestrial technology.

In spring 2000, the Ministry of Culture formed a new working group including representatives from the Ministry of Culture, the Ministry of Research and Information Technology, the National Telecom Agency and from the university. It produced a report in August 2000, which recommended that the digitisation of the terrestrial network should proceed and that the necessary legal modifications should be made as soon as possible. Furthermore, it recommended that there should be made room on the digital multiplexes for

[6] Of note is the fact that the company "Bredbandsbolaget" in some small residence areas has established new local networks for distribution of both high speed internet and TV.

interactive digital services other than TV-programmes, such as e-mail, on-line shopping and Internet-based TV channels.

A political decision is expected to be taken before the end of 2000. The development of terrestrial digital TV in Sweden and the results of the ongoing Danish trials (see below) will have important impacts on this decision and its timing.

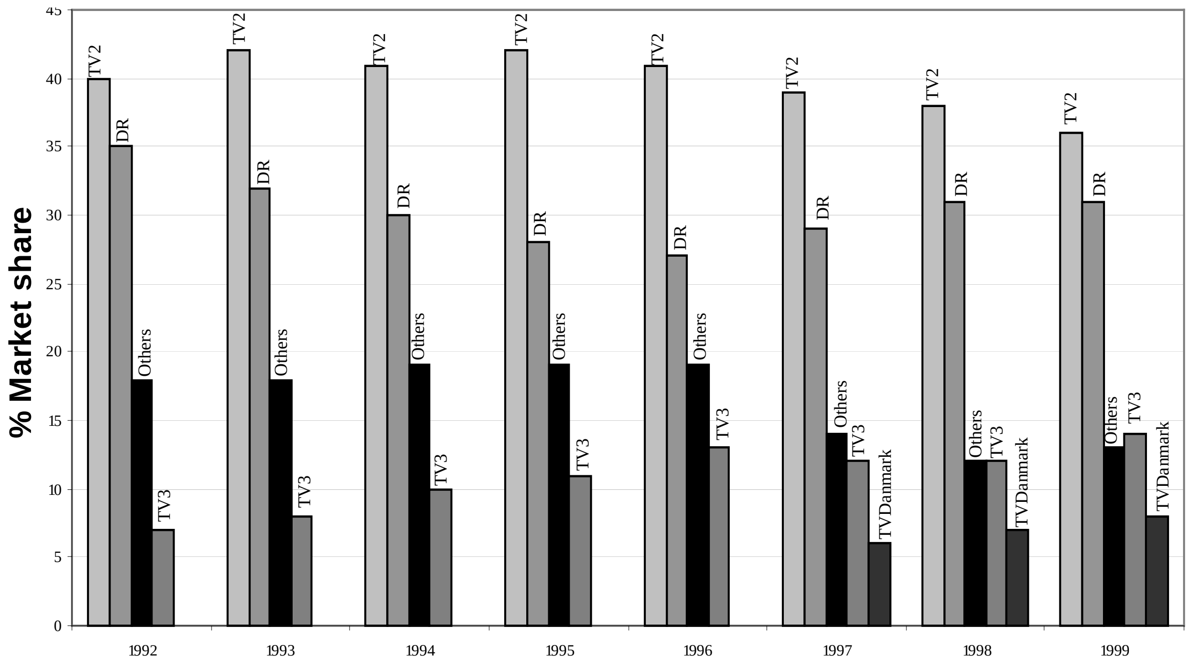
Neither has the political system made a decision on the time horizon for the turn-off of analogue services either. The above-mentioned report in the above estimated the simulcast period to be 10-15 years.

Technical trials, covering the greater Copenhagen area, are conducted since November 1999 under the responsibility of public service televisions DR and TV2. Trials are to continue until December 2000. Portable reception will form part of the trials.

1.1.5 Market development

Digital TV is in its initial phase in Denmark. It mostly consists of pay-TV and counts 150.000 subscribers[7]. The Danish digital TV market value amounted to more than € 11 million, which is 1,3% of the total Danish TV market and 5% of the total Danish pay-TV market. The value is still small, but digital TV market has more than doubled compared to last year. This is mainly due to strategic investments by the commercial network operators and the free replacement of analogue boxes with digital boxes, but also the possibility for receiving public service channels in digital form with no charges. The market shares of public service broadcasters in Denmark (see the following figure) underlines that the capacity of digital TV operators to include the public channels in their packages is key to their competitive situation.

[7] DR1 and DR2 did, however, start satellite transmission of their services in digital form in 1996 and the satellite households with digital receivers have been able to receive these services.



However, digital TV users are still mainly the former customers of premium analogue pay-TV channels who had their proprietary decoder boxes replaced, and foreigners who want to watch programmes in their native languages. Due to the small population, a high rate of migration of households to digital reception will be necessary for new Danish digital TV-based services to appear. In this context the nation-wide digitalisation of the terrestrial network is likely to have a positive effect on the development of the market because of the large potential user base The following table shows some basic information on digital TV in Denmark in July 2000.

Name of the service	*Ownership*	*Date of launch*	*No. of subscribers*
Tele Danmark Cable TV	Ameritech	Spring 1998	85.000
STOFA Cable TV	Telia	November 1998	5.000
Canal Digital	Canal+ & Telenor	Autumn 1998	60.000

1.1.6 Regulatory status

TThe Danish Broadcasting Act was changed in May 2000 (L446 31/5 2000). The issues related to digital TV are:

- ✓ DR's and TV2's digital services are not covered by the same "must carry" rule as their analogue services. That is, only the digitised SMATV/cable systems that distribute digital services are obliged to distribute DR's and TV2's digital services.
- ✓ SMATV/cable systems are only allowed to convert digital "must carry" services to analogue services if they simultaneously distribute the services in digital form. Otherwise they are not allowed to make the conversion.
- ✓ The digital trial is not covered by the "must carry" rule.
- ✓ Prohibition of using piracy decoders etc. will be extended to cover also ownership of piracy decoders etc. for pure personal use.

1.1.7 Barriers to competition or market development

Different barriers to the development of digital TV can be identified:

Lack of frequencies for the terrestrial network: The additional frequency resources needed for the provision of digital TV in Denmark are scarce. The main reason for this scarcity is the priority given in Denmark to local TV; many radio frequencies are allocated for this purpose.

This scarcity results, at least in the first phase, in the availability of only one countrywide Multiplex Block, which is to carry only four digital TV services. In order to compete with the multi-channel environment of cable and satellite, four TV services seem to be far too few. In addition, two of these four services are dedicated to carry simulcast of the analogue public service channels, DR1 and TV2. This only makes it possible to include two new services, which gives little incentive for people to acquire digital set top boxes for the initial terrestrial distribution.

However, it is expected that more than one digital network will be available. The National Telecom Agency has therefore been asked to coordinate frequencies for more digital networks. Four digital multiplex are at present under coordination with neighbouring countries according to a political agreement of 18 December 1998. This coordination is expected to be completed by beginning of 2001.

The price of digitalisation of small SMATV: Digitalisation of SMATV networks requires upgrading of both the distribution network and the head station. This is still expensive and requires a certain minimum number of subscribers to carry the costs although there is a continuous decrease in prices.

Uncertainty: The inability of the political system to give a clear date for the transition to the digital terrestrial network has been criticised, as it leaves consumers and actors in general in the dark and so limits investments into new equipment and services. Oluf Ravn, Chief of Sales at the Advertisement Department, TV2, comments that the transition to the digital generation will not be realised until such a deadline is made public[8]. Similarly, Viasat's ambiguous position towards digitalisation caused much confusion, and even economic misfortune. Force, the Danish producer of set top boxes, based the development of the Duomaster set top box, on the assumption that satellite transmissions would remain both analogue and digital for some time. This was based on earlier statements from Viasat, stating that it would remain analogue. The market for this product was then undermined when Viasat suddenly decided to stop the sale of analogue smart cards.

Overspill: This is a copyright issue, but it might develop into a barrier. DR1 and DR2 are as public service channels provided free in e.g. Canal Digital's Digital satellite service in Denmark. This provision results in copyright issues in the form of overspill. Danes living in other Nordic countries must pay for the service (e.g. in Sweden, where the service is priced at

[8] 'Digitalt inde, analogt ude – men hvornår', www.bfe.dk

140 SEK (15 Euro) per month). The copyright issues may occur if smart cards obtainable free of charge in Denmark are sold as grey market cards or provided to acquaintances, relatives etc. in other Nordic countries. Furthermore, in the terrestrial network it is technically possible for Danes to see the Swedish digital services in, e.g., part of Copenhagen area, but Senda has no official plans to expand their consumer base to Denmark. There are hence potentials for creation of similar grey market.

Piracy: This is another copyright issue which has been much debated and it has been argued that it has been a barrier to the market development. The satellite service providers, Canal Digital and VIASAT have claimed that piracy is a serious barrier to their business development in Denmark. The Ministry of Culture commissioned a survey to evaluate the problem[9]. The problem is almost exclusively identified in the analogue pay TV marked.

Based on the survey the ministry of culture has by law required that prohibition of using piracy decoders etc. will be extended to cover also ownership of piracy decoders etc. for pure personal use.

1.2 Details of services

1.2.1 New digital services

The majority of the channels in the tables are available in both analogue and digital form. In general, the services that are only available in digital form are therefore either channels targeting a narrow market or interactive services. Amongst the new channels are:

- ✓ The premium pay TV channels, Canal+, Canal+ GUL, Canal+ BLÅ[10] and Erotica,
- ✓ The Nordic public services channels, TV Finland and NRK international
- ✓ Foreign language channels in Tele Danmark's cable TV
- ✓ Some of the foreign thematic channels.
- ✓ Pay per view channels such as KIOSK – in reality a cross between a TV channel and an interactive service

The new services include:

- E-mail
- Chat rooms
- Advanced program guides
- Individual choice of camera angles

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[9] The area is also regulated by an EU directive (98/84/EF), on the legal protection of services based on, or consisting of, conditional access, applicable from May 28th 2000. The directive sets minimum standards implying that commercial manufacture etc. is illegal in all EU countries.. The member countries are allowed to have tighter regulation.

[10] Canal+BLÅ is a new service from Canal+. Canal Digital has announced that Canal+ BLÅ will contain popular movies, some of them in 16:9 format

- Product information
- On-line shopping

The marketing and advertising of DTV has mainly been focusing on two qualities

1) the variety of choices
2) the high quality of digital TV programmes.

Better and easier navigation and the availability of easy access to programmes have also been seen as arguments for the superiority of digital TV.

1.2.2 Detail of the DTV offer

The following table outlines the digital services available on the Danish TV market

Table A: Channels on digital terrestrial television (trial)

Multiplex	Operator	Free to air	Subscription	Coverage
1	DR & TV2	DR1 DR2 TV2 TV2 regional: TV-Lorry TV-Øst		50%

It should be noted that the channels, TV-Lorry and TV-Øst only send a limited number of hours every day.

The public service channels DR and TV2 operate the pilot project. After the trial period (end 2000) and depending on the political decision this organisation may change.

Table B: Digital Satellite Channels

Channel type	Number in type	Comments
Non-subscription	7	DR2’’*, Viasat Interactive services’, TV2 Zulu*, DR1*, TVDanmark1*, TVDanmark2*, Canal Digital Interactive services
News	7	BBC world’, Bloomberg’, Sky News*, CNN*, CNBC*, Sky News*, BBC world*
Entertainment	11	Four channels from TV3’’, Hallmark’*, TV6 Action’, ZTV’, Viasat Plus’, Eurotica* (also as stand-alone: DKR 69), Adult channel*, Cinecinemas*(also as stand-alone DKR 69), BBC Prime*
Sport	3	VIASAT Sport’, Eurosport News*, Eurosport Nordic*
Documentaries	10	History Channel’, Travel Channel’, TV6 Nature’, Four from Discovery Channel**, Adventure One**, National Geographic*, [.tv]*
Kids	5	Nickelodeon’*, Fox Kids*, Cartoon Network*, TCC*, TCM*
Music	4	MTV’*, VH-1’*, Multi-music’(10 channels), Music Choice* (20 channels)
Premium movies	6	TV1000’’’, Cinema’’’, Playboy TV’’’, Three channels from Canal+**
Pay-per-view	2	Ticket’, KIOSK*
Stand-alone premium Channels	5	TV Finland** € 13 (DKR 95) NRK International** € 15 (DKR 115) Manchester United** € 7 (DKR 49) ORT International** € 13 (DKR 100) Two channels from Prime TV** € 22 (DKR 165)

DR1 and DR2 are free with a separate smart card

Notes:

’: Included in Viasat Silver and Viasat Gold

’’: Viasat Basic

’’’: Exclusive to Viasat Gold

*: Included in Canal Digital Entertain package

**: Not included in Canal Entertain package

Price (Some examples)

Channels	€ per month
Viasat Basic	€ 53 (DKR 399) first 6 months, then € 24 (DKR 179)/6 months
Viasat Gold	€ 27 (DKR 199)
Viasat Silver	€ 11 (DKR 79)
Canal Digital Entertain	€ 17 (DKR 129)
Canal Digital: Canal+	€ 27 (DKR 198)

Notes:

- ✓ Subscribers need to have Viasat Basic in order to subscribe to Viasat Silver, gold or Ticket.
- ✓ Interactive services include e-mail, electronic Programme Guide, and choice of camera angle for football matches.
- ✓ Canal Digital has a service charge of € 39 (DKR 290) in the first year and € 19 (DKR 145) in the subsequent years. It introduced a rental service for set top boxes of €7 (49 kr.)/month when viewers subscribe to either Canal+ or Canal Digital Entertain.

Table C: Digital Cable Channels

Channel type	Number in type	Comments
Non-subscription	8	DR1, DR2, TV 2, Two regional programmes, two foreign public service channels, Infokanalen
News	4	Bloomberg, WorldNet, CNBC*, Sky News*.
Entertainment	5	[.tv]*, E!*, TCM Classic Movies*, Hallmark*, Adult Channel*, KIOSK**
Documentaries	2	National Geographic*, Travel channel*
Lifestyle	3	Arte, Fashion TV, MCM International
Kids	3	Fox Kids*, Nickelodeon*, Cartoon Network*
Music	4	MTV 2, VH-1*, Muzzik, Performance
Stand-alone premium Channels	5	Three from Canal+, two from TV1000

Notes:

*: Included in Canal Entertain

**: Pay per view

Price (Some examples)

Channels	€ per month
Basic entry	€ 7 (DKR 49) with subscription DKR 60 without
Canal Entertain	€ 11 (DKR 79)
Lifestyle package	€ 7 (DKR 49)
News package	€ 5 (DKR 39)
Children's package	€ 4 (DKR 29)
Family package (Canal+ and Canal Entertain)	€ 35 (DKR 259)
Language package	€ 11 (DKR 79)

Notes:

The subscription fee is € 27 (DKR 199) for Tele Danmark Cable TV. Part of the programme package structure is outsourced to Canal Digital and so some of the programme offers are identical. Tele Danmark also offers additional channels, such as the Viasat premium channel TV1000. The language packages offer special channels for a specific language or region. At present, there are ten such packages covering the following:

- Turkish
- Arabic
- Baltic
- Polish
- Italian
- French
- Spanish
- Pakistan
- Asian
- Tamil

STOFA does not have a uniform price or programme structure. The network comprises of local, regional networks and the company therefore refrains from informing about the specific channels and prices. However, whereas Tele Danmark has specific co-operation with Canal Digital, Stofa's programme structure is based on that of Viasat, and so the premium pay TV channel is TV1000.

1.3 Operators and market structure

1.3.1 Concentration of the pay-TV market

In 1999, the digital pay-TV market was highly concentrated, when the only actors in the digital pay TV market were Canal Digital and Tele Danmark cable TV, with STOFA having a minor share of the market. A significant part of Tele Danmark cable TV's share of digital pay TV market was also canalised to Canal digital according to the strategic alliance between Tele Danmark cable TV and Canal Digital. Consequently, Canal Digital counted for the major share of the digital pay-TV market. This situation has changed with VIASAT's introduction of digital TV services in spring 2000. VIASAT is a major actor in pay-TV market in Denmark and has 3 times more premium pay-TV customers than Canal Digital.

It should also be noted that in addition to the intra-national developments, an international concentration of the pay-TV market is taking place in Scandinavia. The larger actors increasingly view the Nordic countries as a single market and the offers in the different countries are just about identical. Business groups that include both network operators and content providers now have considerable leverage in a TV-landscape that traditionally has been dominated by the national public service providers. This has produced some remarkable changes. Firstly, commercial channels are now providing some of the most popular programmes. These include programmes that are produced in-house, thanks to larger financial capacities and scale. One example is the series 'Robinson Expedition' produced by MTG, which was the 3rd most popular programme when it was launched. Also, commercial channels are now capable of purchasing the rights to show classic broadcasts such as national soccer matches. This means that programmes that were accessible to everybody a few years ago, now require subscription to cable or satellite services.

However, public service channels are still the most popular in the Danish market. It is therefore important for the satellite providers to obtain agreements with the public service and to be able to go further than providing premium pay-TV channels in the digital TV market. There is no "must carry" rule in the satellite market but the regular business rationale results in a heavy competition between Canal Digital and VIASAT to include provision of public service channels for free, to strengthen their strategic position in the market.

1.3.2 Agreements between satellite operators, cable operators and DTT operators

There is no direct agreement between the satellite operators Canal Digital and VIASAT. They have chosen different CA and API technologies. There are still negociations between the two public broadcasters, TV2 and DR, and VIASAT regarding VIASAT's clear commitments to open standards. Regarding agreements between satellite operators and cable operators, Canal Digital Denmark continues to handle some of Tele Danmark's subscriber management services for its digital service offers. Canal Digital's alliance with Tele Danmark includes programming as well as distribution. Tele Danmark redistributes some of Canal Digital's digital packages in its cable network and it also handles the technical access issues. As a consequence of this agreement between Canal Digital and Tele Danmark, many of the services offered by the two distributors are similar.

1.3.3 Vertical integration

Because the major actors in Scandinavia work across the national borders, the same integration processes take place in all countries. The MTG-Viasat Group is the most significant example of this trend.

UPC-SBS

The aborted (May 2000) UPC-SBS merger would have been another key step in the vertical integration process on the Scandinavian markets, as SBS owns all of Kanal 5 in Sweden and TVDanmark in Denmark, and has the majority stake in TVNorge (50.7%). The project was withdrawn due to the "turnmoils" on the financial markets[11].

1.4 Technical issues

1.4.1 Decoder issues

Nokia is one of the first set top box providers that has announced a NorDig box and Nokia has products on the Danish market for all three distribution forms, satellite, cable and terrestrial. In autumn 2000, the Danish Set-Top-Box provider Force Electronic manufactures a decoder for digital satellite and the Duomaster for both digital and analogue satellite signals on the market (Cable and terrestrial Set-top-boxes are planed to be available on the market in late 2000). Both of them are compliant with Nordig Standard. Force Electronic will implement MHP as their API when it is available.

Different manufacturers provide the set top boxes on the Danish market. They are listed by distribution form below and by product/ producer in the table.

Cable TV: Tele Danmark offers the set top box called “Selector” from the French Sagem with Viaccess CA and Open TV API. STOFA uses the same box with a software modification.

Satellite TV: Nokia, TRIAX, Philips and Force Electronics have products on the Danish market. Canal Digital uses Philips boxes with Conax CA and MediaHighway API for their rental service. Additionally, VIASAT has taken the South Korean manufacturer Humax on board for digital decoders with Viaccess CA and Open TV API.

11 'Because of the continuing turmoil in the financial markets, we have reluctantly taken the decision not to proceed with the acquisition of SBS. Given UPC's current share price levels it is simply notpractical to complete the transaction.' Mark Schneider, Chairman and CEO of UPC.

Set Top Boxes

Name	*Provider*	*CA*	*API*	*Free to air compa-tibility*	*16:9 compati-bility*	*Integrated Modem*
SELECTOR	SAGEM	Viaccess	Open TV	Yes	Yes	Yes
MediaMaster, S, C and T	NOKIA	Embedded Viaccess (+ DVB CI)	Open TV	Yes	Yes	Yes
Na	NOKIA	Conax	Media Highway	Yes	Yes	Yes
Philips digital box	Philips	Conax	Media Highway	Yes	Yes	Yes
Force Duomaster 1030S	Force Electronic	Conax (+ DVB CI)	Media Highway	Yes	Yes	Yes
Force D-master 1133S	Force Electronic	Conax (+ DVB CI)	Media Highway	Yes	Yes	Yes
Force Dmaster T	Force Electronic (late 2000)	Conax (+ DVB CI)	Media Highway	Yes	Yes	Yes
DVB-63S	TRIAX	Embedded Viaccess (+ DVB CI)	Triax EPG	Yes	Yes	No
DVB-65S	TRIAX	Embedded Viaccess (+ DVB CI)	Triax EPG	Yes	Yes	Yes
DVB-40S	TRIAX	Embedded Conax (+ DVB CI)	Media Highway	Yes	Yes	Yes
VACI-5350	Humax	Embedded Viaccess (+ DVB CI)	Open TV	Yes	Yes	Yes

1.4.2 16:9

Distribution of services in the 16:9 format has been one of the additional arguments for the introduction of digital terrestrial TV in Denmark. Thus, the terrestrial pilot scheme in Denmark contains programming in 16:9. Further, the Canal Digital channel Canal+ BLÅ (Blue) transmits a large number of movies in 16:9 format. According to Canal+ in Denmark, in near future Canal+ Blå will only contain 16:9 movies and sport. Other actors, including public service broadcasters, have also had 16:9 transmissions of selected movies and plan to increase the 16:9 share of programming. The remaining problem for the further diffusion of the standard is limited supply of programs in 16:9.

As it is shown in the following table, the diffusion of 16:9 TV sets in Denmark has experienced a considerable growth. Nevertheless, in absolute terms it is still at a rather low level.

16:9 TV sets (Thousand sets)

As of 31 of December	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*Estimated values*	
							2000	*2001*
16:9 TV sets	0	4	10	11	18	20	35	65

Source: *BFE*

1.4.3 Portable reception

Portable reception has been an often-used argument in the discussions on the introduction of digital terrestrial TV in Denmark. The public service broadcasters have often argued in favour of a terrestrial digital network, as it is the only form of digital distribution that can provide services for portable TV. The change in the pattern of TV consumption is a central point in this argument: People will increasingly watch TV in the kitchen, bedroom, etc. and they do not want a lot of TV sets, complicated cabling or different satellite dishes in their house. They prefer portable TV with "in-house" antenna, or possibly wireless home networks some time in future. Furthermore, according to this argument, people are also expected to use TV more and more out of the house with the new interactive services, e.g. on the beach and on vacations, and they do not want to carry satellite dishes and receivers around.

Portable reception is recognised as one of the issues to be tested during the digital TV pilot in Denmark.

1.5 Conclusion

Digital TV is available on the satellite and cable TV market in Denmark. 1,15 million cable TV households and 530.000 satellite households can potentially subscribe to digital services, out of which, 150.000 households actually do so. Tele Danmark is the main network provider of digital cable TV, while STOFA covers only about 10% of its network digitally. Other smaller networks remain analogue.

There are 60.000 subscribers to digital satellite services; all of them belong to Canal Digital, which started its digital service provision in fall 1998. VIASAT is the major premium pay-TV provider in Denmark and its entry to digital market in spring 2000 will have major influence on the development of digital market in Denmark. VIASAT has chosen other CA and API (Viaccess and Open TV) technologies than Canal Digital. Because of the lack of, e.g., simulcrypt agreements between the satellite operators the end-users must use two boxes or boxes with Common Interface to be able to see services from both providers. This situation will continue until a common DVB-MHP platform has been developed.

Terrestrial digital TV is currently being tested, and the outcome will have considerable consequences for the future of Danish digital TV. A key issue under investigation is the efficient use of frequency resources. This is central because the scarcity of resources for countrywide digital TV is considered as one of the barriers for the development of terrestrial digital TV. The commercial digital networks are ahead of the national efforts, e.g. with more than 50 services in Tele Danmark's cable TV. Equally important, there is a noticeable development of new innovative services, such as e-mail, chat-rooms through the Internet, extended shopping facilities and the possibility of choosing camera angles for sport events. Along with this development is the increased capability to provide individual services to certain parts of the population, which could not be satisfied profitably with analogue technology. These include several thematic services and programmes in native languages targeting groups of foreigners in Denmark and e.g. several NVOD services.

The market share of digital TV is not high, but the infrastructure for digital TV and new services has been developed. The majority of cable households have the possibility of subscribing to digital services, practically all of the population can subscribe to digital satellite services and the digitalisation of the terrestrial network is likely to continue after the trial period. Furthermore, there are a growing number of services available only in digital form. This development has forced actors who previously claimed that they would remain analogue, to change their strategy. Further, the variety of these services has increased, and in particular the interactive services that are technically exclusive to the digital media have received more attention. As a result, the competition in the Danish digital TV market has intensified, and analogue services seem to become increasingly imperfect as a substitute.

Key figures for the Danish market[12]

2.1 Country fundamentals

As of 31 December	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*
Population (millions)	5.200	5.220	5.250	5.280	5.310	5.314	
Households (millions)	2.340	2.360	2.370	2.390	2.410	2.415	
GDP (billion Euro)	128.000	138.000	145.000	150.000	156.000	162.968	

2.2 Equipment

As of 31 of December	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*
TV households (millions)	2.299	2.280	2.300	2.342	2.356	2.351	
TV households (% of total households)	98.2%	96.6%	97.0%	98.0%	97.8%	97.3%	
TV households with 2 TV sets or more (millions)	0.739	0.821	0.852	0.927	1.029	1.075	
TV households with 2 TV sets or more (% of TV households)	32.1%	36.0%	37.0%	39.6%	43.7%	45.7%	
TV households with 16:9 Television sets (millions)	0.000	0.004	0.010	0.019	0.037	0.057	
TV households with 16:9 Television sets (% of TV households)	0.0%	0.2%	0.4%	0.8%	1.6%	2.4%	
VCR households (millions)	1.429	1.547	1.662	1.778	1.878	1.892	
VCR households (% of TV households)	62.2%	67.9%	72.3%	75.9%	79.7%	80.5%	
Digital STB households (millions)	0.000	0.000	0.000	0.000	0.052	0.095	
Digital STB households (% of TV Households)	0.0%	0.0%	0.0%	0.0%	2.2%	4,0%	
IDTV[13] households (millions)	0.000	0.000	0.000	0.000	0.000	0.000	
Digital TV households (% of TV households)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Digital households[14] (millions)	0.000	0.000	0.000	0.000	0.052	0.095	
Digital households (% of TV households)	0.0%	0.0%	0.0%	0.0%	2.2%	4,0%	

[12] Until 1998 all amounts are in ECU
[13] Integrated Digital TV Set
[14] Sum of Digital STB homes and digital IDTV households

2.3 Television market estimates

Millions Euros	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*
Analogue TV Market							
Public funds (only licence fees)		316.840	337.930	339.810	364.300	379.995	399.055
Advertising		165.180	182.470	199.041	224.816	230.858	234.434
Subscription		100.000	121.000	127.000	191.000	209.718	212.317
Total analogue TV		582.020	641.400	671.190	781.640	820.571	845.806
Digital TV Market							
Public funds		0.000	0.000	0.000	0.000	0.000	0.000
Advertising		0.000	0.000	0.000	0.000	0.000	0.000
Subscription		0.000	0.000	0.000	0.000	4.400	11.175
Total digital TV		0.000	0.000	0.000	0.000	4.400	11.175
TV Market							
Public funds		316.840	337.930	339.810	364.300	379.995	399.055
Advertising		165.180	182.470	204.380	226.340	249.800	234.434
Subscription		100.000	121.000	127.000	191.000	214.118	223.492
Total TV market.		582.020	641.400	671.190	781.640	829.371	856.981

2.4 Details of the subscription-TV market

Cable

	1993	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*
Home passed (millions)		1.700	1.700	1.500	1.600	1.700	1.700
of which digital (millions)		0.000	0.000	0.000	0.000	1.150	1.150
Home passed (% of TV households)		73.9%	74.6%	65.2%	68.3%	72.2%	70.3%
of which digital (% of TV households)		0.0%	0.0%	0.0%	0.0%	48.8%	47.6%
Analogue basic subscribers (millions)		1.170	1.270	0.950	1.000	1.316	1.335
Digital package subscribers (millions)		0.000	0.000	0.000	0.000	0.048	0.065
Analogue basic subscribers (% of TV households)		50.9%	55.7%	41.3%	42.7%	55.9%	56.8%
Digital package subscribers (% of TV households)		0.0%	0.0%	0.0%	0.0%	2.0%	2,8%

Satellite

	1993	1994	1995	1996	1997	1998	1999
Satellite households (millions)		0.240	0.270	0.390	0.430	0.470	0.530
Satellite households (% of TV households)		10,4%	11,8%	17,0%	18,4%	19,9%	22,5%
Satellite subscribers (millions)		0.239	0.245	0.252	0.274	0.300	0.345
Satellite subscribers (% of TV households)		10,4%	10,7%	11,0%	11,7%	12,7%	14,7%
of which digital (millions)		0.000	0.000	0.000	0.000	0.004	0.030
of which digital (% of TV households)		0.0%	0.0%	0.0%	0.0%	0,2%	1,3%