Volker Wittke, Heidemarie Hanekop,
Sociological-Research-Institute (SOFI) at the University of Goettingen, Germany

National Divergence in Developing Broadband Internet Access: The Specifics of the German Case

The wide-ranging diffusion of broadband access is probably a significant turning point in the history of the Internet, because the changes connected with it transcend the mere increase of bandwidths. To use cable modems or ADSL technology entails more than getting the same content faster. The mere fact that users having broadband access are typically ”always on” apparently already has an impact on usage patterns as well as on the socio-demographics of user communities (Anderson 1999). In addition more bandwidth facilitates access to video content and might mark the initial break with predominantly text-based forms of presentation on Internet sites. Providers of broadband Internet services – such as Excite@Home, Roadrunner or Chello – are currently working on new ways to present and mix content, developing formats and templates which promise to utilize the possibilities of broadband extensively. Of course, it is hard to predict the results of these efforts in the medium run and assess what will be accepted by users. However, it is foreseeable that the character of the Internet will change significantly as a consequence of the mass diffusion of broadband access. Therefore, the question of the conditions under and the speed at which broadband Internet access will spread is of considerable importance.

There are several ways to accomplish broadband access technologically. At the moment, cable and xDSL are the two technologies that are being used commercially. But satellite and wireless technologies as well as power lines are expected to be available in the near future as well. Among these technologies, cable succeeded in getting the head-start. In North America, after an initial period of latency cable has witnessed impressive growth rates since 1997. Within a bit more than two years the number of subscribers of Internet over cable has rapidly increased from just a few thousand (in early 1997) to about 1 million in the second quarter of 1999 (Kinetic Strategies Inc. 1999). The xDSL technology, which was introduced later, is a far cry behind this degree of diffusion, even though its development is particularly dynamic and projections gather that the number of xDSL lines will surpass the number of cable

modems between the years 2000 and 2002 (TeleCoice 1999). But whatever the respective market size of competing broadband technologies will be in the future, cable definitely played the crucial role in the commercial inception of broadband Internet access.

Compared with this North American development, the deployment of broadband Internet access over cable in Europe is still in its infancy. In Germany – the largest Internet market in Europe – the commercial launch of cable technology for Internet access has not even started. At first glance one could consider this cross-national variation in the diffusion of broadband technology repeating the pattern set by narrowband Internet access. There, too the US development had been far ahead of Europe, and within Europe Germany was not among the early adopters. Although it is probably true that there is a time lag in deploying broadband technology in Europe, the sluggish development in Germany is more than a time lag. Special difficulties of wide-ranging development of broadband Internet access are caused by national political conditions, particularly the national regulatory framework, as well as national telecom and cable industry structures.

We claim that an important set of reasons for the variation in the development of broadband Internet access over cable can be found in significant differences in the cable industry's structure, business models and business culture between Europe and the US. With regard to these factors the shape of the German cable industry represents a very special case, even within the European context. These differences between the US and German case have their origins in different social – regulatory and institutional – contexts that shaped the emergence of the cable industries in these countries. Social contexts, however, did not only influence the industry's formation; they also remain influential in shaping the conversion of the existing cable infrastructure into an interactive network that makes broadband Internet access possible. This conversion is much more difficult in Germany than it is in the US, and also still much more difficult than in many other European countries.

1. Diffusion of Broadband Internet Access over Cable: What are the Differences Between the US and Europe?

The leading role of the US in introducing broadband Internet access over cable becomes evident in the numbers of both subscribers (i.e. the actual use) and homes that could

potentially use a broadband connection, as they are located in areas which are already equipped with two-way cables. Of the approximately 30 millions of homes for which this is the case, 740,000 are currently (Q2, 1999) subscribers of broadband services (Kinetic Strategies Inc. 1999). Thus, almost 50% of all US cable homes are passed by upgraded lines. 2.5% of these households actually make use of the new possibilities – with growth rates of more than 30% per quarter. Cable operators have almost finished the upgrading of their networks. The increase in the number of lines is not primarily limited by a hesitant demand, but by supply, because in addition to the necessary upgrading of the cable systems, getting two way lines still requires a rather costly, manual procedure of installing the connection, which is why the providers are working to develop automated techniques of line hook-up.

In Europe, exact information about the scale of the two-way cable systems and numbers of subscribers are not available, because the providers are reluctant to give precise figures regarding these factors. However, it is obvious that the Europeans are far behind the US in terms of both infrastructure and numbers of subscribers. Adding up the data of Western European cable operators, today a maximum of 4 million homes are passed by two-way upgraded cables. Given the fact that there are around 40 million cable subscribers in Western Europe (ECCA 1999) the extent of upgraded cable systems is thus far below the level in the US: instead of 50% in the US less than 10% of all TV-cable homes in Europe are passed by two-way upgraded cable lines. Roughly estimated there are less than 100,000 subscriber households in Europe. Although the absolute number of subscribers of broadband Internet services in Europe is still small, penetration rates of broadband Internet are in Europe at the same level than in the US: about 2,5% of all homes that are supplied with broadband Internet service (passed by two-way upgraded cable lines) have subscribed to broadband Internet access[1]. The acceptance of the new advanced Internet service by users is in Europe as high as in the US.

These numbers indicate that the main difference between the US and Europe is not a matter of the pace at which the penetration in already upgraded cable systems is increasing. Instead, the crucial difference lies in the fact that the cable operators in Europe started later and are upgrading their cable systems with significantly different

[1] Referred to 4 million homes passed by upgraded cable systems, 100,000 subscribers are about 2.5%

speeds. While in the US cable systems are comprehensively modernized, the upgrading of cable systems in Europe furthermore takes place selectively.

Broadband Access in Europe: Time Lag But in Progress

There is, however, large variation within Europe both in the extent to which cable systems are modernized and broadband Internet access is being offered. The subscribers of broadband Internet access are currently concentrated in countries with high Internet penetration rates (Morgan Stanley Dean Witter 1999) and high deployment rates of cable[2]. This is the case in the Scandinavian countries (Sweden, Norway, Finland, and – in a lesser extend - Denmark), the Benelux countries (the Netherlands, Belgium, Luxembourg), as well as Switzerland and Austria. It is thus not very puzzling that the largest cable plants with high speed Internet services are located in Vienna, Basel, Amsterdam, Brussels and other cities of the Benelux countries. The introduction of high speed Internet started there in 1996.

In contrast, the large European countries – defined in terms of both population and market size – are lagging far behind both with the modernization of cable systems and offering broadband Internet access. In the case of France this is due to the combination of comparatively low Internet penetration rates and a low cable density. The situation is similar in Italy and Spain. However, there is some indication that the situation is changing. The upgrading of the cable infrastructure - to be followed by offering broadband Internet access - can be expected at least for metropolitan areas such as Paris. The UK - even more dramatically than France - appears to be ready for a spurt-like development, although cable density is still rather low due to the very late start of cable. Large roll-outs of high speed Internet - both for cable and for ADSL - have been announced for the next months. A number of trials with cable modems have already been finished. The relatively high rates of Internet penetration in the UK make it likely that diffusion of broadband internet access will be rapid, once the technology allows offering the service.

[2] High deployment rates are common in smaler European countries because people in the small countries are often interested in receiving the TV programs of their neighbor countries, partly as a result of language borders' cross-cutting national borders.

Broadband Internet Access in Germany: Promising Market Factors but Poor Development

Broadband Internet access is still poorly developed – up to now there are about 5,000 subscribers – although both internet and cable pentration rates in Germany are high:
Germany has the largest cable system in Europe: Currently TV-cable is available for 26 million homes passed (ALM 1988:335f). In metropolitan areas, more than 90% of households are subscribers. The situation is different in rural areas with only 67% (ALM 1988:336).
In terms of Internet penetration Germany is above average and ranks similar to countries like Switzerland and the Netherlands: 17,7 % of adults use the Internet (ARD/ZDF 1999:401) with growth rates of 40% during the last six months (GfK 1999). Internet use has almost tripled since 1996 – in mid-1999 there were about 11,2 million Internet users in Germany (ARD/ZDF 1999:401).
With regard to the number of households equipped with computers, Germany's position is above average – almost 40% of all German households have a PC (Statistisches Bundesamt 1999) and that tendency is rapidly increasing. These numbers indicate that the German market is not only interesting because of its absolute size but also because of its being well equipped with the necessary infrastructure. Given these factors, demand for broadband access could reasonably be anticipated to be high.

Summing up the results so far: In the countries with favorable demand factors implementation of broadband Internet access is growing. But in Germany development still falters, in spite of auspicious preconditions.

European Development is Driven by Broadband Pioneers

What is the situation in Europe in terms of supply – who are the industry's pioneers? Similarly to the initial phase in the US there are just a handful of operators in Europe that are already upgrading their cable systems. The majority of European cable operators are interested, albeit less enthusiastic about contributing capital for its financing. The largest upgraded cable networks are owned by an US cable operator (UPC). Vienna, Amsterdam and recently Oslo as well as some smaller cities have already been hooked up. By the end of 1999, the upgrading of cable systems is expected to be complete in Vienna and Amsterdam; by the end of 2000 in Oslo. Overall, UPC has upgraded cable systems in Europe for 2.5 million homes passed (i.e. 61% of about 4.2

million homes supplied by UPC). 53,000 UPC-subscribers have signed up for broadband Internet service (which UPC is marketing under the brand of Chello). This is a penetration rate of 2.2%, which roughly corresponds to the average American proportion. UPC apparently benefits from the time lag between the US and Europe. They obtain a competitive advantage from applying the US experiences to Europe. Today other European cable operators also try to gain from the US-experience, for instance by cooperating with Excite@Home, the largest US broadband ISP.

With 20,000 current subscribers CASEMA is the second largest broadband Internet provider in Europe. The company has 1.2 million cable customers and its proportion of broadband Internet subscribers therefore is nearly 2%. It represents the type of company that continues to dominate the industry in Europe today: CASEMA is a spin-off from KPN, the former Dutch PTT. KPN sold CASEMA to France Telecom, the former PTT of France. Cable operators that are somehow connected with or descended form former PTTs play a dominating role in Europe. 50% of the European cable market is being supplied by cable operators that are closely connected with telecommunications firms or have spun off a telecommunications company, usually a former PTT, in recent years. Their cable networks are usually relatively large and therefore costeffective to upgrade. Other Dutch and Belgian cable operators are also in the process of upgrading their networks; the number of subscriber is not released at the present point, but it should be not more than 5,000. In Switzerland the two largest cable operators have started offering Internet services one or two years ago, today they provide Internet over cable in the bigger cities of Switzerland. Totally we estimate about 3,400 Internet subscribers. These numbers must be considered in relation to the total of merely 2.5 million cable subscribers in Switzerland.

This description of the European broadband cable networks does not claim to provide an exhaustive picture, but it does capture the present situation in Europe quite well: The existing interactive cable networks are expanding, and new networks are being added. The next stage in this development can already be observed in the cases of the more advanced broadband service providers: The scattered network islands are being connected with one another. At the same time special broadband ISPs – like Chello – are developing a comprehensive spectrum of services such as classical ISP-functions, specific broadband ISP tasks and the providing of a portal site. In this respect too, European development is following the American example.

The German Case as an Exception

The situation in Germany is characterized by the fact that the size of upgraded cable networks is currently frozen at 5,000 – 10,000 homes passed. The first German pilot trial is a good example for the effect of this seemingly insurmountable obstacle: Toward the end of 1995 the trial was approved. After a preparatory phase the first 50 users were hooked up by the end of 1996, and the official launch in the three participating cities was 1997. High speed Internet service over cable was offered to about 10,000 households, and between 600 and 1,000 households have made use of the offer until the end of 1998. The cable operator is continuing the service on a commercial base, but without expansion of the service to more than the initial cable plants. These upgraded cable plants are restricted to some streets. Instead of upgrading the hole networks of these cities (that would be more cost effective), the same cable operator has started a new project in 1999, involving 5,000 homes passed in Berlin, where about 250 high speed Internet subscribers have been connected through mid 1999.

In Germany there is no company – comparable to Excite@Home or Chello – that would specialize on broadband Internet access to develop the access features of Internet over cable. Private cable operators have tried to come up with models for the development of broadband Internet applications in the context of several trials. However, these models suffer from insufficient scope, due to only small numbers of subscribers. In addition to that there has not yet emerged something like an autonomous broadband ISP, which would be sustained by more than one cable network provider.

Besides, unlike in the other European countries, none of the European or American cable operators has become active in Germany so far. This too is an indication of the fact that there must be structural obstacles at work in Germany, which have something to do with the specific situation of the CATV-infrastructure in Germany.

Further evidence for our thesis – that the specialty of the German case with regard to broadband Internet access has nothing to do with an underdeveloped market, but is a consequence of structural characteristics of the cable industry – is provided by the deployment of ADSL in Germany. Here Deutsche Telekom has been playing the role of a provider of high speed Internet services. ADSL-technology has been offered as trial in a few German cities since the spring of 1999. The commercial launch of ADSL in eight large cities started in July 1999; forty additional cities are supposed to follow till the end of this year. By the end of 1999 a total of 100,000 users are planned to be provided

with high speed Internet services via ADSL. But Deutsche Telekom is not implementing the ”always-on” advantage of ADSL-technologies and seems to aim mainly at small and medium-sized enterprises rather than the residential market (Kubicek, 1999).

The deployment of ADSL takes place not only in Germany but in other European countries – such as UK, the Netherlands, and Sweden – as well (e.g., British Telecom has announced a ”roll out” of ADSL for about 250,000 customers for the second half of 1999). But there is no doubt that Deutsche Telekom is acting as one of the ADSL pioneers in Europe. This indicates once again the demand for broadband Internet access in Germany. If the supply of broadband services rather than a lack of sufficient demand is the bottleneck in the German case, and if the German telecommunications sector is short of supply only in the case of cable (but not in the case of ADSL), then the question is: why?

2. Conditions of Conversion – Technology and Beyond

Broadband Internet access over cable can use the existing infrastructure of cable TV. The crucial difference from the traditional dial-up access over narrowband telephone lines then mainly consists of the broadband local loop. However, using the existing cable systems requires far-reaching alterations and extensions of the existing technological infrastructure, as these cable systems, although suited for the transmission of broadband services, cannot be used interactively without upgrading the systems. Furthermore the cable systems must be equipped to handle a broader frequency spectrum, in order to avoid a situation in which the new services are offered at the expense of the present supply of cable TV.

Even if the actors involved usually refer to these changes of the cable systems as *upgrading,* what is really going on is a *conversion* of the technological infrastructure. Upgrading strategies do not only equip the cable systems for handling a larger frequency spectrum and realize the return channel, but they also implement quite far-reaching modifications in the architecture of the cable systems. They replace the traditional tree structure of the systems and build a HFC[3]-structure that bears much more resemblance with data lines than it does with conventional cable systems. Headends are connected with fiber optic rings to build metropolitan or regional systems,

with the result that the cable systems become bigger. These metropolitan or regional rings are then connected with a broadband backbone which not only serves as the global return channel, but also provides access to content beyond cable TV. This conversion of cable systems is extremly costly.

This raises the question of what actors will drive the conversion, and what kind of business models they have in mind when doing so. This question poses itself equally saliently in the US and in Europe, yet the answers found in Europe differ sharply from the ones found in the US

Obviously, the cable systems in the US and in Europe – particularly in Germany – are technically different, because of the separation of different network levels, owned by varying cable operators. But it is not only the different technological architectures that account for the contrasting organizational solutions. The answers to the question of who will accomplish the conversion according to what kind of business model, we claim, are much more driven by the embeddedness of cable infrastructure systems in social contexts that have strong national characteristics.

In the US the conversion of the cable systems already started in the beginning of the 1990s, even before the Internet as a means of mass communication played an important role at all. The cable companies fully operated within the traditions of their business when upgrading their cable systems. They were chiefly interested in improving their core business – the transmission and distribution of TV – and they sought to enhance the possibilities in that core business by extending the capacities (to transmit more channels), by differentiating their offers (pay per view as an additional option), and by creating the means for interactive television (video on demand). Cable operators – such as TimeWarner Cable or MediaOne – have undertaken technologically very demanding projects in those areas in the mid-nineties. Even though some cable operators were thinking about integrating additional service offers (such as interactive home shopping) and, in this context, about transforming their cable systems into full service networks, the driving force behind the enhancement of the systems was their traditional core business: cable TV. The investment of enhancing the systems had to be financed with this core business as well. Therefore the projects were planned on a rather long-term time horizon and upgrading initially proceeded at a low pace.

[3] Hybrid Fiber Copper

The conversion of the cable systems picked up speed when two additional applications were being envisioned, which would both use the infrastructure of the local loop constructed within the HFC structures: Internet access and telephony over cable. The former was the consequence of the unexpectedly rapid evolution of the Internet into a medium of mass communication, being increasingly used by residential customers as well. The latter option is essentially a consequence of regulation in the telecommunications industry in 1996, which allowed long distance carriers to enter the regional markets. As these two additional applications could use the upgraded HFC structure of the local loop, additional means of financing the projects became available. Accordingly, the upgrading process has accelerated since the mid-nineties.

The important aspect in this context is the fact that the cable operators played the key role in the conversion of the cable systems. It is them that modernized the local loop, while for financing the modernization projects they could soon draw on the revenues from several sources: Broadband Internet, digital/interactive TV, telephony. The fact that established companies in a traditional branch of the industry were pivotal in initiating the conversion of the cable systems does not entail, however, that the structure of the cable industry would remain unaffected in the context of conversion.

During the past few years the industry has witnessed a strong tendency toward consolidation, a tendency that has to do with the conversion of the cable systems and the financial demands connected with the investment required for realizing the conversion. Furthermore, the broadband Internet access requires the construction of infrastructure that goes beyond the upgrading of the local loop. This infrastructure (the backbone) is built up and operated by companies that are specialized service providers (Excite@Home and Roadrunner), which are, however, fully owned by the cable operators.

The new applications beyond TV and the classical Internet have also called forth actors from outside the cable industry. The opportunity of telephony over cable – and maybe even the prospect that cable systems may become part of an IP-based telecommunication infrastructure – has instigated At&T, above all, to ensure its access to the local loop through cooperation agreements (with TimeWarner Cable) or by acquisitions (in the cases of TCI and MediaOne). Moreover, the key role of digital settop boxes in the post PC era has apparently persuaded Microsoft to get stakes in cable operating corporations. The ownership structures in the cable industry are

undergoing a fundamental change and the entry of new companies into the industry further accelerates the conversion of the cable infrastructure, though the kind of companies being attracted to the industry underscore the strategic role of the cable operators.

All of this may seem to be somewhat trivial considered from a US perspective. The brief outline of the development in the US, however, is important as a point of reference for the analysis of the European, and again particularly the German situation. That the conversion of the cable systems into interactive networks suitable for the broadband Internet access has not yet taken place there is essentially due to the fact that in Europe different actors with different sets of strategic options are the crucial players in the emerging technological systems.

3. The Specifics of the German Case: Legacies of the Regulative Conditions in the Formative Phase

Until now, there are no cable operators in Germany that could be seen as comparable to their US counterparts in terms of business models or business culture. Neither was this the case in the phase of building up cable infrastructure nor later on. This means that the conditions for a conversion of cable infrastructure (in order to enable broadband internet access) are rather limited. This difference goes back to regulatory and institutional obstacles the development of cable infrastructure had to deal with since the beginning of the eighties. The consequence of these conditions is that the technical infrastructure of cable systems as well as business concepts of cable operators differ considerably from the US model. There have been far-reaching changes of regulatory conditions that applied in the beginning – particularly in the course of deregulation of the telecommunication sector since the middle of the nineties. The structure of the cable industry, however, is shaped by the conditions of its creation until today.

The first CATV networks that came up in the sixties and seventies have been ”community antenna” TV systems in the original meaning of the term. They exclusively served the purpose of broadcasting programs of the public radio and TV services (Fuenfgeld 1997). They were run by housing companies in cooperation with antenna service firms in order to provide their tenants with higher quality reception of those programs that were commonly available. By the end of the seventies, about eight million housing units were supplied by the small cable systems.

This development was accompanied by a controversial debate in the seventies about the construction of an exhaustive cable infrastructure system that resulted in pilot trials (two in 1972, three more from 1979 on) and plans for nationwide exhaustive cabling by the German PTT – what later became Deutsche Telekom (Wilke 1999). The decision of the federal government, however, that was necessary for the execution of the plans, wasn't made under the social democratic government. The situation changed when the conservative government took over in 1982 (Kleinsteuber, Wilke 1992). The improvement of new communication technologies, especially cable systems, became a central part of government policy. An important aim of this development was the promotion of private broadcasting stations. Annual investments of more than one billion DM led to a fast development of cable systems. Only eight years later, every second German household was able to receive TV programs via cable.

The exhaustive development of cable systems was done under the condition of double regulation: for developing and running the technical infrastructure (including prices) federal regulations for telecommunications applied. For the content (the question which TV programs were transmitted via cable) legal regulations on media applied which lie in the responsibility of the states (Bundeslaender) in Germany. Regarding the infrastructure as well as the content, the conditions of cable operators in Germany differ from the situation in the US (Schneider 1999). The specifics of the German case arise to a large extent from the interplay of those two special conditions.

Regulation of Content

The crucial effect of media regulation lay in the fact that cable operators (who run the technical infrastructure) up to now have no influence on the TV programs they transmit[4]. The states (Bundeslaender), more precisely special control bodies on state level, decide which programs are transported by cable systems (in the German context this is called the "transportation model"). Only programs that received a license in the respective state may be fed into cable systems. By this form of regulation, the business models of cable operators are quite limited. They have no influence on the marketing of the programs. Their service is limited exclusively to the technology of broadcasting and

[4] At present, an amendment of the media legislation is being prepared. In the context of introducing digital TV, the operators will be allowed more freedom for the first time. Only a part of programs will be obligatory "must carry" services. As for the rest, the control bodies of the states will still watch that sufficient plurality is granted.

the transport of content. This transport service is paid for by cable customers and private broadcasting services.

This form of content regulation – public control over broadcasting including the contents – can only be understood against the backdrop of the experience of National Socialism. The federal, publicly controlled broadcasting system has to be seen as a reaction to the misuse of the radio for Nazi propaganda. By exerting public control on broadcasting services on a decentralized level, not only freedom of speech was to be granted. More than that, a pluralistic and balanced opinion-forming was intended by this kind of "quality management".

This type of regulation that applied already for the era of exclusive public ("oeffentlich-rechtlich") TV in Germany (up to the middle of the eighties), shaped the implementation of private TV as well. Private TV stations can be pressurized to follow content control by the threat of refusing or withdrawing their licence. The control body on state level consists of different social groups and elected representatives; it is by definition no government authority. Under these conditions, a program supply developed in the eighties and nineties, that consists of a blend of public programs (which are also transmitted terrestrial) and private TV.

While TV programs under public law are funded by fees, the large majority of private broadcasting services in Germany is Free-TV, financed through commercials. Pay-TV in Germany is still in its infancy. Compared to other countries, a wide variety of freely available programs is offered which seems to limit interest in additional programs that cost additional fees. Starting in 1991 Pay-TV today has about 1.7 million subscribers and provides a range of about 30 channels. These difficulties in establishing Pay-TV also limit the scope for cable operators to include Pay-TV services in business models for upgraded cable networks (we will come back to this later).

For private households, cable connection was interesting because it provided access to those private broadcasting stations that were not transmitted by terrestrial devices (antenna). Since the beginning of the 90s, however, it faces growing competition by satellite TV. Prices for satellite receivers went down strongly, and Free-TV funded by commercials can also be received via satellite. Under these conditions the most reliable cable customers are those who live in rented apartments of housing companies, because on the one hand they have cable connection at affordable rates (the housing agencies

negotiate subscriber fees with cable operators, see below) and on the other hand the owners often don't allow the installation of satellite dishes.

Thus, the difference compared to the situation in the US lies not only in the different content transported by the cable systems (in Germany, there is no equivalent to cable networks and pay-TV-channels). For cable operators in Germany this means that they (have to) provide a uniform service to their customers. Differentiation (different packages) is not possible. This, however, has implications for the relation between cable operators and their customers. The reduction of business models to the "transportation model" leads to a limitation of marketing and sales activities to connecting the customer to the network. There are no additional customer contacts nor experiences of cable operators (for instance with differentiated pricing).

Regulation of the Technological Infrastructure

When we talk about "cable operators" in the German context, the scope of the strategic options of these actors is not only restricted through the traditionally predominant "transportation model". Unlike in the US there is the additional factor that ownership of the technological infrastructure is fragmented in Germany. Cable operators usually do not own complete cable systems (from the head-end all the way to the residential customers), but merely parts of it. Roughly speaking, the Deutsche Telekom (Germany's largest cable operator) controls the head-ends and the tree structure to the extent that they are on public ground (in the German context these parts are called "network-levels" 1 through 3). The parts of the cable system that are installed on private ground (the so called "network-level 4"), however, is mostly in the hands of private cable operators. The cable subscribers are customers of the respective operator on the network-level 4. Unfortunately this general rule has not remained a principle without exceptions, so that the current situation is even more complicated.

Of the 21.5 millions of cable subscribers the vast majority of 17.3 millions are with the Deutsche Telekom, as far as the network-level 3 goes. There are, however, about 4 millions of households that are served by private cable operators already on the level three.[5] On network-level 4 the Deutsche Telekom has merely 5.8 millions of direct customers. In contrast, the private cable operators have 11.5 subscribers who depend on

[5] Most of these networks lie on the former East German territory. They have been built during the 1990s when regulatory conditions in the telecommunications industry were already changing.

the supply from the Deutsche Telekom on network level 3, plus 4 millions of households served exclusively by private cable operators (VPRT 1999:30f.).

While the direct customers of the Deutsche Telekom are predominantly households in detached houses and duplex houses, private cable operators concentrate on apartment buildings where larger units can be hooked up to the cable networks. Often these are apartments owned by private or municipal housing agencies[6]. In these cases the cables on private ground may be owned by the cable operators, yet they do not have autonomous control over the use of these cable systems. Instead, they underlie restrictions, contractually negotiated with the housing agencies, as far as prices (subscriber fees) and the introduction of additional service offers are concerned.

Political Arrangement Leads to Fragmentation of Cable Systems

This fragmented structure of the cable industry has its roots in a political arrangement that emerged when cable was extended to a dense infrastructure which should cover nearly every household. Different interest structures of the PTT and the private operators of already existing CATV-systems had to be taken into account. The PTT argued that broadband cables are part of the normal telecommunications-infrastructure, so that their provision and modernization falls within the PTT's area of responsibility. The operators of CATV-systems contested this view and reproached the PTT with illegitimately playing a dual role, namely as the agency granting permissions for operating cable systems and at the same time as company competing for subscribers. The federal government, favoring the solution that promised the rapid construction of the infrastructure, preferred the PTT to built and run the cable system. This position appeared to be able to guarantee technological competence in the first place, but secondly and perhaps more importantly, the financial means for building the infrastructure fast (which had to be provided by the PTT/Telekom) seemed to be secured. The private CATV-operators enganged in lobbying until they finally succeeded in reaching a compromise in 1983/84. Network level 4 and the marketing of the cable connections with the private residences were supposed to be reserved for private investors, while the PTT/Telekom's activities were supposed to be limited to the provision of the signals, i.e restricted to the network levels 1 through 3 (VPRT

[6] One has to take into account here that the proportion of people living in apartments is much higher in Germany than in the US (and is even higher than the proportions in other European countries, such as the UK)

1999:22f.). This arrangement, with its split responsibility for the different network levels, sealed the fragmentation of the cable systems.

Effects for Business Models of Deutsche Telekom and Private Cable Operators

The conditions under which the cable infrastructure has been built during the 1980s and 1990s continues to exert its influence on the business strategies of the cable operators. As the speed and the strategy of wiring followed state regulations and not economic calculations, the broadband cable business of the PTT/Telekom, that is, the construction and operation of the network levels 1 through 3, ran at heavy losses which are mainly due to the large investment sums in the construction phase (Werle 1990:285f). The magnitude of these losses is estimated to have amounted to 11.5 billion DM between 1983 and 1997 (VPRT 1999:45f). The private cable operators, in contrast, were run according to the usual criteria for profitability. Their business models may have differed sharply from the models prevailing in the US, which is a natural consequence of the particularities of the shape of the industry in Germany. Nevertheless, they operated their companies successfully indeed , based on these models.

The profiles of the private operators of cable networks initially differed. They are strongly shaped by the conditions of their development. Some cable operators mainly acted as providers for the housing agencies, at whose request they ran their networks and whose tenants they served. Other cable operators emerged from marketing Telekom-services. They appear as general agents of the Deutsche Telekom in their transactions with private customers, and their business consists of buying services from the Telekom at wholesaler-prices and then sell them again to final customers while making a profit.

Besides 100% subsidiaries of Deutsche Telekom, one can make out five groups according to origin or economic interdependence: subsidiaries of appliance manufacturers like Bosch or Siemens, regional marketing firms with stakes held by banks and PTT, cable operators which were outsourced by housing companies, housing companies themselves and a large number of small handicraft firms. According to estimates, there are up to 4.000 private cable network operators. Concentration within the cable industry has meanwhile led to an almost complete intermingling of these profiles. About 6 million households are served by 4 to 5 important private cable network operators on a supraregional level. One of them is a cable operator from the

side of appliance manufacturers. The two largest operators have strong ties to housing companies, another large operator was created by a merger of two SMEs[7]. With 1 to 2 million subscribers, these operators can be considered having an intermediate size on a European level. Their room for maneuver, however is restricted in several regards. One is the extreme fragmentation of the physical networks. Those 1 to 2 million households per cable operator are distributed among innumerable network cluster that often include only a few houses. Cluster that include a whole street are rare. Normally, one cable operator supplies single houses that are scattered over the whole town. The second reason for restriction is the close relation to the housing agencies and PTT/Telekom. The ties with the housing industry are so close that the services of the cable operator are fixed in detail by long term contracts.

The room for maneuver for private operators is therefore restricted on both ends of their value chains: vis a vis the Telekom as their supplier and vis a vis the housing agencies as their main customers. They are bound by long-term contracts on which the cable operators do not want to shed doubt, as long as these contracts constitute the basis of their business that has been successful so far.

4. Conversion in Germany

The strategy of Deutsche Telekom did not aim at carrying out the conversion of cable systems for broadband internet access on its own. According to its self-definition and tradition, the company primarily is a telephone carrier and concentrates on perspectives that arise from the use of the telephone network. Deutsche Telekom has invested in digitization of the telephone network; compared to other countries, ISDN technology is very common. Contrary to assumptions that arose for some time Deutsche Telekom is, at the same time, a protagonist of using ADSL technology for the development of broadband access lines. More than that, the company is very involved in the wireless business where it runs a close race with Mannesmann for leadership in the German market. Finally, Deutsche Telekom has upgraded their backbones in fiber-optic technology. In short: the problem for Deutsche Telekom is not an insufficient technical infrastructure in Germany, but its lack of international presence. Unlike US carriers, the company has a complete infrastructure, regarding the long distance area as well as the local loop. Thus they do not depend on additional infrastructure that an upgraded cable network would provide.

[7] Small and medium enterprises

From these facts, one would assume that Deutsche Telekom must be interested in selling their cable systems, even more so since they urgently need capital in order to finance acquisitions they need to improve their international presence. This obviously conflicts with apprehensions that an upgraded cable network would give competitors in their core business (telephone services and data transmission) the opportunity to build up a complete infrastructure as well. So far, this is a factual monopoly of Deutsche Telekom, competitors have their own networks either in the long distance sector (Mannesmann) or only in local areas (like some city carrier). In this perspective, owning the cable systems (in their present state, not upgraded) gains a strategic value of prevention. As long as the networks are not upgraded, nobody else can use them. This points at a perspective to delay upgrading and selling as long as possible, running the risk that cable systems lose their value once alternative broadband technologies like ADSL, Satellite, Wireless or Power Lines are established.

Contradictions between these two perspectives are obvious, making Deutsche Telekom pursue a double strategy at the moment: On the one hand they speed up market introduction of ADSL in order to have broadband access technology over telephone lines. On the other hand the company has announced to sell the majority interest of cable systems while they try to avoid selling them to strong competitors (for details see below). With this double strategy, Deutsche Telekom obviously aims at a timing that does not lead to conversion so early that broadband access technology over cable could become a threat for marketing ADSL. At the same time they try to sell cable systems early enough, so expectations that point towards enhanced options of use may lead to a high purchase price.

As long as Deutsche Telekom neither upgrades nor sells their cable systems, private cable operators cannot act on their own. They are not able to adapt their systems to broadband internet access. For upgrading cable systems to 862 Mhz, converting the tree-and-branch-structure to a HFC-structure and the integration of return channels, they depend on the participation of Deutsche Telekom in the upgrading.

Since the former PTT has always rejected this, the legacy of the past has led to a deadlock: Deutsche Telekom does not want to upgrade cable systems, private cable operators cannot do it on their own. This situation is criticized fiercely not only by private operators and their associations. The fact that cable systems are not used as infrastructure for interactive broadband technology have been put on the political

agenda. In the public debate, there is much pressure for justification on the Deutsche Telekom, resulting in a growing need for action.

In this situation, a ”model” emerged in Berlin in which the different actors that are important for conversion in Germany work together: Deutsche Telekom, the largest private cable operators, housing companies, the ”Landesmedienanstalt” (the body responsible for media regulation on state level) and the City of Berlin. The process of conversion here takes place under special circumstance: There are no binding contracts, the whole process depends on the good will of those involved (and long term trust relations between the persons involved). The project consists of an agreement on network development that is supported by all participants. The Deutsche Telekom upgrades the network level 3 to 862 MHz and feeds additional programs into their headends that were commonly agreed upon. The effect is an enlarged program service for private households, the price for the final customer remains unchanged. The housing companies, however, believe that the value of their apartments rises through the improved TV supply and agreed on contracts for network operators for another ten years. This way the network operators gain a secure basis for funding at least part of the investments necessary for the upgrading.

At the same time time, the upgrading schedule fixes the new clustering of HFC networks. Deutsche Telekom does a two-way upgrading of all elements in their responsibility, thus creating the prerequisite for two-way upgrading of the former network level 4. This is done step by step by the private network operators: 30.000 households will be included in a first upgrading step for broadband internet. The area of the project includes a total of 600.000 households. In order to finance this, private cable operators want to market a combination of several additional services in the cable network such as Pay-TV programs, pay-per-view, telephone services and high speed internet. Cable operators are working on supplying their own contents for broadband internet services.

If the ”Berlin model” is successful, a considerable role model effect can be expected. The opportunities of broadband internet access could be demonstrated in a metropolitan area that currently receives much attention. This way of converting cable systems, however, is probably not appropriate for a broad diffusion regarding the diverging interests of relevant actors. Broad deployment of internet access over cable needs an

integration of the fragmented infrastructure: one single ownership of network levels 3 and 4.

We have already mentioned that Deutsche Telekom is under increasing political pressure to get rid of their cable systems. Especially state governments that carry out industrial and structural politics with the help of state-related regional banks play an important role here. High-profile states in that regard – like Bavaria and Northrhine-Westfalia – have been focussing on the media and telecommunications sector. By a sale of cable systems they expect a strengthening of regional actors in this sector.

The self-interest of Deutsche Telekom is not necessarily opposed to selling the cable systems – we have already mentioned this. On the other hand, the company has a strong bargaining position since it cannot be forced to sell by regulatory measures. The federal government has refrained from separating the cable networks (although this would have been possible) in the course of privatization and Deutsche Telekom going public. Obviously fiscal interests proved to be dominant. Regulatory measures after going public are hard to imagine. The European Commission tries to develop political pressure for a separation - for instance by producing and publishing the 'cable review' that comes to the conclusion that cable systems in the hand of former PTTs cannot develop in the most efficient way. Nevertheless, they cannot force a sale of cable networks with instruments regarding rules of competition. The only way to put pressure on the company would be stipulations for allowing fusions. As long as no takeover is due that would justify such measures, this instrument remains hypothetical.

Deutsche Telekom's Cable Interests for Sale

To prepare selling its cable interests Deutsche Telekom transferred the cable business at the beginning of 1999 to two distinct firms which are still completely in its ownership. One of them is in charge of the technical infrastructure while the other is in charge of marketing and content providing. In spring Deutsche Telekom has announced to sell major parts of its cable systems by the end of 1999. The strategy is not to sell its complete cable operations in one big deal but to split the whole business into 9 regional entities and to sell it region by region to different investors. Deutsche Telekom called investors to bid for these regional parts of the cable business (bids had to be made up to the end of August 1999). This procedure is not really an auction, because the bids are the starting point for negotiations rather than binding offers. By this procedure Deutsche

Telekom tries to identify the most promising investors for sales talks. Beyond the procedure the conditions for investors are remarkable. Deutsche Telekom is claiming a minority stake (25,1%) in each of the 9 regional cable companies, and only that part of the business is for sale which is in charge of the technical infrastructure (which does not include marketing, content providing, or subscriber management). Although, several companies and consortia are bidding. The Deutsche Bank (which recently acquired the largest German private cable operator) is a leading actor in several regional consortia along with regional public banks (Landesbanken). Other companies which participate in biddings for Deutsche Telekom's cable are media enterprises (such as Bertelsmann and Rupert Murdoch), some of the large German cable operators, the largest European cable operator (UPC), US investment firms and – last but not least – Microsoft.

Are the Specifics of the German Case Still Ongoing?

As a result, in late 1999 or early 2000 the preconditions necessary to end the vertical fragmentation of cable systems in Germany (the split responsibility for the different network-levels) might be achieved – at least for some cable plants. However, even if this will happen the specialty of the German case in cables might not yet come to an end as well. This is because the old and the newly emerging private cable operators probably are facing further restrictions which are due to some ongoing legacies.

One the one hand there is still the problem of horizontal fragmentation of the cable systems. Subscribers are scattered even in metropolitan areas with high penetration rates – i.e. even the large cable operators don't have reasonable clusters. Because scale economies are important in upgrading the cable systems, cable operators in the US restructure existing cable plants to increase the cluster size – by consolidation or by exchange of subscribers. For cable operators in Germany it is hard to act in the same way, because – due to their contractual obligations – they have to come to arrangements with the housing agencies in order to exchange subscribers. The housing agencies' strategies to benefit themselves from new options to use the cable infrastructure might cause difficulties to settle these arrangements.

On the other hand cable operators have to face ongoing restrictions for business models which focus on providing multiple services including telephone service, pay-TV/interactive TV, VoD and broadband internet access. As long as Deutsche Telekom has significant stakes in the cable operating companies it remains uncertain to what an

extend telephon service can be a part of the cable operators business models. Sharp decreases of prices for telephon services – as a result of successful deregulation in Germany – increase this uncertainty. With regard to Pay-TV and VoD the cable operators might suffer from the old ”transportation model” which excluded them from packaging and marketing the content. To get access to Pay-TV channels the consumers have to buy or to rent settop boxes from the content provider (Premiere and DF1) which use proprietary standards. Unlike in other countries the settop boxes are not installed by the cable operators. The result is that the revenue flows directly from the subscribers to the content provider. About 1.7 million settop boxes have been installed so far. Under these conditions it might be a tough job to change the rule of the game in pay-TV – i.e. to introduce pay-TV run by cable operators and controlled by their settop boxes.

Again, the effects of this constellation in the medium run are hardly to predict. But because of the mentioned limitations of TV-based business models providing broadband internet access might be far more important for cable operators in Germany than it is for operators in the US (or other European countries). The critical point here could be the share of revenues between the cable operator and the broadband internet service provider.

The question remains how the conversion of the cable system in Germany could be set up, with the legacies of the past still playing a role. To put the question differently: What could be the long term effects for Broadband Internet in Germany with only poorly developed access over cable?

References

ALM (1998): Jahrbuch der Landesmedienanstalten 1997/1998, Muenchen 1998, Verlag Reinhard Fischer.

Anderson, Ken (1999): The Impact of "Always On" High Speed Data Services: An Ethnographic Study; presented at INTERNET TELEPHONY CONSORTIUM, Meeting , January 28-29, 1999.

ARD/ZDF (1999): ARD/ZDF-Online-Studie 1999: Wird Online Alltagmedium? In: Media Perspektiven.

Beck, Martin (1998): Wettbewerb und Deregulierung im europäischen Telekommunikationsmarkt: das Beispiel der Kabelfernsehnetze, Sindelfingen, 1998, Libertas Verlag.

ECCA (1999): The Industry; www.ecca.be.

Fünfgeld, Hermann (1997): Was Sie über Rundfunk wissen sollten, Berlin 1997, Vistas Verlag.

GfK (1999): GfK Online-Monitor, 3. Untersuchungswelle: Präsentation der zentralen Ergebnisse, Febr. 1999.

Kinetic Strategies Inc. (1999): Cable Modem Customer Count Tops 1 Million, Aug. 1999; www.kineticstrategies.com.

Kleinsteuber, H.J; Wilke, P. (1992): Germany; In: The Media in Western Europe, Euromedia Research Group, London, 1992, Sage Publications.

Kubicek, Herbert; Beckert, Bernd; Williams, Robin; Stewart, James; van Bastelaer, Beatrice (1999): The Social Shaping of Multimedia in an International Perspective. A Four Countries Comparison. Forthcoming (August 1999).

Morgan Stanley Dean Witter (1999): The European Internet Report, www.ms.com/main/link21.html.

Schneider, Volker (1999): Staat und technische Kommunikation, Wiesbaden 1999, Westdeutscher Verlag.

Statistisches Bundesamt (1999): Einkommens- und Verbrauchsstichprobe 1998, Pressemappe Nov. 1998, Berlin.

TeleChoice (1999): Analysis of DSL Technologies, Deployment; www.xdsl.com/content/resources/deployment_info.asp.

VPRT (1999): Entwicklung der BK-Netze in Deutschland, Berlin 1999, Vistas Verlag.

Werle, Raymund (1990): Telekommunikation in der Bundesrepublik, Köln, 1990.

Wilke, Jürgen (1999): Mediengeschichte der Bundesrepublik Deutschland, Köln, 1999, Böhlau Verlag.