

## **Deutsche Telekom in Transition**

Liberalisation in the German telecommunications market and  
the development of Deutsche Telekom AG 1999-2001

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<b>1. Introduction .....</b>	<b>4</b>
1.1. Deregulation/re-regulation .....	4
1.2. Industry value chain.....	5
1.3. Technological change .....	5
<b>2. The German telecommunications market in transition .....</b>	<b>6</b>
2.1. A brief history of liberalisation .....	6
2.2. The German regulatory authority.....	7
2.3. Impact of liberalisation on market competitiveness.....	9
2.4. Politics of regulation .....	12
<b>3. Deutsche Telekom company profile .....</b>	<b>14</b>
3.1. Ownership patterns and public offerings .....	14
3.2. Financial data and stock performance .....	15
3.3. Major assets of Deutsche Telekom.....	15
<b>4. Impact of deregulation on Deutsche Telekom.....</b>	<b>16</b>
4.1. Regulatory uncertainty.....	16
4.2. Competitive uncertainty.....	17
4.3. Technological uncertainty.....	17
<b>5. Repositioning of Deutsche Telekom.....</b>	<b>18</b>
5.1. Ownership and control structures in the German corporate sector .....	18
5.2. DT's vision, strategy and organisation .....	19
5.2.1. Old and new internal organisation of Deutsche Telekom .....	20
5.2.2. Pay system at Deutsche Telekom.....	22
5.3. Deutsche Telekom R&D.....	23
<b>6. Developments in Deutsche Telekom's business fields .....</b>	<b>24</b>
6.1. T-Com .....	24
6.1.1. History and structure of the German cable TV network .....	24
6.1.2. Current development in the cable network market .....	25
6.1.3. Outlook.....	26
6.2. T-Mobile.....	27
6.3. T-Online .....	28
6.4. T-Systems .....	30
<b>7. Conclusions .....</b>	<b>31</b>
<b>8. Literature .....</b>	<b>33</b>

## Figures

Figure 1:	Minimum call by call prices for domestic long-distance fixed line calls .....	34
Figure 2:	Prices for international calls to 10 major destinations .....	34
Figure 3:	Growth in the number of providers .....	35
Figure 4:	Call minutes in German telecommunications market 1997-2000 .....	35
Figure 5:	Customers and penetration rates in German mobile market .....	36
Figure 6:	Share price of Deutsche Telekom and DAX (main German stock index) performance at Frankfurt stock exchange .....	36
Figure 7:	Share price of T-Online in 2000 at Frankfurt stock exchange .....	37
Figure 8:	Structure of German cable network .....	37
Figure 9:	ISP subscriber numbers in Germany 1995-2000 .....	38

## Tables

Table 1:	Market volumes of the German telecoms market .....	39
Table 2:	Deutsche Telekom financial data 1996-2000 .....	39
Table 2a:	Key figures Group Deutsche Telekom .....	40
Table 3:	DT EBITDA margins by segment 1998-2000 .....	40
Table 4:	Deutsche Telekom revenues by segment .....	40
Table 5:	Deutsche Telekom strengths and weaknesses .....	41
Table 6:	Deutsche Telekom Board of Management .....	41
Table 7:	Deutsche Telekom Supervisory Board .....	42
Table 8:	Deutsche Telekom new business fields .....	42
Table 8a:	New divisional organisation of Deutsche Telekom .....	43
Table 9:	Recent acquisitions and divestitures of Deutsche Telekom .....	43
Table 10:	Key management in DT's mobile communication business .....	44
Table 11:	Changes in T-Online's Board of Management .....	44
Table 12:	Major subsidiaries and associated companies of Deutsche Telekom in 1999 .....	45
Table 13:	Market competitiveness after one year of liberalisation .....	46
Table 14:	Market competitiveness after five years of liberalisation .....	47
Table 15:	German cable TV market overview .....	47
Table 16:	Deutsche Telekom's financial results (broadband cable TV and broadcasting) .....	48
Table 17:	Deutsche Telekom's industrial property rights .....	48
Table 18:	Deutsche Telekom R&D .....	48
Table 19:	Deutsche Telekom ownership pattern, May 2001 .....	49
Table 20:	Top 10 Western European mobile operators ranked by subscriber base .....	49
Table 21:	Top 10 Eastern European mobile operators ranked by subscriber base .....	50
Table 22:	Top 10 US mobile operators ranked by subscriber base .....	50

## 1. Introduction

This paper describes the development of Deutsche Telekom AG, the former monopolist telecommunications provider in Germany after the liberalisation of the market for telecommunications services. As a consequence of this liberalisation the whole telecommunications industry underwent a fundamental transformation. The dynamic interaction between deregulation, technological innovation and strategic choice on the firm and product level challenges both incumbents like Deutsche Telekom and new players to fundamentally rethink their business and reformulate their strategies.

In an analysis of the “interrelated causes of change“ in the telecommunications industry Fransman (2000) remarks that, although economists like Marshall and Schumpeter have been well aware of the phenomenon of industrial dynamics, we do not yet have a satisfactory theory for understanding and explaining the systematic patterns behind the rich and detailed historical evidence provided by industry and technology studies. Although this paper is not primarily concerned with the transformation of the industry as such but rather with its impact on the former state monopoly in Germany, Deutsche Telekom AG, Fransman’s observation holds true also for the firm level. One might claim that important contributions to the evolutionary theory of the firm – in particular the resource-based perspective on the firm (with the seminal contribution of Penrose (1959), see Foss (2000) for a survey) – might give some guidance. However, a comprehensive theory of firm development and its interconnectedness with change on the industry level is badly missing. Such a theory has to start with empirical observations of how firms are affected by change, how they react and what possible connections to industry-wide phenomena can be established. Thus, this paper provides a description of the change in the German telecommunications market and its impact on Deutsche Telekom AG as the incumbent ‘mothercom’. The theoretical lens is provided by the resource-based perspective on the firm. Additionally, it is conjectured that fast-paced technological change as witnessed in the telecommunications industry can inform alternative views on corporate governance as proposed by O’Sullivan (2000), Grandori (2000) and others.

Three interrelated processes are important to understand the transformation of the telecommunications industry: Deregulation/re-regulation, the deconstruction of the industry value chain and fast-paced technological change. These three developments are seen as key concepts for understanding both industry transformation and change on the firm level. It would be fascinating, though clearly beyond the scope of this paper, to inquire into possible causal relationships between these processes.

### 1.1. Deregulation/re-regulation

Deregulation of the European telecommunications industry has its roots in the mid-1980s. As a brief history of that process in the next section will show, deregulation was above all a political process. As Fransman (2000) argues, deregulation induced a transition in the industry’s technological regime which structures the ‘learning regime’ determining the speed and direction of innovation. Whereas the ‘old’ telecommunications industry was characterised by a ‘closed’ innovation system (the monopoly network operator and service provider chose a circle of specialist suppliers resulting in a well-defined, slow innovation

process), deregulation leads to competition by new entrants and vertical specialisation which in turn leads to multiple suppliers on different levels. Put more generally the industry value chain was deconstructed.

## **1.2. Industry value chain**

The similarity to the evolution of the computer industry is obvious. IBM as the global leader in mainframe computers was a vertically integrated company with a highly integrated in-house production chain; from chip design and manufacturing, assembly, operating systems, application software to sales and distribution marketing computers were designed, produced and sold by one single firm. The mid-1980s saw smaller scale specialists entering the market in each layer, e.g. Intel, Motorola, AMD and Cyrix reshaping the semiconductor industry, Microsoft and WordPerfect creating a market for standardised applications software, Compaq, Dell and others assembling and partly distributing the final product etc. Within a few years the industry, once dominated by one large player, changed completely into a competitive field with multiple players in several newly emerging businesses. A similar development can be seen in the telecoms industry. Each national telecommunications market was once dominated by an incumbent state monopoly that owned and operated the network, created products and services, and sold them to private customers and businesses. As in the computer industry, de-monopolising the industry created entrants on all layers, which dramatically changed the innovation regime and the economics of the industry. One important implication for telecoms companies is the location of value in the value chain; depending on the customer segment the location of high-value generating activities will vary which makes it difficult for a provider to provide all services to all customer segments.

## **1.3. Technological change**

Finally, technological change can be seen as both a cause and a consequence of the other two factors. Deregulation and deconstruction of the industry value chain spurred technological change. Vice versa, technological innovations accelerated vertical disintegration and led to new and fast-growing markets, which in turn requires regulatory activity as the market for Internet access clearly shows.

The deconstruction of the vertically integrated industry and activities of a newly erected regulatory authority changed the industry economics profoundly. As a consequence, new and (even more so) old firms in the telecommunications industry are constantly forced to re-examine the fundamentals of their business and (re)formulate their strategies. How did Deutsche Telekom react to this challenge?

The paper is organised as follows. In the next section, the process of the liberalisation of the German market for telecommunications is described. Special consideration is given to the work and the impact of the German regulatory authority. Then, a company profile of Deutsche Telekom is given (section 3). The impact of deregulation on Deutsche Telekom's business is the subject of section 4. Section 5 describes and analyses DT's efforts in reformulating its corporate strategy and internal organisation (including R&D) as a response to market liberalisation. Section 6 gives an overview of current developments in DT's business fields. Section 7 offers concluding comments.

## 2. The German telecommunications market in transition

### 2.1. A brief history of liberalisation

Because of huge network externalities, the market for telephony was traditionally seen as a natural case for a regulated monopoly in most countries. Although this holds true for the telecommunications market as such different structures emerged in different countries; in Europe, Australia and New Zealand there was one state-owned provider whereas in Japan the service for national and international connections was split between two providers. In contrast, the US and Canadian market witnessed several regional carriers. Thus, the starting point for liberalisation was quite different in different countries. In the early 1980s telecommunications policies witnessed a fundamental change. First, there was growing dissatisfaction with the services provided by the state-owned companies. It was increasingly believed that competition between suppliers would technically and economically improve the products and services. Second, technological innovation in several related fields increasingly undermined the idea of a telephone network still being a natural monopoly. Besides providing completely new services technological innovation led to increasing modularization (Langlois 1999) which lowers entrance barriers and investment specificity.

In the European Union discussions began in 1987 with the publication of the Green Paper declaring the intention of establishing a common market for telecommunications services and equipment. The subsequent information and telecommunications policy was then significantly influenced by the White Paper on growth, competitiveness and employment (1994). Besides the diminishing technological need for regulation, the IT-driven information and communication industries were believed to pave the way towards an information society and thereby stimulating growth and employment in the member countries. This development should be driven mainly by the private sector, supported by an appropriate regulatory framework.

Parallel to the discussion on the European level the debate on liberalisation of the markets for posts and telecommunications services in Germany dates back to the early 1980s. The newly elected German government under Chancellor Kohl (1983) established a committee, later known as the 'Witte-Kommittee'.<sup>1</sup> As a consequence, the liberalisation of the German telecommunications market proceeded through three stages.

#### *Stage 1*

In the first stage the established institutions in the posts and telecommunications market were restructured by the then Minister of Posts and Telecommunications. The state monopolies for terminal equipment, data transmission and value-added services as well as mobile and satellite communications were abandoned. At the same time the operational activities of the old monopoly Deutsche Bundespost were separated from the regulatory tasks (type approval, assignments of frequencies, authorisation issues, etc.) by establishing three companies Deutsche Bundespost Postdienst, Deutsche Bundespost Postbank and Deutsche Bundespost Telekom. All three companies remained fully in public ownership.

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<sup>1</sup> Cp. the section on 'telecommunications liberalisation' at <http://www.regtp.de>

For the first time in history, Deutsche Bundespost Telekom faced a certain degree of competition. Although the separation between regulatory and operational activities was a first step in the direction of liberalisation, the regulatory authorities continued to act strongly in favour of Deutsche Bundespost Telekom. As one consequence the Federal Office for Posts and Telecommunications ('BAPT') was established in 1990 stressing the separation between regulation and market activities.

### *Stage 2*

Parallel to the restructuring taking place in Germany the discussion on liberalisation of the telecommunications market in the EU continued. A Council resolution from July 1993 decided to abandon the state monopolies in voice telephony. Furthermore, national governments agreed upon the opening of national infrastructures to EU-wide competition until 1998. In Germany respective measures were taken by transforming the three Bundespost companies into stock companies.

### *Stage 3*

The final stage was introduced by the Telecommunications Act ('TKG') coming into effect on July 25, 1996. Among other issues the TKG led to the installation of a formally independent regulatory authority for posts and telecommunications on August 1, 1996 and the closing down of the Federal Ministry of Posts and Telecommunications on December 31, 1997. With these measures political conditions and legal conditions for free competition in the German market for telecommunications were established.

Although other influences, as for example rapid technological change, have certainly played an important role it has to be stressed that the liberalisation of the telecommunications market in the EU and in Germany was primarily a political process. It was the consensus of the political actors that liberalisation would foster employment, innovation and growth of the national economies. It is interesting to note that since 1998 the German market for telecommunications belongs to the most liberal markets in the world (see also below). In comparison with other markets only one country went further in liberalising the market; in Chile for *every* provider, including the former state monopoly, Entel, specific prefixes were introduced. As a consequence, Entel lost more than 60% market share within three months.

Deutsche Telekom was not hit that hard by competition in the German market. However, liberalisation had a profound impact on both the market in general and Deutsche Telekom as the incumbent in particular.

## **2.2. The German regulatory authority**

As already mentioned the telecommunications market has certain properties to be taken into account during liberalisation. First of all, the network infrastructure is owned by the former incumbent. In turn, if competitors have to build up their own network infrastructure they have to make huge specific investments which establishes high entrance barriers. Furthermore, although network externalities have been reduced in size because of technological innovation these externalities still exist in both markets for voice and data transmission. Besides that there are significant information asymmetries between the former incumbent, new competitors, the regulatory authority and the politicians providing

the regulatory framework. Universal service obligation and similar policies derived from general social goals further complicate the regulatory task.

Because of these difficulties all countries liberalising the telecommunications sector have set up a regulatory authority which is intended to foster competition and smooth the transition from a state-owned telecommunications monopoly to a private sector providing these products and services. As can be expected from the divergent histories/situations before liberalisation in different countries, the organisation, content and impact of regulation also differs significantly between different countries. Regulation is provided by a government department/ministry (e.g. Japan) or by more or less autonomous national authorities (USA, Europe), the scope and organisation of which differ in important respects from country to country.

In Germany, the Regulatory Authority for Telecommunications and Posts ('Regulierungsbehörde für Telekommunikation und Post', henceforth RegTP) was founded on the basis of the Telecommunications Act on August 1, 1996 in Bonn. RegTP played a decisive role in the deregulation of the telecommunications market. The scope of its activity is described as follows:<sup>2</sup> "The former monopoly operators in the postal and telecommunications markets, Deutsche Post AG and Deutsche Telekom AG, will be able to maintain their dominant position long after market liberalisation. The core task of state regulation must therefore be to keep a check on each dominant provider's position in the market and to create a level playing field to protect the new entrants. The federal government's regulatory approach hence goes beyond merely policing anti-competitive behaviour *ex post*. The tasks associated with such regulation are too specialised to be fulfilled under general competition law. Hence the need for sector-specific regulation, at least until effective competition is established in the postal and telecommunications markets ... A structurally separate authority with the maximum possible independence is needed to perform these tasks ... [The authority] is a higher federal authority within the scope of business of the Federal Ministry of Economics and Technology".

As most competition laws or statutes and articles of regulatory authorities RegTP is aiming at a rather generally formulated goal; foster competition in a liberalised market with a former monopoly incumbent. In telecommunications the transition from a regulated monopoly to a competitive market usually proceeds through three stages.<sup>3</sup> In stage one the incumbent holds a (*quasi-*)*monopoly* with a market share of more than 90%. Competitors have no alternative network infrastructure available. Competition will grow out of this stage only if such an alternative becomes available, either by new investment and building up a new network or by access to the incumbent's networks. The second stage is characterised by a *dominated market* with the incumbent's market share of 40-50%; no competitor of similar size exists. Competition has brought down prices already and entry barriers are still prevalent. In the final stage the market benefits from *workable (oligopolistic) competition* in which prices drop further giving incentives to product and process innovations.

The establishment and decisions of the RegTP are widely believed to be a success story. The authority became known to the general public with the spectacular auction of the UMTS licences in 2000 at the htest. The auction generated revenue of almost EUR 50

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<sup>2</sup> See <http://www.regtp.de>

<sup>3</sup> See Schedl (2000).

billion. However, the more important part of RegTP's activities consists of decisions fostering competition in the newly liberalised market. Among those decisions were:

- low formal barriers for new entrants
- unlimited number of licences for new entrants in any business field
- low licensing fees/no licence auctions (with the exception of GSM 1800 and UMTS frequencies)
- unbundling of the local loop and wireless local loop
- mandatory approval procedure for DT's major tariff decisions
- mandatory billing of DT for competitors
- free number portability
- low interconnection rates
- universal service obligation for important services
- fixed rate for subscription to DT's local loop for competitors
- call by call for long distance and international voice telephony
- obligation for DT to offer competitors a non-discriminatory wholesale flat rate for Internet access

How can the impact of these decisions be evaluated? In telecommunications, the competitiveness of a market can be roughly characterised by (i) intensity of competition, (ii) position of the former incumbent and (iii) the effects of competition. The corresponding measures are (i) market entries/number of competitors, (ii) market share of incumbent and (iii) price movements for services. Of crucial importance is the demarcation of the market; the development of the markets for the local loop, national and international long distance calls, mobile communication, and data services and internet services was quite different. In addition, a spatial dimension is required for some markets, e.g. the local loop, since the technical and economic conditions in agglomerations differ from those in rural regions.

### 2.3. Impact of liberalisation on market competitiveness

As can be imagined from the list of decisions and regulations in the last section, deregulation had a dramatic impact on Deutsche Telekom's business. Moreover, many of RegTP's decisions meant in fact *re*-regulation for DT. Besides that, since liberalisation Deutsche Telekom faces aggressive competition in all layers (equipment, network, services).<sup>4</sup> As described above, the development of the market can be characterised as follows:<sup>5</sup>

#### (i) Market entries & growth

- a) *new network operators*: Two types of new network operators entered the German market:<sup>6</sup> Large network operators/phone carriers, e.g. Mannesmann, Viag Interkom, and o.tel.o (which was acquired in April 1999 by Mannesmann), which build country-wide new network infrastructure. The necessary large capital expenditures are partly raised from utility companies that are themselves subject to deregulation and strive for

<sup>4</sup> For the layer structure of the telecommunications industry see Fransman (2000).

<sup>5</sup> See tables 13 & 14.

<sup>6</sup> Cp. Telecommunications online, 10/1999.

new business opportunities by diversification. By acquisitions and huge investments Mannesmann (now Vodafone) has become the largest alternative phone carrier in Europe (and is currently number two in Germany, Austria, France and Italy). Besides that small city carriers and local utility companies build focused networks in metropolitan areas and business centres, therefore generating a (limited) alternative to DT's local loop.

- b) *Service provider (resellers)*: Call by call generated a profitable business model viable at least in the short run; instead of investing in network capacity new entrants simply resell capacity from Deutsche Telekom. This is a compelling model because resellers are typically small entrants with lower costs per minute than DT was allowed to charge for the use of its network and have a significantly higher return on assets. However, as standard economic theory would predict, an aggressive price war brought profits down which has already led to a first wave of exits and mergers.

This shakeout notwithstanding, the number of providers and licence holders is growing. By mid-2000 more than 1800 service providers were registered with RegTP, the majority being Internet service providers offering Internet access services (figure 3).

### *Market growth*

Besides an increasing number of competitors the German market for telecommunications also grows in terms of volume, traffic and subscribers:

- *market volume*: Revenues in the market for telecoms services rose by 10% in 1999 (table 1) to a total of DM 95.5 billion. The key driver is the growth of mobile communications where revenues grew by 38% to DM 30 billion in 1999.
- *increasing traffic*: In spite of sharp price decreases telecommunications revenues are rising because of increasing traffic. The total number of call minutes (fixed and mobile voice, data) is estimated to grow by 50% from 1997 to 2000.
- *subscribers*: Growth in mobile communications is one of the key drivers of market growth. In Germany there are four mobile networks: D2, operated by Mannesmann (now Vodafone, with a market share of 40.6% by mid-2000); D1, operated by Deutsche Telekom (39.4%); E1 (E-Plus Mobilfunk, 14.7%); and Viag Interkom (E2) with 5.3% market share. In 1999 subscriber numbers grew by 9.7 million to 23.2 million boosting the penetration rate to 28.3%. In 2000, growth accelerated. By the end of 2000 RegTP forecasted some 48 million subscribers which would push the penetration rate up to 60% (figure 5).

The growth in online user numbers in Germany shows a similar picture. Subscribers to online services are expected to have grown to more than 9 million by the end of 2000. The total number of Internet users in Germany is estimated to reach over 25 million by the end of 2000 which represents a 70% increase within one year.

Market growth is reflected in job growth. The downsizing underway at Deutsche Telekom (6.2% and 4% less employees in 1998 and 1999) is more than outweighed by new jobs created by competitors. By the end of 2000, 239,000 people worked in the German telecommunications market which means an increase of 3.5%, after a 2.7% rise in 1999.

### (ii) Market share of incumbent

One year after liberalisation, DT's market share in total call minutes was still above 90% (figure 4). However without local calls (domestic long-distance, international and fixed to mobile calls) competitors had already reached a market share of up to one-third. In 2000 DT's rivals managed to cut 22% out of total call minutes. Subtracting local calls, DT's competitors reached a whole 40% market share in domestic long-distance, international and fixed to mobile calls combined. In mobile communication, both DT and its largest competitor (Mannesmann, now Vodafone) held an approximate 40% market share from 1998 to 2000. As in many other countries, in Germany the market for mobile communication is one of oligopolistic competition with two large firms. Competition in the local loop remains a problem. In 2000 DT still holds a quasi-monopoly in the market for local calls, dominating the local loop with a market share of 98.5%.

### (iii) Prices

As was to be expected, sharp price competition drove prices significantly below monopoly level (see figure 1). Domestic long-distance rates dropped up to 85%. Furthermore, rates for the ten most important foreign connections decreased by an average of 74% from 1997 to 2000 (figure 2). Not surprisingly, the consumer price index for voice telephony reflects these price decreases and an 8% increase in the (not deregulated) rates for local calls. Minimum prices for call-by-call daytime Internet access declined from 9 Pfennig (end-1998) to 3.2 Pfennig (mid-2000). In mobile communications prices dropped by 13.1% from mid-1999 to mid-2000 and a total of 60% from 1995 to 2000.

Another important aspect of market dynamics is technological innovation. Rapid market growth induced by deregulation has fostered R&D expenditures and led to accelerating technological change. Some of 1999's "ten hottest technologies" spotted by *Telecommunications Online* in its May 1999 issue are already outdated by next-generation technologies. Another example refers to the utilisation of the local loop consisting mainly of copper lines. Until recently, ISDN was seen as the most efficient use of these copper lines, allowing for two 64 kbit/sec connections per copper pair at the same time which allowed customers to have Internet access and a voice connection simultaneously. After DT introduced a 'primary' ISDN service allowing for 15 64 kbit/sec channels, xDSL ('Digital Subscriber Line') is state-of-the-art allowing broadband local access using old wires which was not thought to be feasible just a few years ago. ADSL as offered by DT (under the brand name 'T-DSL') provides 768 kbits/sec downstream and 128 kbits/sec upstream. SDSL offered by some competitors reaches up to 2.3 MBit both downstream and upstream. Deutsche Bank Research forecasts that the number of DSL lines in Germany will exceed 10 million by 2008, creating a whole new market for broadband local access and services.

How is the overall effect of regulation to be evaluated? In the market of *non-local (national & international) calls* the stage of working competition has been reached. With respect to *mobile communications*, in Germany (as in many other countries) the market for mobile communication is one of oligopolistic competition with two large firms (DT & Mannesmann/Vodafone). *Internet access* has more or less become a commodity business. Current discussions and regulatory measures in this market revolve around wholesale flat rates to be offered by DT. However, this problem has its roots in the still existing monopoly of DT in the *local loop*, use of which is required for internet access. Although in

metropolitan areas certain alternatives to DT are available the local loop is still not subject to competition in Germany because of high entry barriers.

According to measures (i)-(iii) liberalisation in Germany was quite successful even by international comparison (see tables 13 and 14). More independent network operators than in other countries entered the market. Besides that, prices dropped faster and more significantly than in other countries. The main reason seems to be that there are only low formal barriers for new entrants in the voice telephony market. Furthermore, as long as no monopoly barriers are touched (e.g. local loop) mobile communications (except licensing) and Internet related services are not subject to regulation at all. In addition, RegTP placed an obligation on DT to open its fixed voice telephony network infrastructure to competitors at low interconnection rates.

This development is remarkable because the government holds ownership of DT and is at the same time the final authority of the regulatory process. Therefore, there are conflicting interests at government level. In addition, regulation is quite naturally a battleground for DT and its competitors because every decision of the regulatory authority shapes the rules of competition significantly. In Germany the public at large also has a great interest in regulatory measures, for example with respect to Internet access. Telecommunications infrastructure and its evolution are widely believed to shape future economic and societal development in important ways. Therefore, the politics of regulation will be analysed in more detail in the next subsection.

## 2.4. Politics of regulation

As was already mentioned, the government as both owner of DT and the regulatory power is arguably the most important player in regulation. Further players are DT itself, its competitors and the general public representing individuals and businesses increasingly dependent on IT and telecommunications products and services. The interests of DT, its competitors and the general public can be illustrated in a rather straightforward manner: deregulation of market (DT); deregulation of market, far-reaching regulation of DT (competitors); cheap, fast, reliable and innovative telecommunications services (buyers/general public). Since the work of the regulatory authority influences the core business of DT and its competitors in important ways, a closer look at the content and politics of regulation is warranted. DT's major tariff decisions, and certain services which DT offers to competitors, are subject to approval by RegTP.

It is not surprising that DT's relationship with the regulatory authority has never been very harmonious. DT has strong interests in RegTP easing down on liberalisation. On the other hand, DT's competitors have interests in breaking up DT's former monopoly position as fast as possible in all markets. The regulatory framework in turn depends crucially on the rules of the game, i.e. the delegation of authority and decision processes within RegTP and the government. Formally the Regulatory Authority is a "higher federal authority within the scope of business of the Federal Ministry of Economics and Technology"<sup>7</sup>. In certain respects RegTP superseded the former Federal Ministry of Posts and Telecommunications. RegTP's decisions are made by its five ruling Chambers. The interested parties are involved in the process, mainly by hearings. RegTP's ruling cannot be reversed by the

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<sup>7</sup> See <http://www.regtp.de>

Ministry; there is no scope for governmental discretion in the determination process *per se*. However, the Ministry exerts significant influence by appointing RegTP's president and vice-president. Therefore, despite RegTP's formal independence from the government the latter is seen to remain an important determinant of regulatory politics. Being a major shareholder of DT the government clearly has conflicting incentives. On the one hand, competition seems to foster innovation and growth in the telecommunications industry and to benefit the general public. On the other hand, far-reaching deregulation/intense competition means lower company value of DT and fewer possibilities for industrial policy.

The first president of RegTP was Klaus-Dieter Scheurle, member of the CSU (sister party of the CDU, the German Christian Democrat Party). In September 1998 the Social Democrat Party (SPD) won the federal election and Gerhard Schröder was elected as the new Chancellor. Since the most straightforward way of influencing RegTP's decision is by appointing favourable presidents and vice-presidents rumours were soon heard that Scheurle would not remain president of RegTP for long after the federal election. In any case, after the election of the new left-wing government the regulatory authority was said to increasingly come under pressure to take regulatory decisions in favour of DT because it seemed that the government was not only interested in generating a high revenue from further sales of DT shares but also had some (old Social Democrat) ideas about industrial policy by supporting DT in its struggle to become a global player.

At first sight, this impression was strengthened by RegTP's president Scheurle sending in his resignation effective from December 31, 2000. Furthermore, Matthias Kurth, at that time vice-president of RegTP, 'succeeded to the throne' on January 15, 2001.<sup>8</sup> Kurth is said to have a close relationship to the federal Minister of Finance, Hans Eichel. Furthermore, although the regulatory authority itself and the German monopoly commission agreed that regulation remains necessary to ensure working competition in the telecommunications market, speculation even went so far that the new DT-friendly government would consider closing down the regulatory authority which would be fully in line with DT's interests. The resignation of Scheurle was said to be a result of strong political pressure.

This interpretation seems plausible because the presidency of RegTP is a hot seat. Players with big money being in tough competition are constantly trying to influence regulatory measures. However, there is another explanation that was informally confirmed by RegTP; in August 2000, the auction for next generation (UMTS) licences was closed, generating revenue of more than EUR 50 billion. Doing so RegTP, represented by its president, gained high popularity (although there was later criticism that the German mobile communications industry will suffer from this cost for a long time) and a good reputation among professional observers of the telecommunications market. Scheurle was hired by a Swiss investment bank that made him "an offer which he could not refuse" (a reported 7-figure income in DM) that allowed him to get rid of the political conflicts he was involved in as RegTP's president.

There is a consensus that the decisions of RegTP have not become more lenient with Kurth as new president. Instead, it has been Kurth's explicit goal to foster competition in the local loop as a detailed report on the current situation in the local loop market indicates. He

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<sup>8</sup> See Der Tagesspiegel, 26. November 2000, „Chef-Regulierer muss Ex-Monopolisten schonen“, p. 23; and c't (Magazin für Computertechnik) 26/2000, „Genug reguliert?“ p. 26.

initiated this report when he was vice-president of RegTP. The local loop is one of the few remaining markets in which DT still holds a de facto monopoly. Some industry observers believe that the goal of establishing competition in the German telecommunications market will be reached with competition in the local loop. In fact, the local loop as part of fixed-line voice services is the only one of four current core businesses of DT (see below) which is subject to strong regulation. The two strong growth drivers, mobile communications and data services, are not part of RegTP's realm, but only fall within the authority of general competition law. T-Online as the fourth core business of DT is only subject to regulation because it requires fixed network infrastructure (which it is believed will become less important for revenue generation in the near future, in contrast to content services). Contrary to first beliefs it seems that the Schröder government rather postpones further privatisation (not the least because of DT's current low share price) and abstains from anti-competitive industrial policy in the German telecommunications market instead of exerting pressure on RegTP to more DT-friendly behaviour.

### **3. Deutsche Telekom company profile**

#### **3.1. Ownership patterns and public offerings**

The Bonn-based Deutsche Telekom AG is the largest telecommunications company in Europe and is among the world's largest telecommunications companies. As was described previously, DT emerged as a listed stock company from the old Deutsche Bundespost Telekom. One part of the liberalisation of the telecommunications market was the partial privatisation of DT. In order to ensure working competition between the incumbent and newly emerging competitors, the German government created the regulatory authority RegTP. At the same time privatisation of DT was under way. The IPO of DT shares was in November 1996. A total of 713.7 million shares (26%) was sold at DM 28.50 generating a revenue of approximately DM 20 billion. Two further public offers followed. On June 27, 1999, 250 million DT shares (plus an additional green shoe of 25 million shares) were sold at 39.50 EUR resulting in approximately EUR 11 billion revenue. In December 1999 the resulting shareholder structure was 43% government, 22% Kreditanstalt für Wiederaufbau (KfW, a state-owned bank dedicated to the promotion of the German economy by mainly financing German SME's), 2% France Telecom, 18% institutional investors and 15% private shareholders. The third public offer was on June 19, 2000 with a world-wide offer of DT shares. As a result, the German government held 43% of all shares, KfW 17% and private and institutional investors 40%. With the completion of the acquisition of VoiceStream in 2001 the government's overall share will decrease to 43%.

By May 2001, approximately 57% of DT's shares were privately owned. Of these 57%, 38.3% were owned by households/individual investors and 61.7% by institutional investors (see table 19). Approximately one-third of private investors come from Germany and the US, the remainder from the rest of Europe (23.8%) and Asia (9.9%).

### 3.2. Financial data and stock performance

Stock market performance (DT and T-Online) and financial data of DT can be derived from figures 6-7 and tables 2-4. DT's financial numbers show the company's struggle in the midst of a repositioning process. The decrease of both revenues and margins from network communications reflects fierce competition on the market for domestic long-distance and international calls. In 1999 network communications still accounted for approximately 50% of DT's total revenues and approximately 25% of EBITDA margin. An enterprise value breakdown conducted by UBS Warburg estimates that at the beginning of 1999 a typical mothercom derived approximately 60% of total profits from its core fixed-voice/wired line business (DT was estimated to derive 70%). In 1999 this number dropped to 43% for DT reflecting the fast crowding out of the core business. Correspondingly, the growth drivers mobile communication and T-Online accounted for 20% and 10% of DT's value at the end of 1999 and contributed most to the revenue increase.

After reaching an all-time high of more than EUR 100 in March 2000 DT's share price dropped to below 40 EUR. Over a five-year period DT's stock market value roughly doubled as compared with a DAX (main German stock market index) performance of 300%. T-Online was hit harder; from IPO in April 2000 to the end of 2000 the share price dropped by more than 60%. Low share prices pose severe problems for a telecoms company: First, a financing problem arises for DT in its growth aspirations because the motive for floating of T-Online and T-Mobil (which was scheduled for autumn 2000 but postponed because of the acquisition of VoiceStream and the plummeting stock market) was to provide DT with "the financial leverage to fund future acquisitions", as DT's CEO Ron Sommer wrote in DT's Annual Report 1999. Furthermore, next-generation technologies such as UMTS demand huge investments in network infrastructure, part of which are to be financed by capital increases. Finally, with a low market capitalisation DT might become a target for a take-over.

### 3.3. Major assets of Deutsche Telekom

Being the former state monopoly and now incumbent, Deutsche Telekom has a number of valuable assets as compared to potential competitors. Table 12 shows DT's major subsidiaries and associated companies. Above all DT has a state-of-the-art network as a foundation for its business. Its national network is one of the most modern in the world. In particular in former East Germany the whole telecommunications network was rebuilt by DT in the years after reunification. Major investments to upgrade the network capacity were completed in 1999. The network infrastructure includes:

- a fully digital, 'data-ready' PSTN/ISDN network with three switching layers
- 163,000 km of a scaleable fibre network between large metropolitan areas with a total capacity up to 1000Gbit/s ('Metropolitan Area Networks'/MAN)
- major ATM transmission capacity throughout Germany with 65 nodes at 25 locations allowing high speed access up to 622Mbit/s
- a national IP Network with 80Gbit/s core network transmission capacity, 10 core backbones, and 220 access PoPs. IP network traffic was expected to have risen to 20,000 Terabytes/year in 2000.

- ownership interests and participation in European and global networks

Since owning the local loop means customer ownership, one of the most important features of DT's network is its ownership of the *local loop*. Owning the end-user is critical not only for local services and data-mining but can serve as a basis for future revenues generated by Internet services (both access and content) as well as broadband services delivered to home users. Consequently, the regulatory authority unbundled the local loop allowing new entrants access to end users without capital-intensive investments in a separate network infrastructure. However, RegTP set the wholesale local loop rate at DM 25.40 which is higher than DT's current retail rate of DM 21.39 but still 30% lower than DT's proposal. An implication of this is that competition in local services is low and prices for local calls increased.

Another major asset is DT's ownership of Germany's broadband cable network. In 1982, the newly elected government of Chancellor Kohl liberalised the market for TV and radio broadcasting. It was decided to build an additional, separate broadband cable network exclusively for TV and radio transmission to households leading to an investment of approximately DM 30 billion. As a result, cable TV is now widespread in Germany with 17.8 million subscribers by the end of 1999. DT operates the layer of national transmission and therefore dominates the whole network although the company only serves one-third of the households directly.

The positioning of DT in *mobile communications* has been excellent from the very beginning. DT introduced the 'D-Net' for digital mobile communications ('D1') in 1992. After the liberalisation of the market one further licence was granted to Mannesmann (now Vodafone; 'D2') so that DT had only one competitor for a long time. Furthermore, from monopoly times DT still has a large real estate portfolio significantly facilitating the installation of network infrastructure needed for mobile communications. In the fast growing overall market DT's market share remains stable at roughly 40% since 1998.

## 4. Impact of deregulation on Deutsche Telekom

The substantial impact of liberalisation on the development of the market in general has already been described. Three interrelated processes governing the development are *deregulation*, *deconstruction of the industry value chain* and *fast technological change*. Individual firms and Deutsche Telekom in particular are therefore confronted with uncertainty from three sources: *regulatory activities*; *competitors' activities*; and *technological development*. In this section, these three sources are elaborated upon in more detail with respect to Deutsche Telekom.

### 4.1. Regulatory uncertainty

As was mentioned in section 2, the regulatory authority made a number of decisions that influenced DT's core business in important ways. DT's major tariff decisions, and certain services which DT offers to competitors, are subject to approval by RegTP. Important regulatory decisions which particularly affected DT's business have been:

- Unbundling of the local loop and fixing of the subscription rate for DT's competitors at DM 25.40.
- Rejection of DT's request for higher interconnection rates (network operators and telecommunication providers can be subject to different interconnection rates in cases of provided evidence of higher costs).
- Statement that the German market for mobile communications is not dominated by a single operator, therefore no regulation of T-Mobil
- Partial rejection of DT's request for new interconnection rates. Instead, new rates were reduced by 24% on average.
- DT has to offer competitors a wholesale flat rate for Internet access. DT's broadband Internet access service 'T-DSL' is subject of an inquiry by RegTP.

As was noted above, the most important impact of regulatory measures on DT is visible in its current core business, i.e. fixed-line voice services. Profits from fixed-line voice services are increasingly crowded out by intense competition. In contrast, the two strong growth drivers, mobile communications and data services, are not (yet) subject to regulation. However, ongoing struggles between DT, its competitors and the regulatory authority (e.g. for the local loop and internet wholesale flat rate) indicate that RegTP's decisions will continue to affect DT's businesses in important ways until workable competition is reached in all relevant markets.

## 4.2. Competitive uncertainty

As already mentioned, deregulation led to new entries and sharp price competition. As a consequence DT's long-distance business quickly eroded. DT faces two types of competitors; one type of company (Mannesmann/Vodafone, Viag Interkom) creates new country-wide networks with a large capital expenditure, the other type concentrating on niche markets in large business centres, partly investing in network infrastructure, partly simply reselling DT's capacity, utilising lower cost structures. Competition has led to domestic long-distance rates that are up to 85% cheaper than at the beginning of 1998. Rates for important international routes have dropped accordingly. As a result, DT quickly lost market shares and revenues. Transport prices in the Public Switched Telephone Network (PSTN) decreased by 27% on average in 1999. PSTN revenues decreased by 25% in 1999. Because of the overall growing market, decrease in market share did not result in decrease in *volume* processed by DT. Strong growth of fixed-to-mobile call minutes and other services offset the decrease in long-distance and international call minutes.

## 4.3. Technological uncertainty

As mentioned previously, technological developments are not the primary focus of this paper. As Fransman (2000) argues, the technological regimes differ remarkably between the old and the new telecommunications industry. In the old industry, the monopoly network operator was the prime innovator. In the new regime specialist technology suppliers become increasingly important as drivers of technological change. To analyse the changing patterns of interaction between DT and its (former) suppliers in the transition

from the old to the new industry would require an in-depth analysis. A visible organisational change is DT's bundling of R&D activities within one company. As of July 1, 1999, Deutsche Telekom concentrated its R&D activities in a newly established subsidiary 'T-Nova, Deutsche Telekom Innovationsgesellschaft'. T-Nova took the place of the former 'development centres' of DT and is expected to generate "innovative solutions" in the 'TIMES' markets (Telecommunication, Information Technology, Multimedia, Entertainment and Security).

The overall impact of liberalisation on DT can be briefly summarised as follows:

- Regulatory uncertainty: DT's core business (fixed wires) is subject to regulatory decisions and has eroded quickly since market deregulation.
- Technological uncertainty: Fast technological change generates new markets with high uncertainty about future demand and calls for large expenditures in licences and network infrastructure.
- Competitive uncertainty: The deconstruction of the industry value chain creates business opportunities for focused competitors with superior cost structures forcing DT to rethink the fundamentals of its business and the corresponding strategy.

Table 5 provides a more detailed overview of DT's major strengths and weaknesses according to DT's attempts at repositioning itself in new business fields to be described in the next sections.

## 5. Repositioning of Deutsche Telekom

How did DT respond to the challenges generated by the transformation of the liberalised market in terms of organisational and strategic change? In this section DT's recent major strategic repositioning and the accompanying organisational reshuffles are described as well as changes in DT's R&D.

### 5.1. Ownership and control structures in the German corporate sector

In order to come to grips with the control structure of Deutsche Telekom in particular, one has to understand the institutional framework of corporate governance in which German stock companies operate.<sup>9</sup> As required by the German Stock Corporation Act all German stock companies have a two-tier board system consisting of a board of management ('Vorstand', see table 6 for DT's current and former board members) and a supervisory board ('Aufsichtsrat', table 7). The management board is responsible for managing the company and representing it in dealings with third parties whereas the supervisory board appoints and removes the members of the management board and oversees the management of the company. Of particular interest is the German pattern of company ownership. Joint stock companies are to a significant extent owned and controlled by banks and other companies. Since the tax burden for divestment of corporate ownership is high (though this is subject to change in the near future) this ownership pattern was stable until recently. Listed joint stock companies usually have one or just a few large

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<sup>9</sup> See e.g. O'Sullivan (2000), chapter 7.

stockholders. The share of households in stock ownership in Germany has traditionally been rather low. [Interestingly, the IPOs of Deutsche Telekom, Deutsche Post and T-Online have significantly attracted attention of the general public to issues related to share ownership.]

As a result, managers of large German stock companies are controlled mainly by banks. In addition to rights derived from their own shares, banks by default exert proxy voting rights and therefore represent virtually the whole share of dispersed (private households') ownership. In the case of DT the situation is slightly different because DT emerged from a state-owned monopoly with the government still being the largest single shareholder. However, another peculiarity of the German system of corporate control is more significant for DT; co-determination by the company's employees ('betriebliche Mitbestimmung'). A significant part of the supervisory board is reserved for employees' representatives (typically union representatives). Furthermore, virtually all important decisions (with the exception of financing and strategy issues) are subject to participation of a 'Betriebsrat' (works council). However, in telecommunications, the unionisation and therefore the position of the works council as well as the employees' representatives on the supervisory board are not very strong. In addition, the non-employee supervisory board members are not necessarily appointed because of their expertise in the telecommunications market but rather for political and strategic reasons. This casts some doubts on the supervisory board's ability to effectively oversee the activities of the board of management.

As a result, the most (and arguably only) important control authority for DT's management is its largest shareholder, the German government. As already addressed in the context of regulatory issues above, the new German government has both a strong incentive and preference for a DT-friendly position. However, with DT's going public, its inclusion in the main German stock index, and the corresponding high internationalisation of the shareholder structure (as compared to other German companies), stock markets' participants increasingly have a keen eye on DT's activities.

## **5.2. DT's vision, strategy, and organisation**

DT's current vision and overall strategy was spelled out by CEO Ron Sommer.<sup>10</sup>

The vision is to transform DT into a global player in the new telecommunications industry. The overall strategy to achieve this objective is to position DT as an "integrated, global telematics provider" while at the same time consolidating market leadership in Europe. Important measures to be pursued are:

1. re-organisation of business fields according to four pillars targeted for investment and growth;
2. high attention to strong operational performance in growth areas;
3. entry into key economies to expand the global reach;
4. majority control of mobile assets.

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<sup>10</sup> DT Annual Report 1999, p. 4; presentation to analysts in April 2000 and January 2001.

The far-ranging and fast changes in telecommunications are envisaged by DT as transforming the former market for fixed voice telephony into a 'TIMES' market (Telecommunications, Information/Internet technology, Multimedia and mobile commerce, Entertainment and e-commerce, Systems solutions and security service) in which DT wants to be a central player. As Sommer writes in DT's Annual Report 2000: "Our goal is to turn your company into a T.I.M.E.S provider with global focus ... Our work is resulting in the creation of the four autonomous operative pillars T-Mobile, TOnline, T Systems and T-Com, which enable us to focus on the T.I.M.E.S market's key segments, i.e. mobile communications, online communications, e-business/systems solutions and broadband network access. Despite the high level of independence they are afforded, the four pillars will cooperate closely with one another in light of the increasing convergence of their operative business" (p. 4). In contrast to, for example, AT&T, the break-up of DT was never considered, given the institutional environment of German stock companies and the political process of deregulation. Quite the contrary, DT's management decided to seize the opportunities arising from the deconstruction of the value chain as an *integrated company* (although DT's management is perfectly aware of the fact that to remain competitive as an integrated telecommunications company huge investments are required which will make spin-offs and divestitures necessary sooner or later).

#### 5.2.1. *Old and new internal organisation of Deutsche Telekom*

How is DT organised in order to implement the overall strategy? Since the former incumbent Deutsche Bundespost Telekom was restructured into Deutsche Telekom AG in 1989 several organisational reshuffles have taken place. When DT was still part of the Deutsche Bundespost its organisation was typical of a public authority with country-wide offices. The crucial feature of this organisational type was an elaborate hierarchy with regional components; a central office in Bonn ('Generaldirektion') was supplemented by 23 regional headquarters ('Dirktionen') which supervised 123 local telephone exchanges ('Fernmeldeämter') and 17 technical authorities ('Fernmeldezeugämter'). On all three hierarchical levels functional and divisional duties were mixed. The self-image of this authority was to provide telecommunications infrastructure and services to all German citizens in a rather hierarchical and authoritarian manner (e.g. a telephone line was not subscribed to or rented but had to be 'applied for').

These attitudes have changed fundamentally. Anticipating the full liberalisation of the telecoms market DT made a first attempt to re-organise in 1993. The goal was to prepare for competition after liberalisation by an increase in customer orientation and decentralisation and incentive realignments towards profit orientation.<sup>11</sup> To achieve this goal a 'customer-oriented divisionalisation' was introduced which distinguished between different business fields; depending on volume and complexity of demanded services customers were grouped into three segments (private, business and system customers). These segments were reflected in the board of directors, which included a director for each segment. These positions were complemented by a director for mobile communication and directors for technology and others (finance, human resources). However, the re-organisation was only half carried through because the regional oriented 'Direktionen' remained, now split between private, business and system customers. The first re-organisation of DT thus resulted in a mixture of a divisional and regional organisational structure.

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<sup>11</sup> See Blank/Hungenberg (1995).

After the market was liberalised in 1998 this organisational structure proved inadequate for several reasons. The most important ones were the fast growth of certain business fields (mobile communications, Internet services) while others declined (fixed voice telephony) and a strategy of international expansion. Both growth and internationalisation posed new and difficult challenges such as co-ordination within a foreign country across different business fields and growth problems in fast-developing business fields (Internet content and access, see below). The strong differentiation between the newly introduced customer segments and production/network infrastructure remained a permanent source of co-ordination problems. This strong production orientation had characterised DT since its monopolistic history. Customer orientation had not yet made its way through into organisational structure.

In mid-2000, DT announced a further re-organisation towards divisionalisation. To position DT as a leading player in the 'TIMES' markets four business fields were identified for further investment and growth (see table 8):

1. 'T-Com' (fixed network, telecommunications infrastructure, cable TV)
2. 'T-Mobile' (mobile communications)
3. 'T-Online' (Internet services)
4. 'T-Systems' (data and IP systems solutions)

These fields are identified as “four pillars for sustainable growth”. After internal discussions the re-organisation of DT’s business was reflected in a restructuring of DT’s Board of Management. In April 2001 DT announced that as of May 1, 2001 two Board members would be responsible for T-Com and T-Systems (Josef Brauner, formerly responsible for Sales and Customer Care) and T-Online and T-Mobile (Kai-Uwe Ricke, new Board member, CEO of T-Mobile International).

Although the individual pillars are intended to be as independent as possible they are expected to “cooperate closely” in case of convergent/interdependent businesses. This leads to the standard questions of how much autonomy is granted to the individual units in a divisional organisation. And, how are the activities of the individual units aligned with the overall group strategy? How is internalisation co-ordinated within and between the individual pillars? Recent incidents show (as in the cases of T-Online and T-Systems, see below) that the second re-organisation was far from smooth.

One important aspect of autonomy refers to strategy formulation and implementation. According to a manager of DT’s Group Organization department, strategy formulation is an “iterative process which runs both top-down and bottom up”. The overall group strategy is complemented by strategies for the individual pillars and local activities. To implement a strategy an iterative planning process generates a financial plan for a three- year period (budget year and the two following years). A longer-term goal is that the individual pillars survive on their own, i.e. can finance their investments out of their own cash flow. The lower the self-financing abilities are the lower the degree of autonomy becomes. Thus, needs for large investment automatically become a group decision; for example, in the mobile market DT’s international acquisitions (VoiceStream, Powertel, Eastern Europe) cannot be financed out of T-Mobile’s revenues. Furthermore, because internationalisation is a core element of DT’s overall strategy, DT’s Board of Management holds the ultimate decision power.

In principle, the individual pillars act independently from each other in their international activities. To co-ordinate their activities a country manager will represent 'Mr. Telekom' in every country in which DT has significant stakes. The country manager's duties are threefold. First he represents Deutsche Telekom as a group in the country; it is DT's explicit aim to always remain discernible as 'a sum of the parts' in spite of rather autonomous businesses within the four pillars. Second he co-ordinates the activities of the individual pillars. Furthermore, he identifies and discusses local business opportunities with the individual pillars and corporate headquarters. The set-up of T-Motion in the UK is a recent example; it was founded in April 2000 as a joint venture between T-Mobile and T-Online to produce online content for mobile communications. Divergent opinions on ownership of T-Online between T-Mobile and T-Online were resolved by the UK country manager.

### 5.2.2. *Pay system at Deutsche Telekom*

Organisational changes at DT were accompanied by changes in the pay system. From monopoly times DT inherited a pay system mainly based on civil service regulations. These regulations put heavy emphasis on criteria such as age, marital status or seniority. Fluctuations and retirements after privatisation allowed DT to negotiate regular (private) labour contracts with an increasing share of its employees. A major change in July 2001 was when a new pay system was introduced with a enlarged performance-based component. Basic pay in sales areas was reduced to allow for a higher variable pay component.

Another important issue is remuneration of top management. The German corporate landscape has not seen stock option plans for top management or key employees until recently. Traditionally, German managers are paid in cash, usually with a fixed and a bonus component (a part of the latter is usually also fixed). The remuneration of individual top managers is not subject to mandatory publication in Germany. However, the sum paid to the board of management has to be published. In 2000, DT's management board was paid a total sum of approximately EUR 9 million. A part of this remuneration is a bonus payment consisting of a fixed and a variable portion. In its F-4/A document filed in 2001 for the SEC Deutsche Telekom describes this system as follows: "A portion of the total compensation of the management board is paid pursuant to a bonus arrangement consisting of a guaranteed portion and a variable portion. The variable portion is dependent upon a number of criteria, including the attainment of certain financial performance objectives and the achievement of certain individual performance objectives" (p. 297). In 2000, 30% of the total of the management board's remuneration was paid as part of that bonus programme. Furthermore, at DT's shareholders' meeting on May 25, 2000 shareholders authorised DT to increase DT's capital by up to 5 million new shares ('conditional capital') to be used for cash or non-cash contributions for offerings to management and key employees under a stock option plan until May 2005. As of March 31, 2000, members of DT's management board owned a total of approximately 4,200 DT shares (members of DT's supervisory board owned 2,700 shares). It remains to be seen how far the newly introduced stock option plan will increase the number of shares held by DT's top management.

### 5.3. Deutsche Telekom R&D

After the liberalisation of the telecommunications market took place, the pace of technological change became much faster. In the old telecommunications market Deutsche Bundespost Telekom as a monopolist held close ties with its main supplier, Siemens AG, Munich. Technological innovation occurred slowly and in close collaboration between the incumbent and Siemens. As Fransman (2000) elaborates liberalisation brought about a completely new learning regime to the telecoms industry. Specialist suppliers on all levels of the production chain compete against each other. Quite naturally, the R&D work undertaken by DT and its relationship to its supplier changed dramatically as a consequence of the new regime. In December 1995, DT opened a 'technology centre' in the dual locations of Berlin and Darmstadt, supported by R&D facilities at a further 17 sites in Germany. Both the technology centre and the 17 offices developed out of former offices of Deutsche Bundespost Telekom. The latter were later reduced to 5 'development centres'.

During liberalisation R&D became increasingly IT-oriented. In 1998, the development centres focused on the generation of IT competencies in key areas such as network management systems and service components. A further indicator is that 40% of all R&D expenses in 1998 were dedicated to software development. These efforts continued in the following years.

As at July 1, 1999, Deutsche Telekom concentrated its R&D activities in a newly established subsidiary 'T-Nova, Deutsche Telekom Innovationsgesellschaft'. T-Nova is part of DT's systems solutions pillar 'T-Systems' and is dedicated to generate innovative solutions in the 'TIMES' markets (Telecommunication, Information technology, Multimedia, Entertainment and Security). More precisely, "T-Nova offers the whole range of intra-group innovations and solutions from a single source: research; product, service, network and software development; and support with market introduction and operation. A vital part of T-Nova's work is the integrative development of the relevant information systems for supporting and handling business processes through the entire Group. T-Nova bundles the specific skills of the individual development units" (DT annual report, p. 25).

Following the set up of T-Nova DT's R&D activities consist of 4 units: T-Nova; Multimedia Software GmbH Dresden; the central innovation management at DT's corporate headquarter in Bonn; and the development division of T-Mobil which did not become part of T-Nova. DT transforms knowledge and ideas into property rights; information on DT's patenting activities is given in table 17. By end of 2000, DT held approximately 3,600 industrial property rights. Since 1995, about 2% of DT's employees work in R&D. DT's R&D expenses grew roughly proportional to revenue. Correspondingly, R&D intensity fluctuated between 1.7% and 2% over the last 6 years (table 18).

*T-Nova bundles:*

- the former technology centre (focusing on R&D in the field of networks and network-related services)
- five development centres (Darmstadt, Berlin, Bremen, Essen, Saarbrücken, each concentrated on a different field, mainly software development)
- business activities of T-Berkom (development of future-oriented telecommunications applications, telematics services, terminal devices, music on demand, Internet telephony)

To a certain extent T-Nova also supervises the work of DT's formally independent subsidiary MM Software GmbH Dresden which develops software applications for multimedia products and intranet and Internet solutions. There is no detailed public information available on the internal organisation of T-Nova. According to T-Nova's web site, the headquarters devise R&D programmes according to DT's overall corporate strategy. The *technology centre* is the main R&D unit committed to a) strategic concepts for networks, network-associated services and products, b) platforms/application verification for service-independent transport procedures, networks and systems technology, and c) integrative technical development of innovative network platforms, functions and components. The five *development centres* are more or less specialised in certain activities (Berlin: SAP, intranet/internet solutions; Darmstadt: network-access and security systems, data-warehouse and sales/marketing solutions; Bremen: billing/pre-billing, object-oriented technologies; Essen: middleware, mobile systems, IT integration, IT systems for T-Sales and T-Service; Saarbrücken: consulting, process re-engineering, e-business). Following the re-organisation of DT into four new 'pillars' it is not clear how priorities in R&D are determined and efforts are allocated (e.g. how the division of labour between T-Nova and the development division of T-Mobile works). Although part of T-Systems, a significant part of T-Nova's R&D consists of work for T-Com, T-Online and T-Mobile. This reveals the already stated intention of DT to further develop as an integrated corporation although the four pillars are said to be as independent as possible.

Besides the national R&D sites T-Nova operates a California-based office ('T-Nova North America') dedicated to "scanning and scouting of new products, services and markets, preparation of business models, piloting and testing of products in the U.S. environment, and cooperation activities with companies and organizations". Furthermore DT acts as a venture capitalist. The subsidiary 'T-Venture' was founded in September 1997 and "operates as an entrepreneurial partner making equity investments in innovative, high-tech companies with growth potential in the T.I.M.E.S markets". In 2000, the portfolio of shareholdings exceeded DM 1 billion (1998: DM 33 million; 1997: DM 8 million). T-Venture expanded into the US market and recently entered the Asian market. By investing in other venture capital funds, T-Venture wants to establish a "strategic network of venture capital experts and partners" (DT Annual Report 2000, p. 33).

## **6. Developments in Deutsche Telekom's business fields**

### **6.1. T-Com**

T-Com, representing the fixed network infrastructure, mainly comprises DT's old core business which is under intense competitive pressure. The newly bundled business continues to undergo profound change. Of particular interest is DT's cable network inherited from monopoly times.

#### *6.1.1. History and structure of the German cable TV network*

The beginnings of cable TV in Germany reach back into the early 1980s. After the conservative party (CDU) took over government in 1982 the then Minister of Post and Telecommunications, Christian Schwarz-Schilling, initiated a several billion DM

investment programme to promote broadcasting alternatives for private TV and radio stations. This created competition for public radio and TV while at the same time generating an alternative to terrestrial broadcasting. By end of 1999 of 37.5 million German households with TV, 22 million subscribed to cable TV (see table 15). From Deutsche Bundespost, Deutsche Telekom inherited the national and regional part of the cable network. A German peculiarity is layer 4 of the cable network. In order to promote small and medium size businesses layer 4 was created which consists of the connection between the regional/local transmission layer and the subscribing households. This layer is only partly owned by DT (6 million subscribers). The remaining 16 million subscribers are served by some 4,000 house-building companies and regional cable service companies owning part of the network on layers 3 and 4. Among these owners the biggest company is Telekolumbus (currently owned by Deutsche Bank) serving some 1.7 million subscribers.

The dispersed ownership observed on layer 4 reflects the political intention of promoting SME's by letting them participate in both construction *and* operation of the network. As a result there are 4 major players in the German cable TV business: Deutsche Telekom, owning the major part of layers 1-3; TV and radio companies, offering content (most prominently Kirch and Bertelsmann Group); politicians (regulating access to cable channels via the 'Landesmedienanstalten'); and thousands of cable service companies owning small bits of layer 4. These are co-ordinated in the ANGA organisation ('Arbeitsgemeinschaft zur Errichtung und Nutzung von Gemeinschafts-Antennenanlagen') founded in 1974.

In 1999 DT bundled its cable activities in Germany in a newly founded subsidiary, Kabel Deutschland GmbH. At the same time MediaService GmbH (MSG) was set up as a "CATV-related technology research company". Kabel Deutschland operates the DT-owned part of the network and serves approximately 6 million households directly.

#### *6.1.2. Current development in the cable network market*

Currently the cable TV network is interesting as an access infrastructure for the purposes of (digital) TV distribution and broadband access for households. Cable TV is currently the only broadband access to private households. However, since CATV establishes only downstream connectivity for full interactive access a technological upgrade is necessary. Originally, there were no plans by the national regulatory authority with respect to the further destiny of the cable network and DT was reluctant to publicly announce its plans for the network since a technological upgrade of the network would generate an alternative to DT's valuable local loop. After a long period of neglect the EU Commission objected to DT's dominant position in network infrastructure, owning both the telephone network and the major part of the cable network. In order to foster competition in the local loop the 'Kabelrichtlinie' (90/64/EU) demanded that DT sell its cable activities by April 2000. After long negotiations with potential buyers DT finally announced the sale of majority stakes in its cable network.

If the cable network is technologically upgraded by providing a back-channel it becomes a universal broadband access solution. This generates significant business opportunities but threatens DT's strategy. Since its introduction cable TV had been producing high losses for Deutsche Bundespost/DT, not least because of the dispersed ownership structure (see table 16). However, a technological upgrade by DT would probably have provoked a public discussion about DT's dominating position in the German access infrastructure landscape. Since the cable network could establish itself as an alternative to DT's local loop (in which

the company still holds a monopoly) DT refrained from significant investments in the network infrastructure. Besides slowing down investments in cable technology DT pushes T-DSL as the preferred broadband access solution. T-DSL is targeted to be available to 30 million households by the end of 2001. Nevertheless, DT was keen to showcase its Berlin pilot project (with 680,000 households) in upgrading the network. In a presentation to analysts in April 2000, Gerd Tenzer, Member of the Board of Management for Technologies and Networks, announced that a technological upgrade to a 862MHz bandwidth with a return channel is planned, accompanied by the introduction of new services and content including digital TV channels, multimedia services and high-speed Internet access. DT's Internet subsidiary T-Online is designed to deliver this content and thereby become the "leading portal across broadband cable."

At that time, the announced strategy had already been made impossible because of the European Commission's directive. Although the sale of the network could no longer be delayed, DT was keen to not directly sell the network to a German subsidiary of its main competitors (BT, Vodafone, France Telecom). For two of the nine regional companies deals were closed in 2000: in February 2000 a 55% share of DT's cable network in Nordrhein-Westfalen was sold to Callahan Associates International LLC, Denver; in March, 2000, 65% share of DT's cable network in Hessen was sold to Klesch & Company Ltd., London (total value of both sales: EUR 2.9 billion). At that time, DT's strategy seemed to be 'divide et impera'. The company announced that it would in any case retain at least a strategic 25% + 1 share position in each of its nine companies which grants DT strong veto rights under German corporate law. There is no public information available about the details of the contracts between DT and the acquiring companies. This sale of majority stakes in the network would not allow potential competitors to upgrade the technology at their discretion and use the network effectively for access purposes because DT will retain a strong minority position. Furthermore, DT has also a strong position in digital TV distribution. DT holds a controlling stake in Beta Research, a company developing the currently dominating solution for digital pay TV. The other partner being Leo Kirch, the dominating player of the German pay TV market, DT retains a strong position in digital cable TV services.

In May 2000, the process of selling off the network made progress with 55% of DT's Baden Wurttemberg network being sold to Callahan. In June 2001, DT announced it was selling its remaining six cable TV regions with more than 10 million subscribers to Liberty Media (an AT&T subsidiary) at an estimated EUR 5.5 billion. At first, DT only wanted to sell 55% (announced in February 2001) but, according to DT's Gerd Tenzer, Liberty made an "attractive offer" so DT sold 100%. Liberty Media granted Klesch & Company an option to buy a 24.9% share of this part of the network.

### *6.1.3. Outlook*

It seems that the anti-competitive strategy originally pursued by DT was given up either because the reaction of the European Commission was anticipated or during the negotiations with Liberty, Callahan and Klesch. The sale of the remaining six cable regions can be interpreted to mean that DT is not overly afraid of CATV as a serious competitor to the local loop in the near future. The aggressive rollout of T-DSL seems likely to establish a dominant solution for broadband Internet access in Germany soon. After the sale, the future of the cable network is unclear. A technological upgrade of the network for broadband Internet access, video telephony or video on demand is estimated to require investments between 50 and 100 billion EUR. It is questionable whether the new

owners are willing to invest these amounts. There remains the possibility of pay TV. However, the pay TV market in Germany has never been profitable because of the many free public and private TV stations. In any case, cable TV subscription rates are expected to significantly rise in the near future. With respect to DT's stake in digital TV technology no information is available if and how this subject was considered in the deal between DT and Liberty.

Another issue refers to the layer 4 consolidation. Deutsche Bank is in talks to sell its ownership of Telekolumbus to Liberty, Callahan or NTL (see WSJE, Tuesday, June 26, 2001, p.1/10). After 20 years of fragmentation in the German cable-television market consolidation of layer 3 and layer 4 of the cable network seems probable. However, even after the acquisition of major layer 4 players by layer 3 firms, layer 4 will remain fragmented. Therefore, future investments in cable will bring about serious struggles since an estimated 50% of overall investments are required on layer 4.

## 6.2. T-Mobile

The German market for mobile communications is the fastest growing business in telecommunications and constitutes one of the major growth drivers for DT. DT explicitly strives for market leadership by growth in subscriber numbers and acquisitions. Being No 2 in the German market behind Mannesmann/Vodafone, DT has aggressively bought significant stakes in European and US companies (for an overview see tables 9, 10, 20-22). Revenue from mobile communications grew by 95% in the third quarter of 2000, contributing approximately 20% of DT's total revenue as compared to 11% in 1999. In 2000, subscriber numbers of T-D1 doubled to 19.1 million by the end of that year. The total number of subscribers to DT's mobile subsidiaries almost doubled from 15.7 million to 31.1 million within one year. However, part of the increase was due to acquisitions.

The companies involved in mobile communications seem to consider global operations as crucial to success in the mobile market. Besides economies of scale (in service development costs, operational costs, market research, etc.) a strong international position offers the possibility of global branding and reduces the probability of hostile take-overs, it is argued.<sup>12</sup> Consequently, international presence is established.

However, DT's acquisition policies seem to be unlucky. Although international revenues increased to 17% of DT's total revenues in 2000, its presence in the mobile communications markets in Italy, France, Spain and North America is marginal. One reason is the long enduring and finally failing co-operation with France Telecom.<sup>13</sup> For a long time, Michel Bon, CEO of FT, tried to prevent DT from establishing itself in the US market. Without co-ordinating with FT in advance, DT went into negotiations about a merger with Telecom Italia. Besides the problem of political pressure for a merger between equals, Ron Sommer already co-operated with France Telecom in the common Italian

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<sup>12</sup> Cp. Telecommunications Online, September 2000, 'A critical time for 3G'.

<sup>13</sup> See the coverage in Die Zeit No. 17, 22.04.1999, 'Pronto! Pronto!'.

venture 'Wind' which is a competitor of Telecom Italia. FT was completely snubbed by DT's move which finally led to the termination of the co-operation between DT and FT. As a consequence, DT retreated from the international joint venture Global One and from the common Italian venture 'Wind'.

The attempt to enter the North American mobile market appears dubious. By the spectacular VoiceStream bid DT acquired the fastest growing American company offering GSM services. However, the acquisition price of \$50.7 billion for VoiceStream, number seven in the US market, was considered too high and analysts raised strong doubts about whether this investment will fulfil DT's high expectation. Furthermore, floating of T-Mobile shares was scheduled for autumn 2000 but postponed because of the VoiceStream takeover and the adverse stock market climate. Together with the decrease of DT's share price this creates a severe financing problem since the further development of the mobile business will critically depend on DT's financing capabilities for two reasons. First, the mobile market is expected to migrate from second to third generation technologies within the next 10 years requiring huge investments in network infrastructure. Second, licences have to be acquired. By the end of 2000, DT had made successful bids in the UK (GBP 4.0 billion), Germany (EUR 8.5 billion), Netherlands (EUR 395 million), and Austria (EUR170 million) equalling total licensing costs of more than EUR 15 billion. Furthermore, DT plans to (or has already) bid for UMTS licences in all countries in which it has operations, among them Spain, France, Portugal, Italy, Poland, Scandinavia and Ireland, which requires further large expenditures.

What is all the money spent on licences good for? Mobile operators expect potential synergies between mobile communications and the e-commerce/Internet business. The tremendous success of SMS and the desire to push e-commerce raised high expectations about WAP and related services in the 2.5 and 3G market. DT recently bundled the mobile multimedia activities of T-Online and T-Mobil in the London-based 'T-Motion' with Nikesh Arora as the new CEO. DT's management expects T-Motion be the "T-Online everywhere" strategy. However, the economics of UMTS remains unclear:<sup>14</sup> the high costs of entry through acquiring licences will be further increased by necessary investments in network infrastructure; potential services are indeterminate; the forecasts of subscriber numbers and revenues are uncertain. A further problem is that the value chain may move from access to content as the Internet business has already shown. Of course, all of these risks are market risks that all operators will face. However, as the analysis of the online and systems business will show, DT was not very lucky in its attempts to move up the value chain to content and integrated services. It remains to be seen how the mobile business will look like for DT as a 3G operator.

### **6.3. T-Online**

With its online subsidiary T-Online AG, Deutsche Telekom is the dominant market leader in Germany and Europe in terms of subscriber numbers (see figure 9). Major foreign subsidiaries are T-Online.at (Austria, 100% ownership), Club Internet (France, 99.9%) and ya.com (Spain, 92.66%). By the end of 2000, the number of subscribers to T-Online (including Club Internet, ya.com, and TOnline.at) had almost doubled to 7.9 million. Nine

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<sup>14</sup> See Telecommunications Online, September 2000, 'A critical time for 3G'.

months' revenue in 2000 grew by 86.5% to EUR 542.6 million, which amounts to approximately 2% of DT's total revenue. The non-access revenues grew to 17.1% of total online revenues in the third quarter of 2000. For 2000, T-Online's EBITDA is estimated by DT at EUR -14.4 million. T-Online is designated for moving up the value chain leveraging its market leadership to grow non-access (advertising and e-commerce) revenues. Combined with aggressive premium ISDN and ADSL marketing, T-Online is expected to establish itself as a leading broadband access service and content provider in Europe.

To finance further growth in subscriber numbers and improve the content business, 9.32% of T-Online shares were floated as at April 17, 2000. The timing was considered unfortunate because of an increasingly nervous stock market (for T-Online's share price see figure 7).

The targeted transformation of T-Online from an access service to a fully integrated content provider runs far from smoothly. On August 25, 2000 Ron Sommer, DT's CEO, fired Wolfgang Keuntje, then CEO of T-Online (for the changes in T-Online's Board of Management see table 11). Although the management's lack of transformational spirit had already been noted by corporate headquarters as well as external analysts, Sommer's move came as a surprise. Keuntje had worked since 1994 for DT and was T-Online's CEO since 1996. Since 1996 T-Online had developed into the leading Internet provider in Europe. In the following three months Sommer fired the whole top management of T-Online with the exception of Eric Danke. This decision came as the climax to an ongoing struggle between T-Online's management (in particular Keuntje) and DT about the subsidiary's autonomy. Whereas T-Online demanded autonomy for entrepreneurial activities, DT had clear preferences for tight control. With respect to the international business of Deutsche Telekom group Ron Sommer grants no autonomy to the company's subsidiaries. In the case of T-Online, Keuntje was said to have been almost closing a deal with the British provider Freeware. Ron Sommer cancelled the acquisition as being too expensive and strategically not sound.<sup>15</sup>

Furthermore, DT's management considered T-Online's management to be too focused on technology and therefore overtaxed with respect to the desired move into the content business.<sup>16</sup> In the new world of telecommunications the access business is expected to become a commodity business with homogeneous goods and competitive prices. If this is true, content services for fixed and mobile communications can possibly serve as drivers for future value and growth. As the example of AOL and Yahoo shows, specialised portals are way ahead of T-Online in terms of content providing and e-commerce. Compared to AOL subscribers, T-Online customers on average use T-Online's content less frequently.

Given the history of T-Online's emergence from the old Deutsche Bundespost this alleged scenario of T-Online's 'geek management' seems to be plausible. T-Online emerged from an old character-oriented online service named 'Bildschirmtext' (Btx), introduced in 1983 by the former Deutsche Bundespost. This service was generally seen to be unreliable and old-fashioned and fostered the reputation of Deutsche Bundespost as being a slow technological dinosaur. In 1995 DT combined Btx with electronic mail and Internet access

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<sup>15</sup> See vwd-Wirtschaftsdienst, September 27, 2000.

<sup>16</sup> See Spiegel online, 25 August, 2000, 'T-Online-Krise: Gab die Telekom Keuntje den Laufpass?'; Der Spiegel 39/2000, 'Alarmstimmung in Bonn'.

and sold the package as its primary online product. This technological continuity is matched by organisational persistence; Eric Danke, the only remaining member of T-Online's old management board, was the leading figure within the former Ministry of Post and Telecommunications in the development of Btx by the former Bundespost.

The search for a new CEO for T-Online proved to be difficult. After four months of being without a CEO, Thomas Holtrop was appointed to the post as at January 1, 2001. Holtrop and the other new members of the Board of Management are said to have little competence in the content business. A possible implication of this observation is that DT's management has not changed its preference for a low autonomy of T-Online and wants to maintain strategic and operational control of its Internet business within DT's management. Possible candidates seem to have been aware of that preference. As was already described in the section on DT's internal re-organisation Kai-Uwe Ricke will represent both T-Mobile and T-Online as a new member on DT's Board of Management.

Besides the difficulties with the transformation of T-Online from a pure technologically oriented access provider to a content provider T-Online has had problems with serving its approximately one million business customers. The technologically focused history of T-Online made the company neglect the extra needs of its business customers for a long time. Since July 2001 DT itself has competed against T-Online. Under the brand 'Business Online' DT's TCom pillar offers fast Internet access tailored to business customers' needs based on DT's ADSL technology. This threatens T-Online's growth plans to serve 2.5 million business customers in the near future.

## 6.4. T-Systems

A business field expected to foster further growth is integrated data and systems solutions for international businesses. DT's strategy in this business field is to construct "a global systems solutions company under the aegis of T-Systems and plans to vigorously assume market leadership in the areas of e-business, consulting, systems integration, project services, desktop services, computing and network services."<sup>17</sup> According to DT forecasts, European markets for data and IT services are expected to grow by 27% and 10% respectively annually. Again, the strategy is derived from DT's efforts to move up the value chain. While DT's position has always been strong on the network layer as fundamental for its core business, capacities in IT services in a broad sense have been largely missing. DT's management considered it important to offer one-stop shopping solutions to its business customers by moving into IT services and offering complementary product and service portfolios. To gain leadership without significant capabilities in that business DT consequently looked for acquisitions. In 2000 the acquisition of debis Systemhaus GmbH got regulatory approval from the Federal Cartel Office. With total revenues of EUR 2.9 billion in 1999 debis was the second largest systems house in Europe behind IBM.

Again, DT faced significant problems in pursuing its strategy as debis had a weak international position. Only 30% of total revenue came from international activities. Furthermore, as a former DaimlerChrysler subsidiary, almost half of its domestic business was in the manufacturing sector. The hardest obstacle, however, came from organisational

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<sup>17</sup> Taken from DT's website, <http://www.telekom.de>

integration. Originally, DT had a tight schedule for integration.<sup>18</sup> After regulatory approval on September 20, the integration process was planned to take place from October 1 until January 1, 2001. On January 1, 2001, T-Systems as a brand and joint market presence of the former debis and DeTeSystems (the former DT systems solutions business) was launched. However, with the exception of one manager the whole top management of debis quit.<sup>19</sup> As a consequence, more than one-third of some 20,000 former debis employees also left during the integration process. Although DT denied this, insiders expected that more than 6,000 employees would have left the company by the end of 2000. This brain drain threatens DT's strategic commitment to the systems market or may at least turn out to be a waste of money since the assets of debis consisted mainly of human capital.

As in the case of management problems with T-Online the business press identified DT's (and in particular Ron Sommer's) desire for "absolute power" as the primary reason for the problems with the integration of debis and T-System's consolidation.<sup>20</sup>

## 7. Conclusions

After some apparently successful years with rising stock prices and a number of successful public offerings Deutsche Telekom faces the consequences of regulatory, competitive and technological uncertainty. Competitors are catching up and continue to erode DT's former core business by aggressive pricing and investment in alternative networks. DT responded by restructuring its corporate portfolio into four "pillars of growth". However, it remains unclear whether DT's optimism ("Transformation generates strong growth in pillars and stabilizes T-Com revenues"<sup>21</sup>) is warranted. High expenditures for licences and network upgrade in the mobile market are not easily met with a lowered stock market valuation and a number of huge acquisitions just completed. Besides that, the decision to remain an integrated solutions provider and to try to climb up the telco and IT value chain comes at a cost. As the management crisis of T-Online, the still underdeveloped non-access business and the difficulties with the consolidation of the systems business show, development into new ventures is difficult and success far from certain. The failure of the first attempt to merge DeTeSystems and debis into the new corporate pillar T-Systems in particular reminds of the scepticism Edith Penrose expressed about growth beyond the firm's "impregnable bases".

In particular, observers agree that CEO Ron Sommer considers the overall strategy of DT (particularly internationalisation) as his personal responsibility and refuses to decentralise any related strategic decision-making to DT's subsidiaries. DT's capabilities in network operating and marketing are considered strong assets. Its strategic choice was to remain an integrated telecommunications company with a rather centralised control structure. However, it remains to be seen how the capabilities needed to manage the new, increasingly dissimilar businesses across the deconstructed value chain can be generated and secured.

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<sup>18</sup> As announced at a DT conference call for analysts on November 30, 2000.

<sup>19</sup> See manager-magazin 2/2001, 'T-Systems: Massenexodus'.

<sup>20</sup> E.g. manager-magazin 2/2001, 'Deutsche Telekom: Schicksalsjahr für Ron Sommer'.

<sup>21</sup> DT Conference call on November 30, 2000.



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Figures

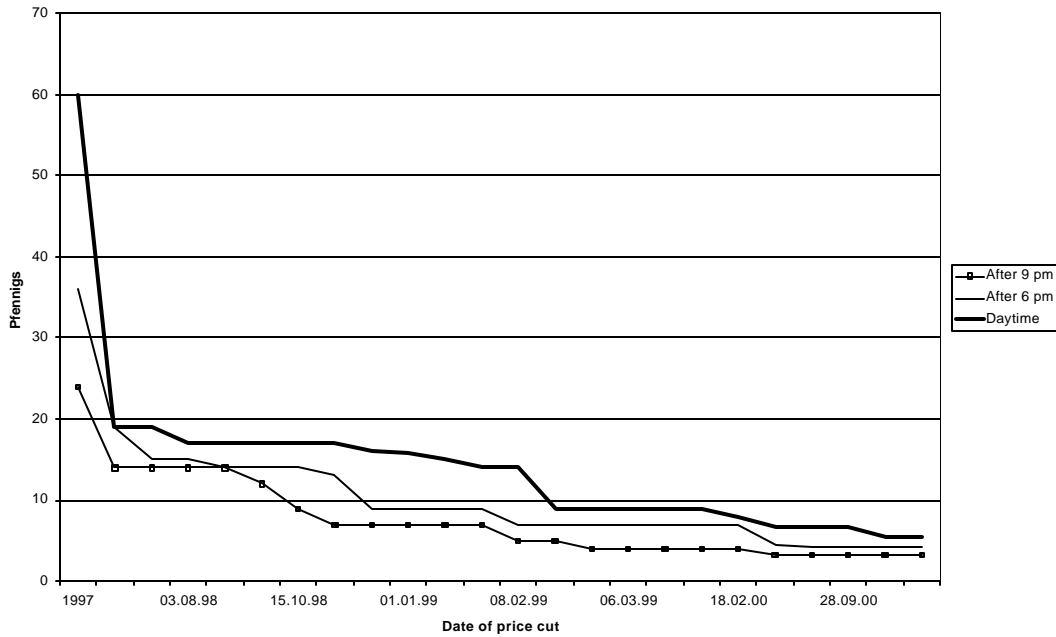


Figure 1: Minimum call by call prices for domestic long-distance fixed line calls (source: RegTP Annual Report 2000)

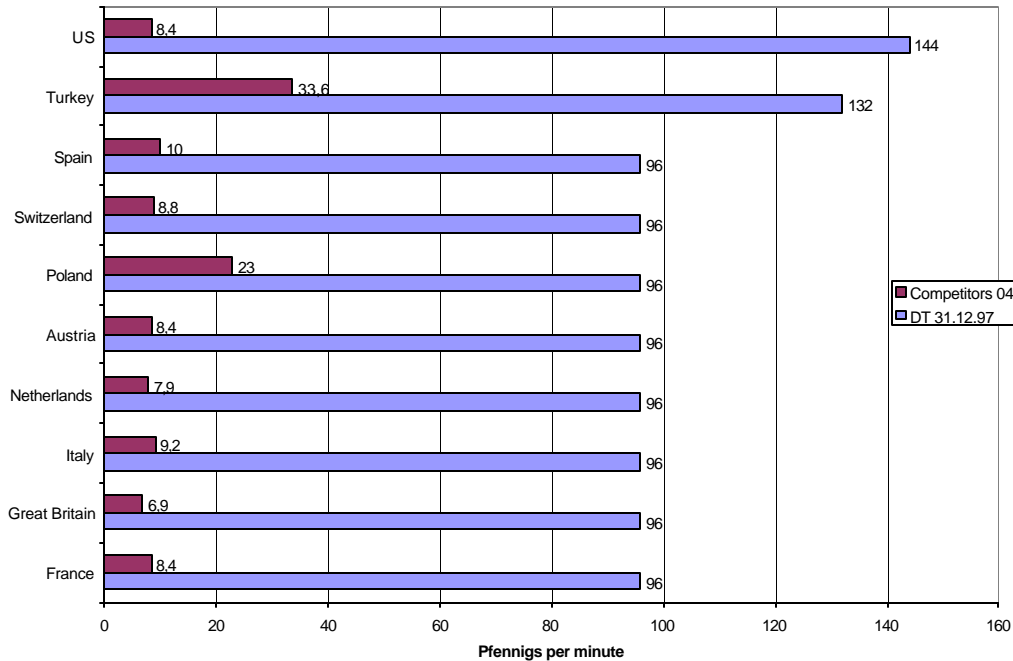
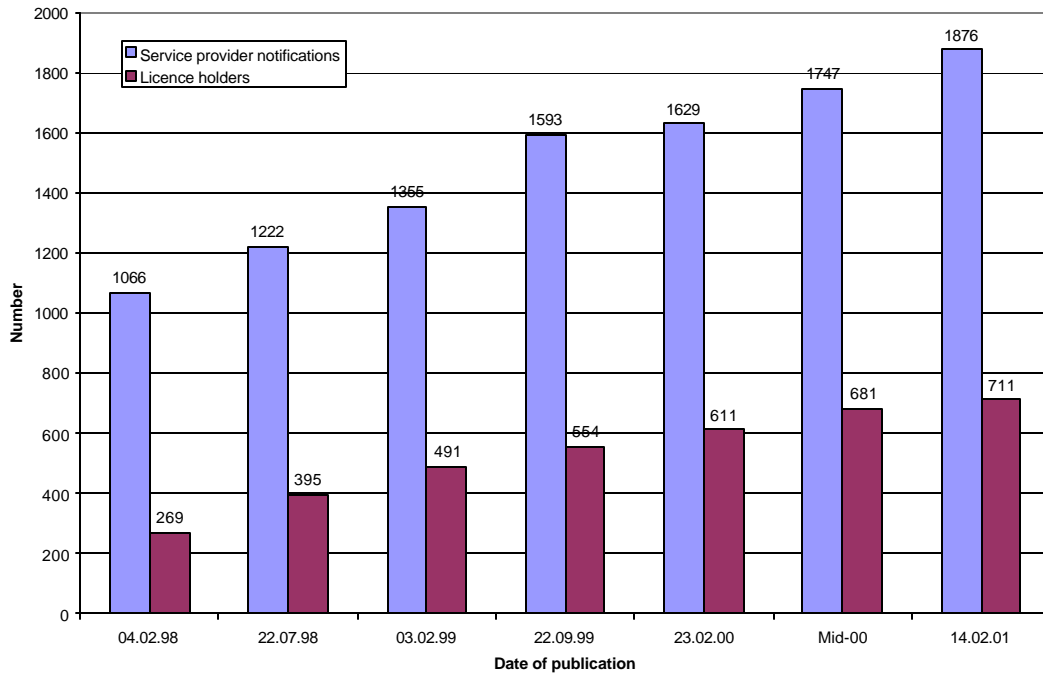
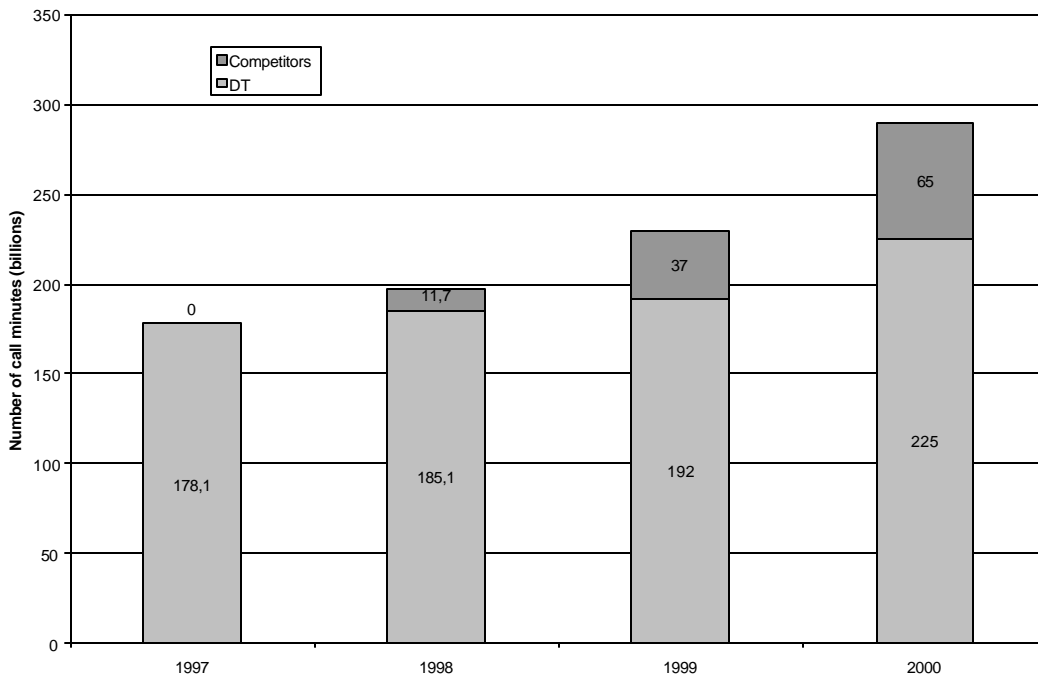


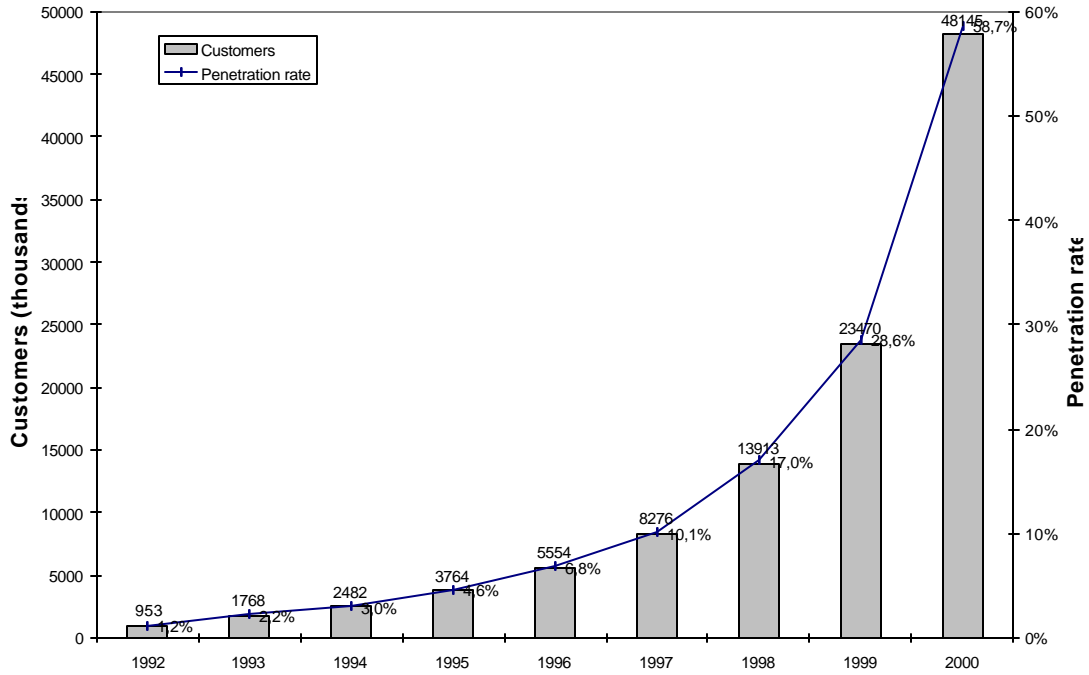
Figure 2: Prices for international calls to 10 major destinations (source: RegTP Annual Report 2000)



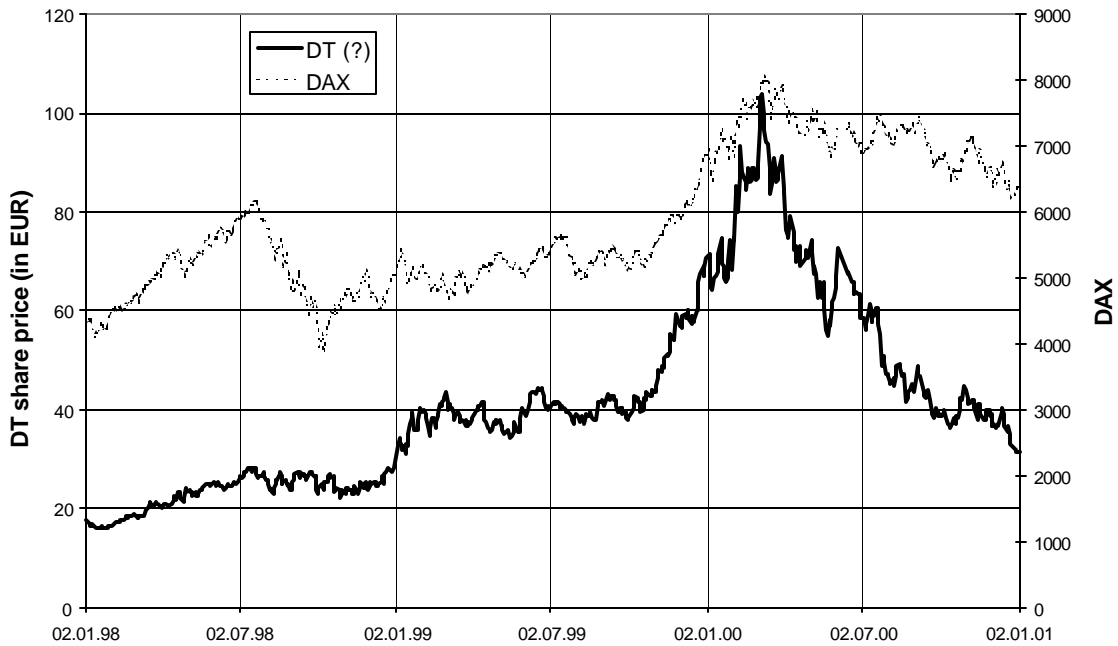
**Figure 3: Growth in the number of providers**  
(source: RegTP Annual Report 2000)



**Figure 4: Call minutes in German telecommunications market 1997-2000**  
(source: RegTP Annual Report 2000)



**Figure 5: Customers and penetration rates in German mobile market (source: RegTP Annual Report 2000)**



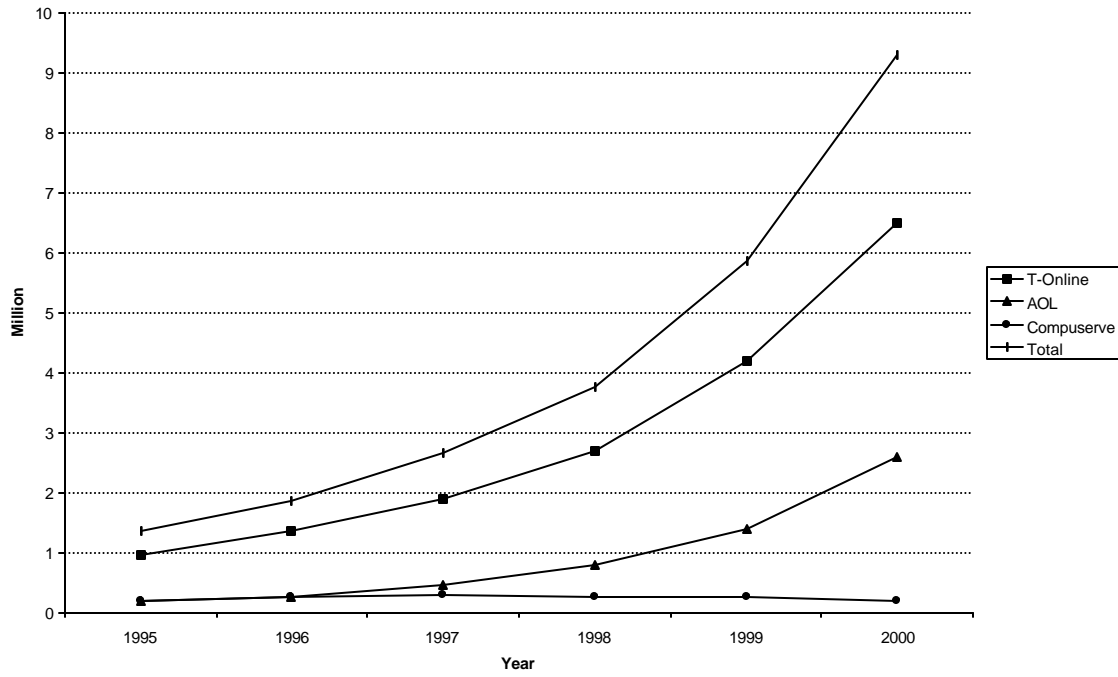
**Figure 6: Share price of Deutsche Telekom and DAX (main German stock index) performance at Frankfurt stock exchange**



**Figure 7: Share price of T-Online in 2000 at Frankfurt stock exchange (source: vwd-Internet Services)**

<b>Layer 1</b> National transmission	Kabel Deutschland GmbH			
<b>Layer 2</b> regional transmission	(Deutsche Telekom's cable network subsidiary 9 regional companies)			
<b>Layer 3</b> local distribution	Private cable network operators 12 million households		Private cable service companies with own local hub	
<b>Layer 4</b> household connection	6.1 million households	<table border="1" style="width: 100%;"> <tr> <td style="text-align: center;">House building companies (6 million households)</td> <td style="text-align: center;">private cable network operators (6 million households)</td> </tr> </table>		House building companies (6 million households)
House building companies (6 million households)	private cable network operators (6 million households)			
<b>Layer 5</b> households	18.1 million households		4 million households	

**Figure 8: Structure of German cable network (source: c't 9/2000)**



**Figure 9: ISP subscriber numbers in Germany 1995-2000**  
(source: RegTP)

## Tables

Revenues (DM billion)	1998	1999	2000
Fixed line services	45.8	41.9	39.7
Mobile telephony	18.6	24.9	35.2
Leased lines	2.1	2.1	2.4
Carrier services (Interconnection)	3.5	7.1	10.3
CATV	4.5	4.6	5.0
Other Services	11.9	14.9	17.3
<b>Total market</b>	<b>86.4</b>	<b>95.5</b>	<b>109.9</b>

**Table 1: Market volumes of the German telecoms market  
(source: RegTP)**

Earnings position (in billions of EUR)	2000	1999	1998	1997	1996
Net revenue	40.9	35.5	35.1	34.5	32.3
Depreciation	13.0	8.5	9.0	9.5	9.0
Total operating expenses	45.1	32.2	29.8	30.3	28.7
Financial income net	-1.2	-2.9	-3.3	-4.0	-3.9
Results from ordinary business activities	6.5	3.2	5.1	3.7	3.4
Net income	5.9	1.3	2.2	1.7	0.9
EBITDA	20.7	14.3	17.4		
Earnings per share/ADS (GAAP) (EUR)	3.1	0.5	0.8	0.5	0.6
Dividend per share/ADS (EUR)	0.6	0.6	0.6	0.6	0.3
Revenue per employee (thousands of EUR)	199	186.0	182.0	169.0	150.0
<b>Assets &amp; liabilities</b>					
Noncurrent assets	106.6	82.0	66.5	70.0	73.8
Current assets. prepaid expenses. deferred charges	17.6	12.6	12.8	13.2	15.3
Shareholders' equity	42.7	35.7	25.1	24.6	23.8
Liabilities <sup>1</sup>	81.5	59.0	54.2	58.6	65.3
Balance sheet total	124.2	94.6	79.3	83.2	89.1
Equity ratio (%)	32.9	35.7	29.5	27.5	25.8
<b>Financing</b>					
Net cash provided by operating activities	10.0	9.6	13.5	11.6	11.4
Net cash used for investing activities	-27.7	-18.7	-7.5	-5.4	-13.0
Net cash provided by financing activities	17.9	8.0	-6.8	-7.0	3.5
Capital expenditures	23.5	6.0	4.8	6.8	8.6
Employees (thousands)	170	175	186	197	208
<sup>1</sup> including debt, accruals, other liabilities and deferred income					
Source: annual reports, author's calculations					

**Table 2: Deutsche Telekom financial data 1996-2000  
(source: DT annual reports. author's calculations)**

<b>(in billions of EUR)</b>	<b>2000</b>	<b>1999</b>	<b>1998</b>	<b>1997</b>	<b>1996</b>
Net revenue	40.9	35.5	35.1	34.5	32.3
Net income	5.9	1.3	2.2	1.7	0.9
Balance sheet total	124.2	94.6	79.3	83.2	89.1
Investments	43.	22.9	7.5	7.9	11.6
Employees at year-end	227.015	195.788	195,876	209.295	220,667

**Table 2a: Key figures Group Deutsche Telekom**  
(source: Deutsche Telekom)

<b>(in billions of EUR)</b>	<b>2000</b>	<b>1999</b>	<b>1998</b>
Network communications	6.2	7.5	11.6
Carrier services	1.8	1.2	1.1
Data communications	1.5	1.1	1.2
Mobile communications	1.4	1.6	1.3
Broadcasting/broadband cable	1.0	1.2	1.0
Terminal equipment	0.3	0.3	0.2
Value-added services	0.3	0.1	0.1
Other international activities	0.8	0.7	0.6
Other segments	-0.3	0.6	0.4
<b>Total Deutsche Telekom Group</b>	<b>13.0</b>	<b>14.3</b>	<b>17.4</b>

**Table 3: DT EBITDA margins by segment 1998-2000**  
(source: Deutsche Telekom)

<b>(in millions of EUR)</b>	<b>2000</b>	<b>1999</b>	<b>1998</b>
Network communications	15051	16737	20531
Carrier services	3983	2884	1611
Data communications	3352	2828	2536
Mobile communications	9253	3919	3061
Broadcasting/broadband cable	1861	1917	1804
Terminal equipment	1036	1207	1382
Value-added services	1802	1903	2051
International	2058	2863	1322
Other segments (T-Online, etc.)	2426	1212	846
Reconciliation	117	90	74
<b>Total Deutsche Telekom Group</b>	<b>40939</b>	<b>36825</b>	<b>35144</b>

**Table 4: Deutsche Telekom revenues by segment**  
(source: Deutsche Telekom)

	<b>Strengths</b>	<b>Weaknesses</b>
<b>DT Group</b>	<ul style="list-style-type: none"> <li>– Strong brand</li> <li>– Access to all households</li> <li>– Modern network</li> <li>– Presence in all telecoms business fields</li> </ul>	<ul style="list-style-type: none"> <li>– High capital expenditures and depreciation</li> <li>– Presence in all telecoms business fields</li> </ul>
<b>T-Com</b>	<ul style="list-style-type: none"> <li>– De facto monopoly in local loop</li> <li>– Strong position in ISDN, aggressive roll-out of T-DSL</li> </ul>	<ul style="list-style-type: none"> <li>– Deteriorating core business</li> <li>– Inefficient organisation inherited from monopoly times</li> </ul>
<b>T-Mobile</b>	<ul style="list-style-type: none"> <li>– Strong position in German &amp; East European markets</li> <li>– Possible synergies with other business lines</li> </ul>	<ul style="list-style-type: none"> <li>– High-risk entry in US market</li> <li>– Gaps in European network</li> <li>– High costs through UMTS, uncertain business model</li> </ul>
<b>T-Online</b>	<ul style="list-style-type: none"> <li>– Largest Internet service in Europe</li> <li>– High quality network</li> <li>– Strong position in portal business</li> </ul>	<ul style="list-style-type: none"> <li>– Low international presence</li> <li>– Low profile content business</li> <li>– Service problems caused by rapid growth</li> </ul>
<b>T-Systems</b>	<ul style="list-style-type: none"> <li>– Second largest systems house in Europe</li> </ul>	<ul style="list-style-type: none"> <li>– Low international presence</li> <li>– No global service for MNEs</li> <li>– Difficult integration of debis</li> </ul>

Table 5: Deutsche Telekom strengths and weaknesses

*Ron Sommer, Chairman	1995	Chairman, Group Strategy, Communication, Auditing and Org.
*Josef Brauner	1998	T-Com, T-Systems
*Jeffrey A. Hedberg	1999	International
Detlev Buchal	1996-2001	Product Marketing
*Gerd Tenzer	1995	Networks, Purchasing and Env. Prot.
Hagen Hultsch	1995-2001	Technology and Services
*Heinz Klinkhammer	1996	Human Resources and Legal Affairs
Joachim Kröske	1995-1999	Finance and Controlling
*Karl-Gerhard Eick	2000	Finance and Controlling
*Kai-Uwe Ricke	2001	T-Mobile, T-Online
*Max Hirschberger	2001	Corporate Affairs

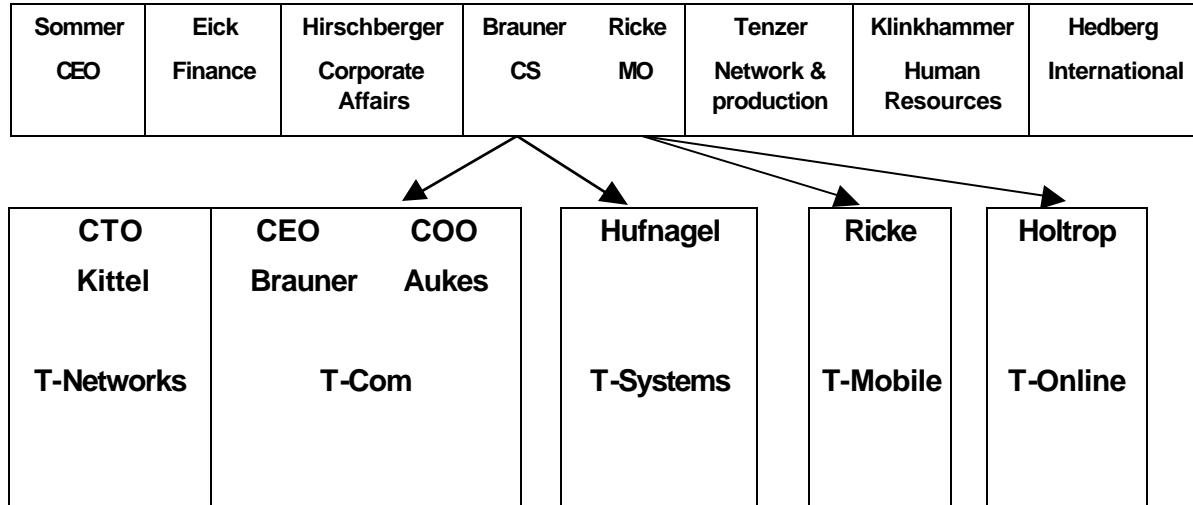
Table 6: Deutsche Telekom Board of Management  
 (\* indicate current members, Source: Deutsche Telekom)

<i>Current members</i>	<i>since</i>	<i>Employees' representatives</i>	<i>since</i>
Hans-Dietrich Winkhaus, (Chairman since 2000)	1999	Rüdiger Schulze, Vice-Chairm.	1999
Helmut Sihler (Chairman 1996-2000)	1996	Michael Löffler	1995
Gert Becker	1995	Ursula Steinke	1995
Dieter Hundt	1995	Michael Sommer	2000
André Leysen	1995	Josef Falbisoner	1997
Hans-W. Reich	1999	Rainer Koch	2000
Dieter Stolte	1995	Waltraud Litzenberger	1999
Bernhard Walter	1999	Wilhelm Wegner	1996
Hubertus von Grünberg	2000	Rainer Röhl	1998
Heribert Zitzelsberger	1999	Wolfgang Schmitt	1997
 <i>Former members</i>			
Michel Bon	1998-2000	Reinhard Ahrensmeier	1997-2000
Rainer Funke	1995-1999	Veronika Altmeyer, Vice-Chairw.	1995-1999
Peter Glotz	1995-1999	Helmut Dettmer	-1998
Klaus Götte	-1998	Maud Pagel	1995-1999
Paul Krüger	1995-1999	Franz-Josef Klare	1995-2000
Claus Noé	1999-1999		
Jürgen Stark	-1998		

Table 7: Deutsche Telekom Supervisory Board  
(source: Deutsche Telekom)

<b>Deutsche Telekom AG, Bonn</b>			
Ron Sommer, CEO			
<b>T-Com</b>	<b>T-Mobile International AG</b>	<b>T-Online International AG</b>	<b>T-Systems</b>
Fixed wire business	Mobile communications	Internet services	Systems solutions
MataV (Hungary)	T-Mobil (Germany)	T-Online (Germany)	debis Systemhaus
MetroHoldings (UK)	maxmobil (Austria)	Club Internet (France)	DeTeSystems
MultiLink (CH)	One 2 One (UK)	T-Online Austria	
Siris (F)	Ben (NL) Voicestream (USA)	Ya.Com (Spain)	
	div. (East Europe)		

Table 8: Deutsche Telekom new business fields  
(source: Deutsche Telekom)



**Table 8a: New divisional organisation of Deutsche Telekom (source: Deutsche Telekom)**

<b>Acquisitions</b>	<b>EUR billion</b>
VoiceStream	59.7
One2One	11.3
Powertel	6.9
debis Systemhaus	4.4
MATAV (increase)	2.2
Media One	2.1
Club Internet	1.9
max.mobil. (increase)	1.1
Slovak Telecom	1.0
Croatian Telecom	0.8
Comdirect	0.7
SIRS	0.7
Ya.com	0.6
Beta research	0.5
<b>Divestitures</b>	
Global One	2.9
T-Online (IPO)	3.1
WIND	2.7
Cable NRW+ Cable Hesse	3.0

**Table 9: Recent acquisitions and divestitures of Deutsche Telekom (end 1999, Source: Deutsche Telekom)**

Kai-Uwe Ricke	CEO, T-Mobile International AG	
Michael Günther	CFO, T-Mobile International AG	
René Obermann	CEO, T-Mobil AG	Germany
Harris Jones	CEO, One 2 One	Great Britain
Georg Pölzl	CEO, max-mobil	Austria
Friedrich Radinger	CEO, max-mobil	Austria
Nikesh Arora	CEO, T-Motion	Great Britain

**Table 10: Key management in DT's mobile communication business  
(source: Deutsche Telekom)**

<i>Current members</i>	<i>since</i>	<i>Function</i>
<b>Thomas Holtrop</b>	<b>01.01.2001</b>	<b>CEO</b>
<b>Veronika Altmeyer</b>	<b>01.12.2000</b>	<b>Human Resources and Legal Affairs</b>
<b>Rainer Beaujean</b>	<b>01.10.2000</b>	<b>Finance and Controlling</b>
<b>Eric Danke</b>	<b>1996</b>	<b>Network</b>
<b>Burkhard Graßmann</b>	<b>01.10.2000</b>	<b>Product Marketing</b>
<i>Former members</i>		
<b>Wolfgang Keuntje, CEO</b>	<b>1996-25.08.2000</b>	
<b>Ralf Eck</b>	<b>01/2000-20.09.2000</b>	<b>Product Marketing</b>
<b>Bernd Reichert-Berg</b>	<b>02/2000-11/2000</b>	<b>Sales and Services</b>
<b>Christian Heoning</b>	<b>01/2000-20.09.2000</b>	<b>Finance and Controlling</b>

**Table 11: Changes in T-Online's Board of Management  
(source: T-Online AG)**

	<b>Share</b>
<b>Data communications</b>	
T-Data Gesellschaft für Datenkommunikation mbH	100.00%
DeTeLine Deutsche Telekom Kommunikationsnetze GmbH	100.00%
DeTeLine Budapest Telekommunikations-Dienstleistungsgesellschaft mbH (Hungary)	100.00%
<b>Mobile communications</b>	
T-Mobile International AG	100.00%
DeTeMobil Deutsche Telekom MobilNet GmbH	100.00%
- max-mobil. Telekommunikation Service GmbH (Austria)	91.00%
- MTS. CJSC Mobile TeleSystems gAG (Russia)	45.94%
- RADIOMOBIL a.s.. (Czech Republic (via Cmobil B.V.. Netherlands)	41.43%
Deutsche Telekom Mobile Holdings Ltd. (Great Britain)	100.00%
One 2 One Partnership (Great Britain)	100.00%
MediaOne International B.V. (Netherlands)	100.00%
Westel 900 GSM Mobil Távközlési Rt. (Hungary)	49.00%
Westel Rádiótelefon Kft. (Hungary)	49.00%
PTC. Polska Telefonía Cyfrowa Sp.z o.o. (Poland)	45.00%
<b>Multimedia</b>	
T-Online International AG	100.00%
T-Online.at Internet-Service GmbH (Austria)	51.00%
<b>Value-Added Services</b>	
De-TeMedien GmbH	100.00%
<b>Broadcasting and broadband cable</b>	
DeTeKabelService Deutsche Telekom Kabel Service GmbH (19 regional cable companies)	100.00%
Kabel Deutschland GmbH (9 regional cable companies)	100.00%
<b>Sales and Service</b>	
DeTeSystem Deutsche Telekom Systemlösungen GmbH	100.00%
Eurobell PLC (Great Britain)	49.00%
	100.00%
<b>International</b>	
Sprint Corp. (USA)	100.00%
SIRIS S.A.S. (France)	100.00%
Wind Telecomunicazioni S.p.A. (Italy)	49.00%
MATÁV Rt. (Hungary)	59.58%
Deutsche Telekom S.A.R.L. (France)	100.00%
France Télécom S.A.	2.00%
<b>Information and innovation management</b>	
T-Nova Deutsche Telekom Innovationsgesellschaft mbH	100.00%
<b>Real estate</b>	
DeTe Immobilien. Deutsche Telekom Immobilien und Service GmbH	100.00%

**Table 12: Major subsidiaries and associated companies of Deutsche Telekom in 1999 (source: Deutsche Telekom)**

Country		Licenses	Number of competitors		Market share of incumbent	Price change (%)
			Network operators	Service provider		
<b>Long distance</b>						
France	N <sup>22</sup>	67	40		> 95	-25
	I	29	29			-20
Germany	N	155			< 70	-70
UK	N	2	2	4	> 97	
	I	15	15	> 30	> 95	
Canada	N		2	100	90	
	I	1	1	25	20	
USA	N	3	3		97	-6
Japan	N	4			100	
	I	1			100	-19
<b>Local loop</b>						
France		3	3		> 99	-5
Germany		155			99.7	+8
UK		4	4	4	>99	
Canada				13	98	
USA <sup>23</sup>		1	1		100	
Japan		2	1			
<b>Mobile</b>						
France		3	3			
Germany		4	4		41	-20
UK		2	2			
Canada		4	4	4		
USA		1-2	1-2			
Japan		1	1			

**Table 13: Market competitiveness after one year of liberalisation<sup>24</sup>**

<sup>22</sup> N National; I International

<sup>23</sup> Local access and transport area

<sup>24</sup> Source: Schedl (2000), p. 210 & own calculations. Year of liberalisation: France & Germany 1998, UK 1991, Canada 1991(N) 1998(I), USA 1984, Japan 1985

Country		Licenses	Number of competitors		Market share of incumbent	Price change (%)
			Network operators	Service provider		
<b>Long distance</b>						
Germany (2000)	N	177	>90			-90
UK	N	5	5	6	71	-50
	I	15	15	> 60	53	
Canada (1997)			5	100	66	
USA	N	3	3		64	-40
Japan	N	4	4			-30
	I	3	3			-56
<b>Local loop</b>						
Germany (2000)		177	52		98.5	+8
UK		7	7	6	80	-50
Canada (1997)						
USA <sup>25</sup>		1	1		100	+0
Japan		8	1			
<b>Mobile</b>						
Germany (2000)		4	4		40	-38
UK		4	4			
Canada (1997)		4	4	4	52	
USA		2	2		50	
Japan		14	1			

**Table 14: Market competitiveness after five years of liberalisation<sup>26</sup>**

TV Homes	37.5 million
Homes Passed	31.6 million
Cable Subscribers	22.0 million
Of which:	
Basic subs (analogue)	21.3 million
basic subs (digital)	0.7 million
Industry revenue	EUR 2.8 billion

**Table 15: German cable TV market overview (End 1999)  
(source: Telecommunications Online/CIT Research)**

<sup>25</sup> Local access and transport area

<sup>26</sup> Source: Schedl (2000), p. 214f. & own calculations.

<b>Revenues (Euro m)</b>	<b>2000</b>	<b>1999</b>	<b>1998</b>
Total (DT)	40939	35470	35140
CATV & broadcast	1861	1917	1804
CATV & broadcast as % of total	4.5%	5.4%	5.1%
<b>EBITDA (Euros m)</b>			
Total (DT)	20700	14299	17425
CATV & broadcast		1180	1007
CATV & broadcast as % of total		8.3%	5.8%
<b>EBIT (Euros m)</b>			
Total (DT)		5300	8400
CATV & broadcast		300	0
CATV & broadcast as % of total		5.7%	0%

**Table 16: Deutsche Telekom's financial results (broadband cable TV and broadcasting)**  
(source: Deutsche Telekom/Telecommunications Online)

<b>Year</b>	<b>New Patent holdings</b>
1993	39
1994	72
1995	158
1996	270
1997	353
1998	363
1999	454
2000	561

**Table 17: Deutsche Telekom's industrial property rights**  
(source: Deutsche Telekom)

<b>Year</b>	<b>People employed in DT Group's R&amp;D units</b>	<b>R&amp;D expenditures</b>	<b>R&amp;D intensity (expenditure / net revenue)</b>
1995	na	na	approx. 2%
1996	na	na	approx. 2%
1997	>4000	1.2 billion DM	1.78%
1998	4400	1.3 billion DM	1.86%
1999	4400	0.7 billion EUR	1.97%
2000	5295 (2.33% of DT group's employees)	0.7 billion EUR	1.71%

**Table 18: Deutsche Telekom R&D**  
(source: Deutsche Telekom)

	Owner	Per cent	Million shares
<b>All shares</b>	German government	30.92%	1297.5
	Kreditanstalt für Wiederaufbau	12.13%	509.2
	Dispersed Ownership	56.95%	2390.7
	<b>Total</b>	<b>100.00%</b>	<b>4197.8</b>
<b>Private Ownership I (households/institutional)</b>			
	Private investors	38.3%	915.7
	Institutional investors	61.7%	1475.0
	<b>Total</b>	<b>100.0%</b>	<b>2390.7</b>
<b>Private Ownership II (Countries)</b>			
	Germany	34.5%	824.8
	North America	31.8%	760.2
	Europe (w/o Germany)	23.8%	569.0
	Asia	9.9%	236.7
	<b>Total</b>	<b>100.0%</b>	<b>2390.7</b>

**Table 19: Deutsche Telekom ownership pattern, May 2001**  
(source: Deutsche Telekom)

Operator	Country	Subscribers		Half Yearly Growth
		Sep 2000	End 1999	
Telecom Italia Mobile	Italy	21,600,000	18,527,000	16.6%
Mannesmann D2	Germany	19,245,000	9,500,000	102.6%
<b>T-Mobil</b>	<b>Germany</b>	<b>19,100,000</b>	<b>9,234,000</b>	<b>106.8%</b>
Omnitel	Italy	14,920,000	10,418,300	43.2%
France Telecom Mobiles	France	13,940,500	9,848,800	41.5%
Telefonica Moviles	Spain	13,669,000	9,052,300	51.0%
Vodafone	UK	11,263,000	7,940,000	41.9%
Turkcell	Turkey	10,069,000	5,466,093	84.2%
BT Cellnet	UK	10,244,000	6,947,800	47.5%
SFR	France	9,921,500	7,223,800	37.3%

**Table 20: Top 10 Western European mobile operators ranked by subscriber base (source: CIT Publications)**

Operator	Country	Subscribers		Quarterly Growth
		Mar 2000	End 1999	
<b>Polska Telefonia Cyfrowa</b>	<b>Poland</b>	<b>2,000,000</b>	<b>1,750,000</b>	<b>14.3%</b>
Polkomtel	Poland	1,692,000	1,523,000	11.1%
EuroTel Praha	Czech Republic	1,262,000	1,070,000	17.9%
<b>Matav Group</b>	<b>Hungary</b>	<b>1,115,000</b>	<b>640,000</b>	<b>74.2%</b>
<b>Radiomobil</b>	<b>Czech Republic</b>	<b>1,050,000</b>	<b>875,000</b>	<b>20.0%</b>
Centertel	Poland	970,000	780,000	24.4%
Pannon GSM	Hungary	751,000	668,000	12.4%
Mobitel	Slovenia	714,000	594,000	20.2%
Globtel	Slovakia	584,000	542,000	7.7%
Vimpelcom	Russian Federation	481,000	353,000	36.5%

**Table 21: Top 10 Eastern European mobile operators ranked by subscriber base (source: CIT Publications)**

Operator	Subscribers		Half Yearly Growth
	June 2000	End 1999	
Verizon Wireless	25,642,000	24,390,000	5.1%
SBC Communications	12,221,000	11,151,000	9.6%
AT&T Wireless Services	11,700,000	9,600,000	21.9%
Sprint PCS	7,400,000	5,727,000	29.2%
BellSouth	5,913,000	5,337,000	10.8%
Alltel Mobile Communications	5,893,445	5,019,000	17.4%
Nextel Communications, Inc.	5,616,600	4,516,000	24.4%
US Cellular Corporation	2,807,000	2,602,000	7.9%
<b>VoiceStream Wireless Corp</b>	<b>2,600,000</b>	<b>846,000</b>	<b>207.3%</b>
Western Wireless	930,500	843,700	11.5%

**Table 22: Top 10 US mobile operators ranked by subscriber base (source: CIT Publications)**