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Macroeconomic impacts of broadband use in Germany

Study commissioned by the

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MACROECONOMIC IMPACTS OF BROADBAND USE IN GERMANY

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Management summary

The potential offered by broadband use as a means of enhancing efficiency and flexibility and improving the competitiveness of industry and government is undisputed. Broadband technologies also benefit the public by giving them new, better-quality services and lower prices.

The question therefore arises as to what action the government can take to promote the use of broadband access technologies and services in a way which is advantageous to the economy. Though there have already been numerous studies on the subject of broadband use, they have tended to concentrate on technological issues or specific market segments. The market potential has not yet been quantified for the economy as a whole.

This study fills that gap by quantifying the macroeconomic impacts of broadband use on growth, productivity, competitiveness and employment.

The study shows that dynamic development of broadband use will be extremely important from the macroeconomic perspective over the next few years. Should such development fail to materialise, the result would be high opportunity costs for the economy with considerable negative impacts on Germany as a centre of business activity.

In the best-case scenario, the economy could grow by 46 billion euros over the next five years provided the right steps are taken now to promote use of broadband. If the possibilities offered by broadband use are not exploited (the worst-case scenario), broadband-based growth will only come to 18 billion euros.

A similar pattern can be seen with regard to employment. A total of 265,000 new jobs could be created by 2010. In the worst-case scenario, however, broadband development would have hardly any effect on the employment situation. This would have hazardous repercussions for the overall economy in view of the crucial need for the constant decline in employment opportunities in more mature areas of the economy to be offset by new market segments.

In order to quantify the macroeconomic impacts, a market-oriented approach was chosen which presents each market segment in a macroeconomic model, enabling them to be quantified and compared. It was essential that, rather than focusing on infrastructure aspects only, the quantification process should particularly include the broadband service segments which build on the infrastructure. Whilst the numerical data presented in previous studies concerning the broadband market often only related to market volumes, this study also provides a quantitative assessment of benefits and displacement effects.

A key factor in ensuring that the macroeconomic effects are achieved will be the speed with which the market potential is harnessed. As well as accelerating infrastructure development, targeted measures to cultivate the market for broadband services will be particularly important.

To demonstrate the macroeconomic significance of these services, the broadband market was divided, for the first time, into basic and value-added services with the following segments:

1 Basic services: infrastructure, communication (VoIP, video telephony)
2 Value-added services:
2.1 Entertainment (internet TV, video on demand (VoD), gaming)
2.2 B2C e-commerce
2.3 B2B e-commerce
2.4 Online IT services/business process outsourcing
2.5 Home working/teleworking
2.6 E-government
2.7 E-health
2.8 E-learning

The quantitative assessment of the market segments demonstrates that there is major macroeconomic potential in the value-added services, in particular. Those services can only be delivered if basic services are available.

However, despite the dynamic development in 2005, the issue in Germany is precisely that the necessary infrastructure is not yet in place. There is not yet a sufficient level of infrastructure competition in Germany and DSL is the dominant technology. In other countries, broadband access is often provided via television cables, as an alternative to DSL, but that option still plays a minor role in Germany. The reason is that ownership of network levels 3 and 4 has been divided up and is extremely fragmented in some cases.

Mobile technologies, especially UMTS, either do not provide for broadband access yet or their infrastructures are not yet sufficiently developed to be of any real relevance to the market. Broadband internet is therefore not yet available throughout the country at competitive prices.

The way existing services are used differs considerably depending on the customer group. Unharnessed productivity and growth potential is largest among small and medium-sized enterprises (SMEs): whilst bigger businesses have already exploited most of the potential available to them, the level of broadband penetration in the SME sector is still low. To boost the penetration rate, SMEs will need to be attracted to broadband services such as e-commerce and online IT services as soon as possible and the range of broadband business services offered for them will need to be evolved.

Having said that, it is not only the business sector that needs to take action – the onus is also on public authorities. It is important that public services, especially those in the areas of e-government, e-health and e-learning, be specifically developed as broadband applications. International comparisons illustrate that e-health, for example, is already seen as an essential broadband segment in other countries whilst key public services in Germany are still at the planning stage.

In this context, it would be advisable to devise a market strategy for each service segment in order to tap into the market potential without delay. Although service and IT providers have a role to play in this respect, the infrastructure providers and the government also have to create an environment which enables the necessary services to evolve more swiftly.

The study shows that Germany ranks well on an international scale in some service segments but could speed up in others. The study's comparison of six selected countries reveals that the two main factors in ensuring higher broadband penetration are lower costs for infrastructure development (investments) and clear benefits of broadband access and services in the eyes of the customer.

The international comparison also indicates, however, that simply transposing those success factors to the German situation would not achieve the desired aim. For instance, it would be rather unrealistic to think that the German infrastructure could be developed without underground cables. Moreover, underlying aspects specific to certain countries, such as the high building densities in Japan and Korea and the ensuing low connection costs, make a direct comparison with Germany difficult.

In summary, the study shows that economic success will only be achieved if basic and value-added broadband services are combined. The ten recommendations for action thus refer both to the creation of a high-capability infrastructure and to the implementation of more broadband-specific services. The recommendations aim to ensure a stronger focus on services and to counter the still common tendency to see the broadband network and innovative services as two separate things. They are therefore also intended to urge all market players to work together in the interest of progress.

Recommendations for action

a Recommendations for action to develop a high-capability infrastructure
1 Improve availability of broadband access via TV cables
2 Promote competition-based development of the fibre network in Germany
3 Accelerate implementation of alternative access methods
4 Increase broadband coverage by using fixed radio access
5 Improve market transparency by introducing "quality marks"

b Recommendations for action to ensure sustainable development of the market for broadband applications
6 Accelerate the development of broadband applications in the areas of e-government, e-health and e-learning and stimulate demand for them
7 Launch joint support and communication projects to increase broadband penetration among SMEs
8 Promote research in the field of broadband applications at institutes of higher education
9 Integrate broadband applications into education and continuing training
10 Expand on established products such as the "(N)Onliner-Atlas" and the "Breitbandatlas" (broadband atlas) to create a strategic platform from which to tap into the market potential offered by offliners and narrowband users

It is clear today that the transition from narrowband to broadband technologies and the associated development of broadband applications will be one of the most fundamental changes in the private and public sectors in recent decades. Broadband is a pioneering innovation with major positive effects for the economy as a whole. Processes, hardware, software and business models need to be re-engineered to take this into account.

1 Introduction

One of the objectives of the German government's "Informationsgesellschaft Deutschland 2006" (Information Society Germany 2006) action programme was to ensure that broadband would be the dominant internet access technology by 2005 and that more than half of German households would have a broadband internet line by 2010.

By using broadband technology, the public, business and public authorities pave the way for completely new services, thereby opening up market opportunities. Broadband take-up also creates the framework required for the public and private sectors to work more efficiently and thus to make Germany even more competitive. The high estimates of the economic potential involved reflect this. Nonetheless, European and international comparisons show that Germany is not among those leading the field in exploiting that potential.

The question therefore arises as to what action the government can take to promote the use of broadband access technologies and services in a way which is advantageous to the economy. Though there have already been numerous studies on the subject of broadband use, they have tended to concentrate on technological issues or specific market segments. The market potential has not yet been quantified for the economy as a whole.

These are the reasons which led the Federal Ministry for Economics and Technology to commission this study. The study's aim is to quantify the impacts which increasing broadband use will have on growth, productivity, competitiveness and employment and to identify what action can be taken by the government.

With that aim in mind, a market-oriented approach was chosen which presents each market segment in a macroeconomic model, enabling them to be quantified and compared. It was essential that, rather than focusing on infrastructure aspects only, the quantification process should particularly include the broadband service segments which build on the infrastructure. Whilst the numerical data presented in previous studies concerning the broadband market often only related to market volumes, this study also provides a quantitative assessment of benefits and displacement effects.

The study is structured as follows: an infrastructure analysis describes the situation on the market for broadband access technologies in Germany. Using this as the basis, the study then compares six countries and identifies the success factors on those markets. Chapter 4 describes and quantifies market trends in nine broadband service segments – broken down into basic and value-added services.

There follows a macroeconomic analysis, based on the criteria of growth, productivity and employment, which takes all of the direct and indirect effects into account. The study ends with recommendations for action to be taken by the players in the political, business and research spheres.

Summaries of key points are given in the margins for easy reference. Each of the chapters between 4.2 and 4.3.8 ends with an overview of the findings (highlighted in orange).

2 Infrastructure market analysis

Though there are plenty of statistics on broadband availability *nationally*, for a long time there was a major lack of knowledge in Germany regarding *regional* availability. In 2005, however, the Federal Ministry of Economics published an "online broadband atlas", which supplies data on the regional availability of various broadband technologies in all of Germany's municipalities. The intention is to increase transparency and give current and potential providers more incentive to raise broadband penetration[1)].

The networks required in order to deliver broadband internet services can be described using the logical structure of the OSI (Open System Interconnection) Reference Model but with its seven layers boiled down to three, as follows:

THREE DIFFERENT INFRASTRUCTURE LEVELS (a side note in the original German version)

- Layer 0: Physical infrastructure; physical medium
  Passive cable infrastructure via which signals are transmitted
- Layers 1-4: Transport level; transport-oriented protocols
  Active transmission and IP technology
- Layers 5-7: Basic and value-added services
  Service platforms, IT equipment

This chapter describes the physical infrastructures and the transport level of broadband internet. The service platforms are dealt with separately in Chapter 4 as they have a substantial influence on the macroeconomic impacts of broadband use.

In addition to the logical structure of the networks, a brief description of the hierarchical network levels and topologies of broadband internet is also required in order to understand the various technologies and business models.

HIERARCHICAL NETWORK LEVELS OF BROADBAND INTERNET

1 International networks
2 Wide-area networks, national networks
3 Regional and local distribution levels
4 Last mile

Levels 1 to 3 are referred to collectively as the "backbone". The term is used in different ways by different people but is generally considered to mean that part of a communication network which has very high bandwidths and a very high traffic load (making the backbone similar to a motorway). Radio networks (fixed and mobile) also use fixed lines as their backbone, with only the "last mile" to the customer being covered by radio technology.

WELL-DEVELOPED WIDE-AREA NETWORKS

[1)] http://www.bmwa.bund.de/Navigation/technologie-und-energie.did=62672.html

Internet service providers (ISPs)[2] need to be able to access international and national wide-area networks in order to be able to offer their customers access to services and content which are not in their own network. Germany has several commercial internet exchanges (CIXs) for this purpose. The largest is the DE-CIX in Frankfurt, which handles around 85% of German internet traffic[3]. As this infrastructure is already very well-developed and connected to international networks, it is not dealt with further in this study.

Germany's wide-area network infrastructure is also very well-developed. There are several physical fibre infrastructures, provided by companies such as Deutsche Telekom , GasLINE, Level3, Interoute and Wingas, plus a few active transmission networks (run by operators such as Colt, BT and Lambdanet), which link up the major German cities. This enables the IP traffic[4] from the international commercial internet exchanges to be distributed to all of Germany's conurbations and regions.

There is much less competition at the level of regional and local distribution networks than at the wide-access level. Apart from in a few cities, such as Berlin, Hamburg, Munich, Cologne and Frankfurt, there are usually only one or two Deutsche Telekom competitors with their own physical infrastructure at the regional or local level. Nonetheless, there *are* providers which perform services on the basis of rented infrastructure.

MONOPOLISTIC STRUCTURE OF SUBSCRIBER LINES

At the end of 2004, around 95% of all subscriber connections provided by Deutsche Telekom's competitors were based on a subscriber line rented from Deutsche Telekom [5]. Only 5% of the alternative telephone lines were based on radio access or lines installed by the competitors themselves. However, by the end of 2005, Deutsche Telekom's competitors accounted for 38% of the active DSL lines including resale.

Operators of rival access platforms, such as broadband cable networks, have already announced that they intend to make sizable investments and considerably expand their customer bases over the next few years.

2.1 Broadband access technologies

There are various access technologies which can be used to establish a broadband connection to the internet. Some of them differ significantly in terms of the usable bandwidth (i.e. the possible transmission speeds) in the downstream and upstream channels and the question of whether the line is for one single user or provides shared medium access for a whole group of users.

The different access bandwidths are as follows:

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[2] Internet service providers (ISPs): These include providers of hosting (registration and operation of domains, rental of web servers and data centre space), access providers and content providers

[3] See http://de.wikipedia.org/wiki/DE-CIX

[4] IP = internet protocol: A tool used for addressing computers in large networks and communicating with them. IP is the cornerstone of the internet.

[5] *Regulierungsbehörde für Telekommunikation und Post* (Regulatory Authority for Telecommunications and Posts), Annual Report 2004

BANDWIDTHS OF DIFFERENT ACCESS TECHNOLOGIES

1 Fixed-line access

- Digital leased lines
- xDSL standard package: 1 to 3 Mbps, sometimes up to 16 Mbps
- Powerline: Up to 2 Mbps in theory, typically 180 to 480 Kbps in the last mile
- Internet via TV cable: 2 to 8 Mbps
- Fibre to the x (FTTx)/Fibre to the home (FTTH) 10 to 1,000 Mbps

2 Fixed radio access

- W-LAN: 11 Mbps or 54 Mbps
- WiMAX: 1 to 6 Mbps (up to 134 Mbps in the future)

3 Mobile radio access/mobile phone networks

- UMTS: Up to 2 Mbps in theory; current networks: 0.384 Mbps (384 Kbps)

4 Satellite

- 768 Kbps to 16 Mbps (often with upstream via the telephone line)

It should be noted, however, that there are hardly any alternatives to DSL in Germany at the moment. The TV cable network infrastructure, which other countries often use for broadband internet access, is extremely fragmented in terms of organisation and ownership (network levels 3 and 4). This makes it very difficult to develop broadband on a nationwide basis, with the result that, in many cases, the infrastructure does not yet have the technical capability required for internet use. Fibre infrastructures are only available for business customers in conurbations – there is currently a lack of willingness to invest in making them available to all customers throughout the country. Other access technologies are still too expensive in some cases, or are not sufficiently developed or are still in the process of being standardised.

DSL IS DOMINANT ACCESS TECHNOLOGY

Having said that, there have also been positive developments in the area of cable networks recently. Many cable network operators have begun to gradually upgrade their networks in order to offer their customers triple play services (TV, broadband internet and telephony).

MOST ALTERNATIVES TO DSL ARE PROVIDED BY DEUTSCHE TELEKOM'S COMPETITORS

So the most commonly used broadband technology is xDSL (digital subscriber line) using the copper twisted-pair lines of the existing telephone network infrastructure (mainly provided by Deutsche Telekom). However, DSL lines are not yet available in several regions, particularly in the eastern part of Germany, due to the fibre network sections between main distribution frames (MDFs) and cable distribution frames (CDFs). According to Deutsche Telekom, this is true of a total of 1.8 million lines in the “OPAL regions” (those with optical passive access lines). Deutsche Telekom has already announced, however, that it will develop availability in those areas by means

of outdoor DSLAMs or cable overbuilds. Another reason why DSL is often not offered in thinly populated areas is the need for cost efficiency.

Almost all (98% to be precise) of the technical alternatives to xDSL described above are provided by Deutsche Telekom's competitors. For cable and powerline, the figure is actually 100%.

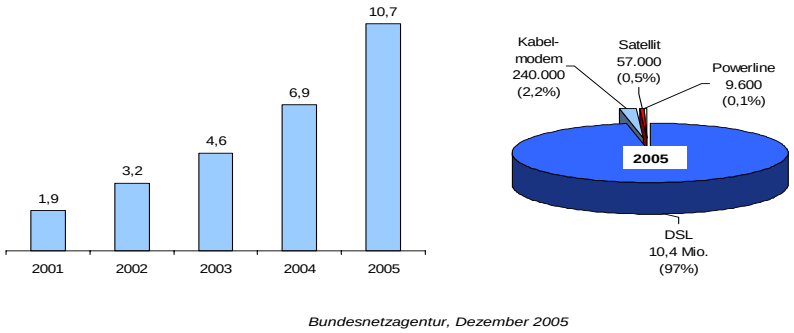


Figure 1: Broadband lines, total (millions)
Source: Bundesnetzagentur (Federal Network Agency),Activity Report 2004/2005

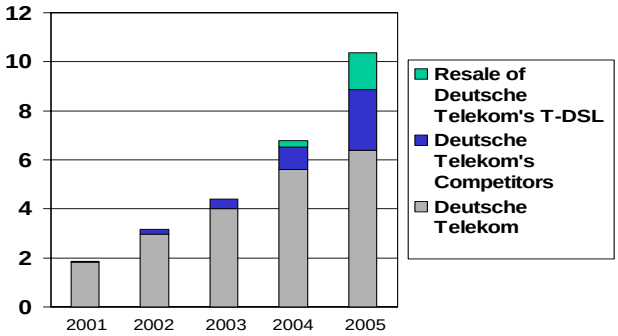


Figure 2: DSL lines in service (in millions, rounded)
Source: Bundesnetzagentur (Federal Network Agency),Activity Report 2004/2005

2.2 Market players and business models

DEUTSCHE TELEKOM'S MARKET POSITION AS A FULL-SERVICE PROVIDER

As the former monopoly holder, Deutsche Telekom dominates the German telecommunications market. It provides a full range of products and services in all segments of the market and the related parts of the IT market and is currently the

market leader in all of the key areas of telecommunications, i.e. infrastructure, voice telephony, internet services and mobile communication. It is the only German company with a nationwide subscriber access infrastructure, which means that all of its competitors in the field of fixed-line access depend on its wholesale services if they want to be able to serve their customers on a nationwide basis too.

FIXED-LINE ACCESS PROVIDERS

On top of that, there are some 200 telecommunications companies which operate their own fixed-network infrastructures though most of them rent the required cable infrastructure from a third party. A large number of the network operators only offer local-level services. These “city carriers” usually use fibre for their large business customers and xDSL (based on the Deutsche Telekom infrastructure) for small and medium-sized enterprises (SMEs) and private customers.

There are also numerous network operators which offer xDSL services in a range of German cities. They have installed up to 1,500 MDFs (of around 8,000 in total) and can therefore cover all of the major cities and conurbations but not the whole country.

By far the largest share of telecommunications providers on the German market consists of “service-only providers”, i.e. companies which do not have their own network. They purchase or rent network capacity from operators of fixed networks or mobile phone networks and sell it on, combined with their own basic and/or value-added services, to their customers.

MOBILE-PHONE NETWORK OPERATORS

Besides the fixed-network providers, there are four mobile-phone network operators in Germany. They have all set up UMTS networks in addition to their GSM networks, which still constitute their core business. These providers will attempt to use their UMTS networks to compete with fixed-network providers in the broadband internet segment too. The first “homezone” products, also intended to replace an xDSL line with a mobile one, appeared on the market in the summer of 2005. The mobile telecommunications companies will thus operate fixed virtual networks on the basis of mobile technology, a business model referred to as “FVNO” (fixed virtual network operator).

By the same token, many fixed-network providers market *mobile* telecommunications products to their customers in order to enhance their own product portfolios and boost customer retention. This business model is known as MVNO (mobile virtual network operator).

PROVIDERS OF CABLE TV INTERNET

The fragmented nature of the cable market makes it difficult for providers of cable TV internet on network level 3 to provide upstream capability for all their customers. In order to avoid these problems and to gain direct access to the end customers, network operators on level 3 are increasingly buying up operators on level 4. The business model currently pursued by the TV cable network operators on levels 3 and 4 is chiefly based on transmission of TV signals.

Positive trends can be seen in the relationship between the providers on network levels 3 and 4. Level 3 operators have learnt from past mistakes and are taking a much more cooperative approach in dealings with level 4 operators when upgrading their networks and marketing new services. The fact that Germany's *Bundeskartellamt* (Federal Cartel Office) has approved Unity Media's (a level 3 operator) takeover of TeleColumbus (a level 4 operator) is also considered a positive sign that broadband cable network operators are gradually being vertically integrated.

ROLE OF POWER SUPPLIERS

Practically all of Germany's power suppliers have their own telecommunications networks for internal communication purposes. Between the middle and end of the 1990s, a number of power suppliers set up subsidiaries on the telecommunications market on the basis of the Telecommunications Act. Although many of them have since largely withdrawn from the telecommunications market, they could act as partners in the development of new infrastructures as some of them have extensive pipe and cable infrastructures plus a great deal of experience in building underground infrastructure.

The business models employed by the various market players depend on the network level on which their activities are focused and the customer groups they wish to reach.

Essentially, there are three different business models used by infrastructure providers, as follows:

THREE BUSINESS MODEL CATEGORIES

1 Establishment of a passive network infrastructure and operation of the active network by one company (vertically integrated full-service provider)
2 Establishment of a passive network infrastructure by one company and operation of the active transmission network (level 2 service provisioning) by another company (infrastructure provider and transmission network service provider)
3 Establishment of a passive network infrastructure by a company and neutral marketing to third parties (open access)

Since the various infrastructure business models differ considerably in several respects, it is a good idea to break them down by logical network level too.

BREAKDOWN OF BUSINESS MODELS BY NETWORK LEVEL

Vertically integrated full-service provider
In this case, the company provides the customer with a full range of services, consisting of broadband internet access and the broadband services. The provider operates the transmission network and performs the basic and value-added services itself. This business model is chiefly used by the large providers, such as Deutsche Telekom and Arcor, as well as the city carriers.

Infrastructure providers
Infrastructure-only providers sell passive network resources, such as fibre cable or cable conduits, to network operators, usually on the basis of long-term rental

agreements. Most of the infrastructure providers are power suppliers or subsidiaries thereof. However, in the majority of cases, only backbone capacities are offered.

Transmission network service providers
These “carriers’ carriers” supply other network operators or business customers with managed transmission capacities in the form of leased lines, IP capacities or xDSL lines.

Service-only providers
In this business model, the provider purchases product packages from a full-service provider and “resells” them to the customer in their own name and for their own account. A second model has established itself among ISPs, in particular, whereby they buy transmission capacities from transmission network service providers and then sell them on to the customer bundled with their own basic and value-added services.

2.3 Legislative and regulatory framework

TELECOMMUNICATIONS ACT PROVIDES MAIN LEGAL BASIS

In Germany, the Telecommunications Act is the most important legal basis for the provision of telecommunications services and thus broadband internet access, products and services. The Act has been revised twice and the current version came into effect in 2004. A review of the European legislative framework for telecommunications got underway at the beginning of 2006. The aim of the review is to advance the harmonisation of European telecommunications legislation and to make regulation more efficient. It can therefore be expected that the German Telecommunications Act will be revised for a third time in the next four to five years. In addition, there are various regulations of relevance in this context, such as the E-Commerce Directive.

INCREASING RELEVANCE OF MEDIA AND BROADCASTING LAW

As transmission capacity increases, so will the content and applications supplied via broadband internet. This is particularly true of full-motion video and television, which is why media law will also become more and more relevant for broadband internet. The situation is even more complicated for some of the TV cable network operators because the addition of an upstream channel and digitisation mean that the channel allocations in the distribution and access networks have to be adjusted. However, the cable network operators have to comply with the provisions laid down in the media and broadcasting acts of the federal state(s) in which they operate and the “cable assignment plans” – they cannot simply decide by themselves what changes to make.

WHOLESALE PRODUCTS NECESSARY FOR BROADBAND COMPETITION

Availability of suitable wholesale products is a particularly important factor in ensuring competition on the broadband internet market. It would be desirable for the dominant telecommunications company to supply a number of wholesale products which allow others to enter the market without having to make excessively high investments. This is especially important for small providers and newcomers on the market, whose new

products and business models can give valuable impetus to the development of the overall market. The wholesale access products should build on one another and be graded finely enough to reflect the various levels of market success and development of those market players. The ladder of investment for the advance investments required in order to be able to use the access products is as follows:

BREAKDOWN OF WHOLESALE PRODUCTS BY NECESSARY ADVANCE INVESTMENT

1 DSL reselling
2 Bitstream access
3 Line-sharing
4 Unbundled subscriber lines

Furthermore, fair charges, in line with the value created, and non-discriminatory access to all elements of the dominant company's network are key to the development of broadband internet competition. This basis will facilitate the development of genuine, sustainable competition, in which various technologies can be used.

RESALE-BASED COMPETITION

Use of the subscriber lines and competition based on reselling DSL lines (which was not made possible until a late stage) are now very well-developed in Germany. In both segments, the regulatory decisions taken have proved to be conducive to competition. Since T-DSL resale enables Deutsche Telekom's competitors to access 90% of German households, companies often use this option to analyse the broadband market and then, if there is sufficient demand, to invest in their own infrastructure. For instance, since mid-2004, Arcor has been offering DSL for the entire area covered by T-DSL. Up until then, Arcor had only been able to reach 38% of households through its own network[6)]. Reselling has thus stimulated broadband competition to a significant degree.

3 Infrastructure and broadband use – an international comparison

Recent years have seen a series of studies comparing broadband penetration in various countries and exploring the reasons why international markets have developed differently. This chapter summarises the main findings of those studies and presents the results of our interviews with experts on the various countries included in the comparison.

3.1 General overview

3.1.1 Broadband penetration and growth

GERMANY LAGGING BEHIND OTHER INDUSTRIAL NATIONS

[6)] http://www.teltarif.de/arch/2004/kw27/s14178.html

Various statistics and studies demonstrate that Germany is lagging behind other countries when it comes to broadband penetration. This is true both when Germany is compared with the leading industrial nations and when compared with other European countries. Germany's position as compared with international and European trends did improve during 2005, with the EU Communication Committee stating in a press release that Germany was number 3 in the EU with regard to broadband internet growth. However, the country still ranked behind France and the UK. According to this evaluation by the Communication Committee, Germany has now reached the average for the 25 EU states but not the EU15 average.

GERMANY'S BROADBAND PENETRATION LAGS BEHIND THAT OF THE LEADING ASIAN, NORTH AMERICAN AND EUROPEAN NATIONS

In an OECD ranking list from mid-2005, Germany made it to number 18 but, among the G7 states, it was joint last with Italy as far as broadband availability per 100 inhabitants was concerned. When compared with the leading industrial nations, Germany's penetration rate of around 23%[7)] ranks behind that of the leading Asian and North American nations and some of the European ones.

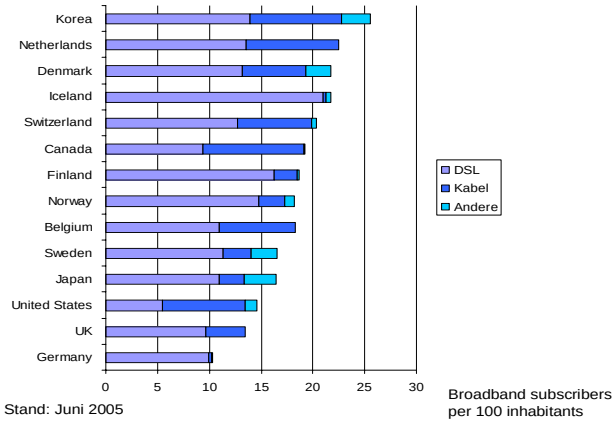


Figure 3: Broadband density worldwide (availability per 100 inhabitants)

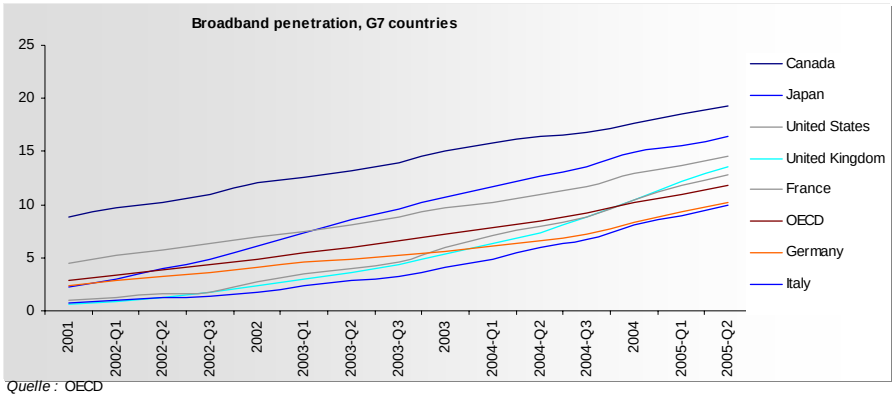
In absolute figures, however, Germany has the highest broadband penetration rate in Europe. Having said that, the rates are currently growing more quickly in, for example, France and the UK.

Positive trends are emerging in the areas of cable and radio access in Germany. Operators of competitive access technologies (e.g. broadband cable networks or radio solutions) have announced that they will be investing sizable sums in the short to middle term and that they are looking to expand their customer base.

GERMANY ALSO HAS MEDIUM BROADBAND-PENETRATION GROWTH RATE

[7)] Household penetration as at the end of 2005. The figure differs from the 27% household penetration rate cited in the *Bundesnetzagentur's* Activity Report 2004/05 because the present study lists the rates separately for private use and business customers' use.

Germany is still at the beginning of the growth phase [8)], while other European nations, among them Belgium, the Netherlands and Sweden, are already extremely well-developed [9)]. On the other hand, the leading Asian nations, particularly South Korea, are already in the saturation phase. This is reflected by their low growth rates which in turn are due to the fact that a relatively large proportion of the population already have broadband lines. From a strictly mathematical point of view, in South Korea there are only around 3.9 people to a broadband line, while the figure in Belgium is 5.4. In the USA, there are 6.9 people per line and the figure in Germany is approximately 9.8 [10)].



Quelle : OECD

Figure 4: Growth of broadband penetration (in percent)

3.1.2 Competition

GERMANY – A "DSL-ONLY" COUNTRY

In Germany, 97% of broadband lines are xDSL-based. 16.7% of German households use xDSL whilst only 0.3% are equipped with alternative broadband technologies [11)]. Compared with the leading European industrial nations, Germany therefore has the smallest share of alternative broadband infrastructures.

The dominance of xDSL on most of the broadband markets around the globe has repercussions for technology competition in the different countries. In its latest study on the international telecommunications market (Federal Ministry of Economics and Labour/*Zentrum für Europäische Wirtschaftsforschung*: "Benchmark 'Internationale

8) Arthur D. Little
9) *Monitoring Informationswirtschaft* (Monitoring the information economy), 8th Factual Report, 2005
10) OECD, 30.06.2005
11) *Monitoring Informationswirtschaft* (Monitoring the information economy), 8th Factual Report, 2005

Telekommunikationsmärkte'", April 2005) [12], the *Zentrum für Europäische Wirtschaftsforschung* (Centre for European Economic Research, ZEW) points out that competition between various broadband technologies is vital in ensuring consumer choice, lower prices and innovative broadband services.

NEGLIGIBLE INFRASTRUCTURE COMPETITION IN GERMANY

In the USA, for instance, there is relatively strong competition between xDSL, cable modem and other broadband access technologies such as satellite and fibre. According to the statistics, only around 34% of broadband lines there are xDSL-based. 58% use cable modems and the remaining 8% use alternative technologies. By contrast, cable modems and the other technologies play a negligible role in Germany. In its analysis of Germany, the ZEW comes to the conclusion that "…the lack of any significant competition between alternative broadband access technologies [… can] be considered an important reason for the German broadband market having less momentum than other countries."

3.1.3 Broadband products

Apart from infrastructure, the availability of attractive products and services has a major influence on broadband penetration. However, the business models for such broadband applications have to be commercially viable. Triple play products are deemed to be essential in furthering broadband penetration in the private customer segment because it is precisely the combination of internet and television which generates potential demand from those customers.

DEVELOPMENT DRIVEN BY TRIPLE PLAY PRODUCTS

In Europe, TV over DSL is mostly offered by the established national operators (the "incumbents" – usually the former government-owned telecommunications providers) as a means of staving off competition from cable triple play products or by alternative telecommunications companies as part of their triple play range [13]. This illustrates that, in particular, availability of alternative infrastructures and functioning infrastructure competition serve to promote the development and marketing of products.

Here again, Germany lags considerably behind other European countries, such as France, Italy and the UK, in the area of visual pay media. Pay TV, in particular, is only used by 3% of the population. As mentioned previously, this is also due to the large number of free TV channels in Germany.

3.1.4 Price/performance comparison

LOW BROADBAND INTERNET PRICES COMPARED WITH REST OF EU

[12] *Monitoring Informationswirtschaft* (Monitoring the information economy), 8th Factual Report, 2005
[13] "Der Kampf ums Wohnzimmer geht weiter" (The fight for lounge audiences continues), A.T. Kearney, November 2005

As a proportion of disposable income, broadband internet prices are relatively low in Germany. So, despite the small amount of competition between the access technologies compared with other countries, prices in Germany are internationally competitive. Nonetheless, the fact that the number of internet lines in German households and companies is above the EU15 average but the broadband internet penetration rate is below it would seem to indicate that the price/performance ratio in Germany is not yet interesting enough from the potential customers' point of view [14)]. One reason is certainly the well-developed ISDN infrastructure, which allows access speeds of 128 Kbps using a run-of-the-mill connection. Standard DSL packages offer eight times as much for downstream but only the same speed for upstream. They are therefore often of little interest to business customers. One of the reasons for private customers' reluctance to embrace broadband is the lack of triple play products mentioned earlier.

3.1.5 Aspects of the ICT market which influence broadband penetration

RELATIVELY LOW PC DIFFUSION

Compared with the highest-ranking countries, PC diffusion in Germany is low. According to the Federal Statistical Office, in 2004 only 66% of German households had a PC [15)], which is equivalent to around 39 PCs per 100 inhabitants. Switzerland, Sweden, Norway and Denmark, all with more than 50 PCs per 100 inhabitants, rank much higher and the USA, with 80 PCs per 100 inhabitants, is the world's number one [16)].

ROLE OF ICT TRAINING IN BROADBAND DEVELOPMENT

The Eurostat publication "Statistics on the Information Society in Europe 2003" (March 2004) states that the share of computer specialists among the total number of employees in Germany was 1.6% in 2002, making it slightly lower than the EU15 average of 1.7% [17)]. Since the number of graduates in technical subjects such as computer science and electrical engineering continues to be low and the number of students embarking on courses in these subjects is still falling, the situation in Germany is not likely to improve in the near future [18)]. The share of computer specialists is above average again in the Scandinavian countries (Sweden 3.3% and Norway 2.5%) and in the Netherlands (3.1%). However, France and the UK, with figures of 1.8% and 2.2% respectively, also fared better than Germany.

3.1.6 Government support

FINANCIAL SUPPORT

[14)] Statistics in focus: Internet activities in the European Union, Eurostat, 31.08.2005

[15)] "Informationstechnologie in Unternehmen und Haushalten 2004" (Information technology in enterprises and households 2004), *Statistisches Bundesamt* (Federal Statistical Office), March 2005

[16)] *Monitoring Informationswirtschaft* (Monitoring the information economy), 8th Factual Report, 2005

[17)] *Monitoring Informationswirtschaft* (Monitoring the information economy), 8th Factual Report, 2005

[18)] See "Wirtschaftliche und politische Chancen der Informationsgesellschaft" (Economic and political opportunities offered by the information society), BCG study, 14.12.2005, and "Weniger Erstsemester in Informatik" (Fewer new students in computer science)

Recent analyses confirm that providing public funding for infrastructure development increases broadband penetration, especially in structurally disadvantaged areas (rural areas, for example) [19]. However, in order to avoid distortion of competition, the infrastructure should be provided by independent firms in the form of an "open access platform" which offers technological neutrality. In view of the present budgetary strains, it is unlikely that the government will augment its direct financial support for the broadband market.

E-GOVERNMENT SERVICES

Germany also has some catching up to do with regard to the supply and use of e-government services. The public sector can lead the way by helping to stimulate the German broadband internet market by stepping up its own use of broadband technologies – the Scandinavian countries are a perfect example of how this can work. With the range of e-government services in Germany being relatively small and predominantly geared to private individuals, they are also used to a lesser degree than in other countries.

3.2 Selected examples of good practice

The following sections compare six countries, including three European ones – Belgium, the UK and Sweden – which have a higher broadband internet penetration rate than Germany and take differing approaches to developing broadband internet [20]. The other three countries are the USA and the Southern Asian countries of Japan and Korea. These three countries have high to very high penetration rates and their markets for broadband services and content are more developed than those in Germany and Europe.

Belgium

HIGH BROADBAND PENETRATION COMPARED WITH REST OF EUROPE

With around 2.1 million broadband internet connections by the middle of 2005 and a broadband penetration of approximately 31% of households, Belgium is very well-positioned compared with the rest of Europe. In 2003, it had the top broadband penetration rate in Europe but the latest statistics show that it had dropped to third place, behind the Netherlands and Denmark, by the beginning of 2005. In the second quarter of 2005, the growth rate was a mere 1% for internet connections overall and 3% for broadband internet connections. During the same period, broadband connections accounted for 82% of internet connections in the private customer segment and 94% among business customers. According to ISPA (Internet Service Provider Association, Belgium), one factor which is preventing extra internet and broadband growth is the relatively low level of PC diffusion in Belgium [21].

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[19] "DIGITAL DIVIDE FORUM REPORT: BROADBAND ACCESS AND PUBLIC SUPPORT IN UNDERSERVED AREAS", European Commission, 15.7.2005, page 5

[20] This was done even though the authors realise that the situation in small countries (e.g. Belgium), in particular, cannot be directly compared with that of Germany. However, the aim here was to identify examples of good practice rather than to benchmark Germany directly against the other countries.

[21] ISPA statistics for second quarter 2005, ISPA Belgium Press Release, 9 September 2005

STRONG COMPETITION BETWEEN CABLE TV AND FIXED-NETWORK INFRASTRUCTURES

There is tough competition between Belgium's TV cable and fixed-line providers in the field of broadband internet access. As they are on equal pegging with regard to available bandwidths and basic functionality, such as "always on", these competitors use value-added services to attempt to stand out from the rest and exploit new sources of income. The particularly fierce competition between xDSL and TV cable networks was triggered by the TV cable network operator TeleNet, which operates networks in the Flanders region. Following the consolidation of several TV cable network operators in the region, TeleNet started a very successful marketing drive to sell high-speed internet access in addition to its existing TV products. It thus very quickly achieved a market share of more than 20% within Flanders and extended its range to triple play.

In response, Belgacom, the successor of the former government-owned telecommunications operator (the incumbent) is carrying out a large-scale, nationwide roll-out of ADSL2+ and VDSL and building partnerships with broadcast providers so that it can offer TV/broadcast services via the faster broadband networks currently being set up. Belgacom has acquired the rights, for instance, to broadcast the Belgian First Division's football matches and has also been offering TVoDSL since the fourth quarter of 2005. In the space of two months, Belgacom gained 20,000 customers with this new service, thereby creating new momentum on the Belgian broadband internet market. At the same time, Belgacom is offering "low-cost ADSL", which has a limited bandwidth and download capacity, in order to retain fixed-line customers and generate new business.

RELATIVELY SMALL DSL SHARE OF 60%

xDSL technology has a market share of just over 60%, compared with 38% for cable (2004). Companies agree between themselves the terms of bitstream access and resale, there is no regulation in these areas. The incumbent must provide a reference offer, however. There are also low prices for line-sharing. Recent developments include:

- swift installation of WLAN and hotspots,
- alliances between fixed-network and mobile telecommunications providers, enabling the partners to offer "quadruple play",
- low-price, slimmed-down ADSL package as a broadband "starter" product and
- early implementation of UMTS.

SUPPORT FOR PC PURCHASES AND PRIVATE USE OF COMPANY PCs

In addition, the government has provided support to ensure that all schools, libraries and hospitals have broadband connectivity. Socially disadvantaged persons also receive financial assistance of up to 720 euros when they buy an internet-enabled PC. Where people buy internet-enabled PCs from their employers, a tax exemption is granted on 60% of the price. Furthermore, civil servants can get a discount on broadband-enabled PCs. These measures were taken to counter the low household PC rate, which was much lower than in other countries, and the major lack of expertise.

THE FOUR SUCCESS FACTORS IN BELGIUM

The key success factors in ensuring a high degree of broadband use in Belgium are:

1 Strong infrastructure competition between TV cable internet and xDSL
2 Availability of triple play via TV cable and DSL networks
3 Marketable, regulated wholesale products offered voluntarily
4 Low prices for the end customer

United Kingdom

MORE BROADBAND LINES THAN NARROWBAND

By mid-2005, the UK had achieved a broadband penetration rate of a good 30% of households, putting it above the EU average. As at 30 June 2005, the number of broadband internet lines in the UK, approximately 8.1 million, had already overtaken that of narrowband connections. With roughly 72% of the market, DSL is the most common access technology. Thanks to price competition, nationwide services and triple play offerings, around 28% of all broadband internet connections in the United Kingdom are based on TV cable networks.

Ofcom, the UK's regulatory authority for telecommunications, is also responsible for TV and radio. This has led to consistent regulation of digital media, which has evidently had a positive influence on broadband internet penetration and use of new digital media.

EARLY CONSOLIDATION ON CABLE NETWORK MARKET

The UK began building TV cable networks back in the 1980s. The consolidation process which took place in the 90s produced two large cable networks (NTL and Telewest), which, combined, cover the whole of the country. Since the mid-90s, they have been operating digital, interactive TV cable networks. In their core area, they have not only been competing intensively with satellite providers, they have also been vying with BT, the former government-owned monopoly holder, for business in the telephone services segment. By the first quarter of 2005, 62% of households in the UK were using digital TV services.

LIBERALISATION OF TELECOMMUNICATIONS MARKET

The UK telecommunications market was liberalised in 1984. Liberalisation has led to sustainable competition although the practice of unbundling subscriber lines has not really taken off as yet and the prices for xDSL services are rather high by European standards. In recent years (since roughly 2003), however, prices for broadband connections have been significantly reduced.

Both types of network, xDSL and TV cable, offer a good level of technology and are used for a wide variety of interactive services, including broadband internet access. At 99.6% of the population, DSL line availability is very high in the UK. According to BT, the number of broadband internet users rose by two million when coverage increased from 60% to 90% as a result of the DSL infrastructure being expanded.

ATTRACTIVE RANGE OF SERVICES

The higher proliferation of broadband connections (in private households) compared with Germany is partly due to the attractive services on offer. One example is that the UK has a considerably larger number of pay TV channels. In 2002, pay TV use stood at 27%, compared with a mere 3% in Germany. On top of that, triple play has become established on the market much more quickly [22)] and so willingness to pay for internet content is higher than in Germany as well. In addition to the triple play offerings for private customers, BT is currently developing broadband-internet-based business process tools for small business customers so as to raise the benefits of and thus the demand for broadband in that customer segment. A number of healthcare projects were also launched last year, in which broadband internet connections are deployed in home care services for elderly and chronically ill persons.

THE FIVE SUCCESS FACTORS IN THE UK

The key success factors in ensuring a high degree of broadband use in the UK are:

1 Early liberalisation of the telecommunications market
2 Consistent telecommunication and TV/radio regulation
3 Strong competition between the alternative technologies of TV cable internet and xDSL
4 As pay TV is very dominant, triple play products are attractive
5 Very high, nationwide availability of DSL

Sweden

SWEDEN IS ONE OF THE TOP-RANKING COUNTRIES IN TERMS OF BROADBAND PENETRATION

In mid-2005 (second quarter), there were around 1.5 million broadband connections in Sweden, meaning that 35% of households already had a broadband line. That puts Sweden among the top-ranking countries, both by European and international standards. There is strong competition between access technologies, with xDSL holding a market share of 51%, FTTH a market share of 25% and TV cable modem 23% (figures from 2004). Over 130 internet service providers (ISPs) offer broadband services. The incumbent's market share is below 42%.

OPEN ACCESS NETWORKS

Sweden began deregulating its telecommunications market back in 1993. In order to promote competition and low prices, all new broadband networks in Sweden have to be "open access networks", i.e. there must be no obstacles to access and choice of provider. Local governments which install their own networks must describe how they intend to ensure that no monopolisation occurs and that access is non-discriminatory.

HIGH NUMBER OF FTTx PROJECTS

[22)] The Communications Market 2004, www.ofcom.co.uk

Based on the assumption that broadband internet is the cornerstone of a society equipped to cope with any future challenges the information age brings, and therefore “the next utility”, many municipal power suppliers are investing in fibre networks. Stockholm was the first to do this, back in the middle of 1990. Since then, over 100 fibre network projects have been launched in Sweden. Although the large number of new, underground fibre networks is somewhat surprising at first, it is due to the fact that the local governments and power suppliers which are building these networks plan on a very long-term basis. In Sweden, investment mechanisms used for public utilities are being adopted for telecommunications infrastructure too. Setting up a new subscriber line costs an average of 1,000 to 2,000 euros per household. If the subscriber pays a monthly fee of five euros, the payback period is therefore 20 years. On this basis and in view of today’s prices for subscriber lines, network operators geared to the long term can develop and implement quite profitable business models purely on the back of the line infrastructure.

VERY OPEN APPROACH TO INNOVATIVE APPLICATIONS

The Swedish people have a high internet affinity and an open approach to the latest technical advances. iDTV (interactive digital television), IP telephony and e-health are considered to be the “killer applications” of the future in Sweden.

TAX BENEFITS

The Swedish government is committed to actively promoting broadband technology. The Swedish Broadband Policy sets a target of 98% by 2005 for nationwide availability of broadband access. In particular, the policy earmarks 1.1 billion euros for developing broadband infrastructure in rural areas in order to ensure equal availability for all regions and all layers of society. Another method employed to encourage use of broadband technology is tax concessions for households and businesses. For example, companies whose xDSL installation costs exceed 884 euros are eligible for a 50% tax deduction. As part of the “PC reform”, employers can buy PCs tax-free and pass them on to employees for home use, thereby enabling employees to save on tax.

GOVERNMENT SUPPORT

All schools are equipped with broadband connections. The E-government 24/7 programme seeks to promote use of new technologies for better access, user friendliness and productivity (by enabling tax returns to be submitted via the internet, for example). The government support measures brought about a rapid increase in PC and internet penetration (to 80% and 78% respectively as at August 2004) and thus an improvement in broadband demand.

THE FIVE SUCCESS FACTORS IN SWEDEN

The key success factors in ensuring a high degree of broadband use in Sweden are:

1 Investment in broadband connections in accordance with the investment mechanisms used by public utilities
2 No single provider dominates the broadband internet market
3 High available bandwidths due to extensive FTTx infrastructure, which in turn helps to increase the availability and use of innovative services

4 Government support (tax concessions and investment support in rural areas)
5 Development of local broadband networks in the form of open access platforms based on a proactive approach by local authorities

USA

By the middle of 2005, the total number of broadband lines in service in the USA was 42.6 million, meaning that roughly 39% of US households had a broadband line.

EARLY LIBERALISATION OF TELECOMMUNICATIONS MARKET

The US telecommunications market was liberalised back in 1984 and the former monopoly holder, Bell, was divided up into a long-distance carrier (AT&T) and five regional companies with local access networks – the Regional Bell Operating Companies (RBOCs). Further telecommunications providers appeared in the wake of this move, often concentrating on long-distance business. Smaller local enterprises, known as competitive local exchange carriers (CLECs), and ISPs normally used the RBOCs' local network infrastructure in order to service their customers.

A good 20 years after liberalisation, there was a wave of consolidation in the USA's telecommunications industry. SBC took over AT&T and Verizon also acquired a long-distance carrier, MCI. So these "former" RBOCs now also have well-developed national and international networks and very high-capability internet backbones in addition to their local and regional networks. This has greatly improved their competitive position both at home and abroad.

INVESTMENTS IN CABLE NETWORK

As a result of the 1996 Telecommunication Act and a cable-friendly government, the cable industry invested billions in technology, creating an alternative access infrastructure which can also be used for broadband internet services. At the end of 2003, six cable providers had a combined market share of 91% of the US cable modem market. The USA's regulatory authority for the telecommunications sector, the Federal Communications Commission (FCC), has now taken that policy a step further this year by exempting TV cable networks from telecommunications regulation. Consequently, there are no obligations for those networks to be opened up to or facilitate unbundling of internet traffic and content.

55% OF BROADBAND LINES ARE BASED ON CABLE NETWORKS

The USA's broadband internet market is unique in that roughly 55% of the broadband internet lines are based on TV cable networks. The primary broadband technology is cable modem, followed by xDSL, fixed wireless broadband (FWB), powerline and FTTH.

The five RBOCs, all of which are DSL providers too, have a combined share of 94% of the USA's DSL market and are now investing massively in FTTx projects. Three of them (Verizon, SBC and Bell South) issued a joint call for tenders for fibre technology in the summer of 2003 and announced investment programmes with a total value far in excess of 10 billion dollars within a five-year period from 2004 onwards. This triggered a price and innovation cycle which is positive for the development of the

broadband internet market. The carriers felt this was necessary because the upstream capability of the TV cable networks enables iDTV and triple play to be offered. Now, the traditional telecommunications companies can also provide triple play on the basis of the FTTx/xDSL networks. This was previously often not possible to a sufficient extent because the copper twisted pair infrastructure in the USA does not permit high bit rates in the last mile. The strategy appears to be paying off for the RBOCs as the number of new xDSL customers, 1.4 million, exceeded that of consumers of broadband internet based on TV cable networks (1.2 million new customers) in the first quarter of 2005. In addition, more than 100 FTTx projects are being implemented by cities and municipalities or their utilities.

LOW INVESTMENT COSTS FOR SUBSCRIBER LINES DUE TO USE OF OVERHEAD CABLES

The average investments necessary for a subscriber line in the USA are lower than in Germany because the former primarily uses overhead cables, which means that there is often no need for cost-intensive civil engineering work in the last mile.

At the urging of the RBOCs, the FCC issued new unbundling guidelines for FTTx networks. The de facto upshot is that the FTTx operators do not have to provide unbundled access to their line infrastructure to other providers. In addition, regulatory obstacles to nationwide use of broadband technology were removed, by altering the provisions concerning routing rights, for example. As a result, it is easier for investors to obtain permission to install cables.

GOVERNMENT SUPPORT INCLUDES LOANS

Government support programmes grant favourable terms for loans for developing the broadband infrastructure (loans worth up to 1.4 billion dollars). Per year, 2.25 billion dollars of funding is awarded in order to promote widespread deployment of broadband connections in schools and libraries. The government also grants tax relief to businesses which develop broadband in structurally disadvantaged regions. In accordance with the 2001 Broadband Deployment Act, companies which invest in broadband technology and services in areas with a low average income are given tax credits. The Economic Development Administration grants subsidies for technology projects through the Rural Utilities Service Agency loan programme. In addition, a fund established by the House of Representatives provides 3 billion dollars in financial support for the development of broadband infrastructure in rural regions. The government has been supporting the development of telemedicine since as far back as 1993 and its support for broadband development also covers research into new technologies (next-generation internet, human computing interaction, scalable information infrastructure and high-end computing).

THE SIX SUCCESS FACTORS IN THE USA

The key success factors in ensuring a high degree of broadband use in the USA are:

1 Early liberalisation of the telecommunications market
2 Early dominance and proliferation of TV cable network infrastructure
3 Existence of several carriers on the DSL and TV cable markets, which are strong but do not dominate the markets (oligopolies)

4 Telecommunications regulation which consistently strives to maintain intermodal competition between DSL/FTTx and TV cable networks and to protect existing operators' investments
5 Establishment of favourable terms for loans for developing the broadband infrastructure
6 Low costs for subscriber lines (overhead cables)

Japan

By June 2005, Japan had 20.3 million broadband internet connections. 14.1 million of them used xDSL, 3.1 million used TV cable modem and 3 million were based on FTTH/B networks. The penetration rate was thus 41% of households. In the first quarter of 2005, net growth in the number of FTTH/B lines was higher than that of xDSL lines for the first time [23]. Now, the monthly net growth rate for fibre lines is pretty much double that of xDSL lines [24].

Technology competition in Japan is intensive. 37% of the ADSL market is held by the formerly government-owned NTT, 33% by Yahoo Broadband and 30% by other companies. More than 34 million households use ADSL, 23 million use cable modem and 16.8 million FTTH.

JAPAN HAS FASTEST AND CHEAPEST INTERNET CONNECTIONS WORLDWIDE

xDSL is provided with 8 to 12 Mbps as standard and up to 16 Mbps in some cases. At prices ranging from 19 to 28 dollars per month, the flat rates available are very reasonable. When competitors entered the market, service prices fell by 50% and transmission speeds rose sixfold. As a result, Japan has the fastest and cheapest internet connections in the world.

INTENSIVE INFRASTRUCTURE COMPETITION

The intensive infrastructure competition was started by the alternative providers, such as unsen Corp. (originally a music station based on coaxial cable), Softbank and Yahoo Broadband. The established providers, such as the former government-owned monopoly holder NTT (East & West) and KDDI, Japan's second largest fixed-network carrier, were initially extremely xDSL-based but now also use FTTx solutions a great deal. Their implementation strategy has two phases. First, they set up FTTC (fibre to the curb) and then FTTH (fibre to the home) or FTTB (fibre to the building).

The national incumbent, NTT, was privatised back in 1985. Since then, 317 telecommunications providers with their own networks have been established, plus more than 13,000 which do not have their own networks. In Japan, there are three or four carriers for each of the various connection technologies (e.g. DSL, FTTx or TV cable), which together cover around 70 to 90% of lines.

SIGNIFICANCE OF GOVERNMENT'S E-JAPAN STRATEGY

[23] IDATE
[24] MIC – Ministry of Internal Affairs and Communication, Press Release Telecom, 4 November 2005

In 2001, the government published its “E-Japan Strategy”, aimed at turning Japan into the world’s leading IT market within the following five years. An “E-Japan Priority Policy Programme” was drafted on the basis of that strategy, which specified five priority areas (1. Infrastructure, 2. Human resources, 3. E-commerce, 4. E-government and 5. Network security). However, the programme explicitly states that the private sector should take the lead in the IT field. The government also implemented measures in the areas of finance, tax refunds and bank guarantees to create incentives for investors to build broadband networks, for example:

INCENTIVES FOR INFRASTRUCTURE INVESTMENTS

- tax incentives of 6 to 25% and subsidies for private enterprises as an incentive to invest in fibre,
- low-interest loans to encourage investment in other broadband networks, such as DSL, fixed wireless access (FWA) and cable and
- reimbursement of 33 to 50% of the costs of projects to supply islands and mountain villages with fibre.

The average investments necessary for a subscriber line in Japan are lower than in Germany because the former primarily uses overhead cables, which means that there is often no need for cost-intensive civil engineering work in the last mile. Furthermore, the average subscriber line lengths in Japan are very short.

The E-Japan Programme has since been supplemented by the U-Japan Programme. The goal of the second programme is to ensure that broadband internet can be used and becomes an established part of all areas of life, society and industry and that ICT is used in a progressive manner in all those spheres too.

The key success factors in ensuring a high degree of broadband use in Japan are:

THE SIX SUCCESS FACTORS IN JAPAN

1 Early liberalisation of the telecommunications market
2 Intermodal competition between the xDSL, FTTx and TV cable infrastructures
3 Government support (tax incentives, low-interest loans, partial reimbursement of costs incurred when delivering connectivity to isolated regions)
4 Very short subscriber lines due to high population density
5 Low costs for subscriber lines (overhead cables)
6 Low broadband internet prices for end customers

South Korea

BROADBAND MARKET IN SOUTH KOREA ALREADY LARGELY SATURATED

With 12.3 million broadband connections, around 77% of South Korean households had a broadband line by the middle of 2005. Since the market is considered to already be largely saturated in terms of broadband penetration, the existing access speeds are now gradually being increased. Forecasters assume that 90% of the

market will be covered by broadband lines with a capacity of 20 Mbps by the end of 2006, climbing to 100 Mbps in 2010 [25)].

A vast number of Korean internet users started out with broadband straight away rather than narrowband. South Korea has around 10,000 internet cafés, which have broadband connections and are used very extensively by the public. They also enable users to gather some initial experience with broadband internet before buying an internet connection for their own homes. There is strong competition between retailers and technologies, which has helped bring about low prices for network access and terminals. FTTH broadband infrastructure has already gained a sizable share of the market. Roughly 30% of the world's WLAN hotspots are located in Korea, which has a total of 7,200 WLAN zones with 110,000 subscribers. WiBro, a WiMAX derivative, is to be rolled out as a new broadband access technology (upload 6.1 Mbps, download 18.4 Mbps) as of 2006.

HIGH DEMAND FOR TYPICAL BROADBAND APPLICATIONS

South Korea has a relatively high population and building density. Approximately 47% of the population live in large blocks of flats and a good 90% of households are connected to the next main distribution frame by lines no longer than four kilometres. Combined with intensive construction activity, this has played a role in pushing up the number of households with broadband lines as well as the line density. Due to cultural consumer preferences, demand is concentrated on typical broadband applications such as online gaming, video on demand and online share-trading. In particular, availability of high bandwidths (up to 40 Mbps) has helped to make such applications attractive. Household expenditure in this segment is relatively high, which results in above-average revenues per user from broadband lines.

STRATEGY TO PROMOTE ICT USE

South Korea began deregulating its telecommunications market back in 1990 when it granted several providers access to the local and national fixed-network markets. Following the economic crisis of 1997, the government concentrated heavily on implementing measures aimed at promoting IT growth and developing South Korea as a knowledge society. To this end, a comprehensive, long-term national strategy was drawn up and implemented to cultivate ICT use and skills. Promotion of broadband internet is a core component of the strategy.

All schools have been equipped with broadband internet lines. Particular support has been given to ease socially disadvantaged persons' access to the new media. Buildings which have broadband access are given "cyber apartment certificates". Furthermore, e-government projects have been intensively supported in order to establish the internet as a medium for interaction with the government. Subsidies worth ten billion euros have been provided to equip households with VDSL and fibre lines. In total, investments in the backbone network amount to 0.25% of the gross national product (GNP).

The key success factors in ensuring a high degree of broadband use in South Korea are:

[25)] www.IDATE.org

THE FIVE SUCCESS FACTORS IN KOREA

1 Low prices for broadband access and terminals due to intensive competition between providers
2 High population and building density, resulting in low connection costs
3 High access speeds, making it easier to use multimedia services
4 Availability of a variety of multimedia applications, such as online games and educational products, which have been especially developed for Korea
5 Government support (subsidies for projects to provide private households with broadband access and to develop the backbone)

3.3 Conclusion

GERMANY NEEDS LONG-TERM ICT AND BROADBAND STRATEGY

Since some of the demographic, morphological and fiscal conditions in the countries mentioned differ greatly from those in Germany, it is not simply a case of copying their successful strategies. It will also not be sufficient to just pick out certain elements and hope that they help put Germany back among the world's leading broadband internet users. What is vital is that a consistent, comprehensive and long-term ICT and broadband strategy be formulated and implemented.

FIVE CORE SUCCESS FACTORS

The assessments of the six countries in this comparison show that there are five key success factors in increasing broadband penetration:

1 Sustainable establishment of infrastructure-based competition (service-based competition instead of reselling) and intermodal competition (between the infrastructures)
2 Low investment costs for infrastructure development (by using overhead lines or an open access approach)
3 Consistent range of wholesale products provided by the former government-owned monopoly holders at prices in line with market conditions, plus processes to prompt competition
4 Broadband access and services which the consumer considers low-cost in relation to the cost and benefits of alternative services
5 Cultivation of ICT skills throughout the population and, in particular, during vocational training

4 Market development in the broadband service segments

4.1 Method: Separate assessment of basic and value-added services

COMPREHENSIVE ASSESSMENT OF BASIC AND VALUE-ADDED SERVICES

Previous studies relating to the broadband market have tended to only include infrastructure in their quantitative analyses of the market. The present study, however, takes a more comprehensive approach, examining both the basic services and the value-added services which build upon them. The findings show that it is

particularly the value-added services which have a major impact on the economy – the basic services primarily serve as a foundation on which value-added services can evolve.

In addition, a new method is required in order to explore the macroeconomic impacts of broadband use. Whilst previous market studies have mostly focused on calculating market volumes, this study also takes into account the positive effects for users plus any displacement effects.

ACTUAL EFFECTS POSSIBLE IN GERMANY ARE DETERMINED, NOT THEORETICAL MARKET POTENTIAL

A market-oriented approach was chosen for the study. In other words, it does not determine the theoretical market potential for Germany by benchmarking the German situation against other industrial nations. Instead, it describes the specific market volumes and macroeconomic effects which can actually be achieved in the short and medium term in the German context.

The authors began by dividing the broadband market into basic and value-added services with the following segments:

SERVICE SEGMENTS

1 Basic services: infrastructure, communication (VoIP, video telephony)
2 Value-added services [26]:
2.1 Entertainment (internet TV, video on demand (VoD), gaming)
2.2 B2C e-commerce
2.3 B2B e-commerce
2.4 Online IT services/business process outsourcing
2.5 Home working/teleworking
2.6 E-government
2.7 E-health
2.8 E-learning

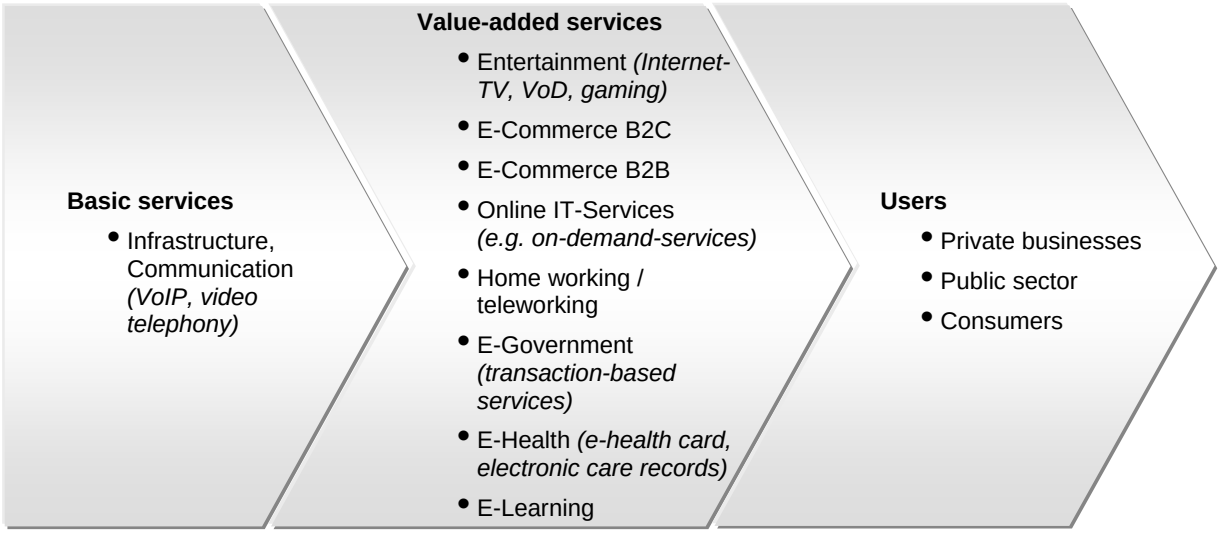

Figure 5: Market structure in the area of broadband-based services

[26] Rather than being examined as an independent market segment, mobile services are included in the various service segments.

This structure was then used to quantify the individual service segments on the basis of secondary analyses and data collected by the authors [27]. Each section begins with a definition of the scope of the service segment and a description of the underlying market model and ends by determining the effects in the following four areas:

FOUR TYPES OF EFFECT ARE ASSESSED

A Market volume (supply side)
B Benefits (demand side)
C Displacement effects
D Effects on foreign trade

Since some of the market segments are influenced by both narrowband-induced and broadband-induced effects, the broadband-related effects are presented separately in the service segments, where necessary [28].

In the following sections, a five-year forecast is given for each segment, indicating the level of development by 31 December 2004, 31 December 2007 and 31 December 2010. The forecasts reflect a good-case scenario, based on a rapid increase in broadband penetration. Since the objective of the study is to identify key impacts, a simplified market model is used [29].

4.2 Basic services

The basic services segment combines broadband internet access services and communication services. By and large, the access services comprise use of the access infrastructure (e.g. DSL lines, leased lines, etc.) and use of the ISP services. Since the latter often include basic communication services, e-mail accounts, web space and VoIP lines, they are also considered in this section.

DEFINITION OF COMMUNICATION SERVICES

For the purposes of this study, the term “communication services” comprises the following services:

- e-mail,
- instant messaging,
- web space and
- telephony (VoIP and video telephony).

Although telephony is essentially a narrowband service, VoIP can only really be used effectively in combination with broadband internet access as it requires always-on functionality. Moreover, VoIP only makes economic sense if it is based on a flat rate and flat rates are now mostly only offered for broadband internet access. Packages

[27] Sources are indicated for these figures unless the figures are based on data collected by the authors themselves.
[28] For instance, revenue in the online shopping sector is partly generated by users with broadband and partly by narrowband users.
[29] The results are based on ceteris paribus assumptions. Inflation and interest rates are not taken into account.

which combine voice telephony with other services, such as video telephony, are clearly part of the broadband internet market since they require high bandwidths.

Practically all of the VoIP services are provided by internet-only companies which do not have fixed network operations. VoIP is also possible using mobile telecommunications technology and products which do so are already available. However, VoIP's share of the market is still small compared with conventional telephony. As yet, very few private customers and only 3% of businesses use VoIP.

This study takes the terms "video telephony" and "video conferencing" to mean a combination of VoIP and image transmission. Such a combination will boost broadband-based use of the two services and offer customers even more added value as well as making it considerably easier and cheaper to provide and use video conferencing.

Web space is also deemed to be a communication service for the purposes of this study because it is normally used for communication by and information for the target group.

CALCULATION OF MARKET VOLUME BASED ON BROADBAND PENETRATION

User numbers and the broadband internet penetration rate are key factors when calculating the market volume in the basic services segment. The penetration rate was calculated separately for private users and businesses because this division serves as the basis for determining the economic potential of the value-added services described in the following sections [30)]. Based on the latest projected broadband internet user figures for 2005 as published by the *Bundesnetzagentur* (Federal Network Agency) [31)], which indicate that Germany had 10.7 million broadband users at the end of December 2005, the following user figures were calculated:

NUMBER OF BROADBAND USERS WILL CLIMB FROM 10.7 MILLION IN 2004 TO 24.3 MILLION IN 2010

	2007	2010
Broadband internet users in millions	15.9	24.3
Of which, private users	13.6	21.5
Of which, business users	2.3	2.8
Broadband internet's share of total number of lines	40.8%	62.2%
No. DSL users (in millions)	14.1	19.3
No. CATV users (in millions)[32)]	0.9	2.1
No. UMTS users (in millions)[33)]	0.5	1.5
No. users of other technologies (in millions)	0.5	1.5

[30)] Our figures differ from those of the *Bundesnetzagentur* (Federal Network Agency), Eurostat and OECD because we subtracted the business customers' broadband internet lines from the number of private customers' broadband internet lines before calculating the penetration rate for households in Germany.
[31)] See the Activity Report 2004/2005 published by the *Bundesnetzagentur* (Federal Network Agency), 15.12.2005
[32)] The figures only take into account CATV users who use CATV for broadband services.
[33)] It should be noted that UMTS does not yet offer broadband functionality and that it will be gradually upgraded to do so over the next few years.

The situation is currently expected to develop as follows:

- the broadband internet penetration rate will rise from the present figure of 90% to at least 98% of the population because the DSL networks will be expanded and WiMAX and UMTS will gain significance as broadband connection technologies;

- the high degree of competition on the German broadband internet market will become even more intense over the next two years due to an increased range of access and basic services using cable TV networks, WiMAX and UMTS;

- the widespread rollout and intensive marketing of triple play services, which are described in the section on entertainment services, will also have an extremely positive influence on broadband internet penetration and the amount of broadband-enabled terminals (flat-screen TVs, media centre PCs, etc.) in private households as of spring/summer 2006 in connection with the 2006 World Cup, which will be a major multimedia event;

- over the next few years, the PC will continue to be the most-used broadband internet terminal but convergence of CE (consumer electronics) and IT products will lead to a growing range of other terminals, such as games consoles, multimedia set-top boxes and digital TV sets with integrated multimedia PCs;

- the convergence of IT and conventional telecommunications technology with the internet protocol (IP), plus the ensuing potential for further process integration, will increase broadband internet penetration among business customers;

- the growth rate in the number of broadband internet lines will fall from 23% to 15% p.a. between 2006 and 2010;

- in the period 2006 to 2008, carriers will invest large amounts to expand the geographical range and capacity of their networks, as follows:

  - DSL carriers will upgrade their networks with ADSL2+, VDSL and fibre lines,

  - TV cable network operators will upgrade the majority of their networks to provide upstream capability,

  - UMTS operators will upgrade their networks with HSDPA as of 2006 and later HSUPA as well so that they can offer more bandwidth and better quality parameters and

  - as of 2006, WiMAX operators will build broadband networks in regions where broadband internet provision is currently non-existent or poor.

A Market volume

The market volume was calculated separately for services, infrastructure/networks and terminals on the basis of figures published by the *Bundesnetzagentur* [34)]. The following assumptions were made:

DELINEATION OF MARKET VOLUME FOR CALCULATION PURPOSES

- the rental charge for telephone lines with DSL are included in the broadband internet category since DSL lines are currently only offered in combination with a telephone line;
- VoIP is included as a broadband internet service. VoIP can only really be used effectively in combination with an IP-based broadband connection and always-on functionality. Revenue generated from VoIP terminals and telephone systems is not included;
- computer hardware and software are only included on a pro rata basis in the area of terminal investments. Investments in terminals are only taken into account for the private customer segment and only for the share of broadband customers in households overall; and
- UMTS network investments from 2005 onwards are included in the broadband internet category because work on developing the base network is now finished. Additional investments will be made for HSDPA/HSUPA upgrades and network enhancements in “non-DSL” areas.

The market potential was calculated on the basis of the projected user figures for 2004 and on the assumption that there will be a decrease of approximately 14% in prices for broadband internet services. Investments in IP backbones, DSL lines and UMTS networks were included as infrastructure investments by operators. Investments in CATV networks, on the other hand, were deemed to belong in the entertainment services category.

On the basis of the above data, the market volumes and user figures can be expected to develop as follows up until 2010:

MARKET VOLUME WILL RISE FROM 7.4 BILLION EUROS IN 2004 TO 20.2 BILLION EUROS IN 2010

	2004	2007	2010
Value-added and basic services (in euros, billions)			
Services	4.4	8.8	13.3
Infrastructure	2	3.1	5.4
Terminals	1	1.1	1.5
Total	7.4	13	20.2
User figures			
Private customers (in millions)	5.3	13.6	21.5
Penetration among private customers [35)]	14%	35%	55%

[34)] Annual Report 2004 by the *Regulierungsbehörde für Telekommunikation und Post* (Regulatory Authority for Telecommunications and Posts), in accordance with Section 122 of the German Telecommunications Act of 14.02.2005

Business customers (in millions)	1.6	2.3	2.8
Penetration among business customers	50%	74%	90%
Broadband internet users, total	6.9	15.9	24.3

B Benefits

BENEFITS RESULTING FROM COST REDUCTIONS AND PRODUCTIVITY INCREASES

The benefits the customer sees as a result of using broadband internet are lower costs and higher productivity. The benefits for private customers were not calculated since their productivity increases do not contribute to gross value added. Furthermore, there is no evidence of increased broadband proliferation leading to major additional benefits for large businesses as around 95% of them already use broadband internet [36)].

On the other hand, there is significant potential in the SME sector. The figures show that, by using broadband internet, these companies can become more efficient in their communication with customers, suppliers and business partners as well as in their transactions. Moreover, broadband is now a major driving force behind changes in business models [37)] and therefore very important for companies' competitiveness. Based on BITKOM, BDI and DIHK statistics [38)], the calculation of the benefits assumed a productivity increase of 30% on top of the 1.3% stated by the *Statistisches Bundesamt* (Federal Statistical Office) for 2004. Consequently, productivity effects of 6.2 billion euros can be expected for 2007 and 6.5 billion euros for 2010.

PRODUCTIVITY EFFECTS OF 6.5 BILLION EUROS BY 2010

C Displacement effects

The displacement effects in the area of broadband internet services chiefly concern narrowband internet access. Since broadband internet lines cost more than their narrowband counterparts, the displacement effects only represent around two thirds of the revenue from services. The displacement effects in the area of network infrastructure are likely to be low at only around 20% because, in most cases, new infrastructure will have to built or existing infrastructure will have to be expanded.

DISPLACEMENT EFFECTS DUE TO NARROWBAND TECHNOLOGIES BEING PUSHED OUT OF MARKET

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35) Percentage share of broadband users among the total number of households in Germany. The figures assume that private users only use their broadband internet line in one household.
36) See "Europe in figures", Eurostat Yearbook 2005
37) See "*Breitbandinternet und E-Commerce*" ("Broadband internet and e-commerce"), Prof. Bernd W. Wirtz, 14.06.2005
38) "*Breitbandanwendungen als Schlüssel der Zukunft*" ("Broadband applications – the key to the future"), press release by BDI (Federation of German Industries), BITKOM (Federal Association for Information Technology, Telecommunications and New Media) and DIHK (Association of German Chambers of Industry and Commerce), 16.02.2004

In sum, the displacement effects arising from narrowband technologies being pushed out of the market will climb from 3.7 billion euros in 2004 to 10.1 billion euros in 2010.

D Indirect effects

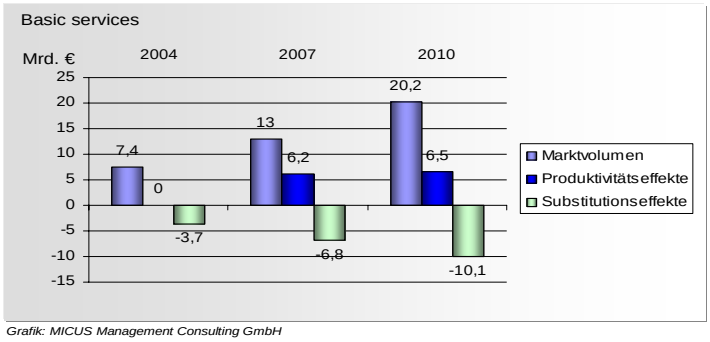
The widespread proliferation of broadband internet lines in Germany (relatively large national market where economies of scale are starting to be generated) will serve as a springboard to foreign markets for German providers of telecommunications equipment and technical services (system integrators and installation firms), as did the market for ISDN telephone systems in the 1990s. However, these effects cannot be accurately quantified at the moment and are therefore not specified here.

E Calculation of the net effects

BY 2010, NET EFFECTS WILL COME TO JUST UNDER 17 BILLION EUROS

The calculation of the net effects had to take into account that market growth in Germany will partly stem from displacement. On the other hand, SMEs will see productivity gains, which will be of relevance to the economy as a whole. The increase in net exports cannot be quantified and is thus not included in the calculation. The net effects will therefore climb from 3.7 billion euros in 2004 to 12.4 billion in 2007 and 16.6 billion euros by 2010.

It should be borne in mind that this calculation represents a good-case scenario. If, for unforeseeable reasons, the market were to develop more slowly than forecast, there would be negative repercussions for the whole market. For instance, if the German market for basic and communication services based on broadband were to develop slowly, German service and infrastructure providers would not be able to achieve economies of scale at a sufficient pace, which would have a negative impact on export opportunities. It is also possible that the users' productivity effects would not be of sufficient size, which would be detrimental to the international competitiveness of German businesses.



Grafik: MICUS Management Consulting GmbH

Figure 6: Effects in the basic services segment – Rapidly growing market volumes and productivity effects but displacement effects as well (billions of euros)

SUMMARY OF FINDINGS: PAGE 39

4.3 Value-added services

VALUE-ADDED SERVICES OF MAJOR SIGNIFICANCE IN MACROECONOMIC TERMS

Availability of appropriate value-added services will be a major factor in broadband penetration. It can be assumed that demand for broadband services will be stimulated not by single applications but by a wide range of services, a combination of those services and/or services designed for specific target groups [39)]. In macroeconomic terms, the benefits, in particular, and, to a certain extent, the effects on foreign trade in the area of value-added services play a significant role. The following chapters describe the individual segments and the outlook for them.

4.3.1 Entertainment services

DEFINITION OF ENTERTAINMENT SERVICES

The entertainment services segment comprises:

- online gaming,
- streaming audio and music downloads,
- TV services (IPTV and iTV) and
- streaming video, VoD, etc.

GROWTH POTENTIAL ON ONLINE GAMES MARKET

Multimedia services such as online gaming or music downloads already enjoy a high level of demand among broadband users, making them the most important fields of application for broadband technologies in the private customer segment. Furthermore, acceptance (and therefore marketability) of pay services is on the rise in this segment as shown by music download platforms, software downloads and video on demand services. The increasing data rates require a broadband connection, thereby acting as a direct catalyst for broadband penetration.

The online gaming segment can be broken down into the casual gaming and hardcore gaming submarkets, with the latter, in particular, offering high broadband-related development potential. It is assumed that the overall online games market in Western Europe and North America generated a turnover of more than 890 million euros in 2004 and that the figure will climb to 1.8 billion euros in the short space between then and 2007.

THREEFOLD INCREASE IN MUSIC DOWNLOADS IN ONE YEAR

The term “music-sharing service” refers to peer-to-peer platforms and services provided by computer firms, where users can download music online. Whereas illegal

[39)] *Deutsches Institut für Wirtschaftsforschung* (German Institute for Economic Research)

music-sharing services are facing increasing pressure from the music industry and the courts (due to copyright issues), more and more *legally* run services are enjoying market success. With the legal music-sharing services, the user pays a fee to the platform operator in order to download songs or even entire albums. According to figures compiled by the International Federation of the Phonographic Industry, the number of songs downloaded via legal music portals in the first half of 2005 was 157 million, up almost threefold on the previous year's 57 million.

Basic services and communication services: summary of findings

The above assessment of the basic services and communication services market segment indicates the following:

1 There is major market potential for service providers
2 Significant market potential is also evident for suppliers of infrastructure and telecommunications equipment
3 Displacement effects will occur
4 Productivity effects stemming from broadband use can be achieved by, in particular, SMEs

Apart from carriers and service providers, the main "winners" in the basic services and communication services segment are infrastructure suppliers and manufacturers of broadband equipment (hardware and software). On the user side, SMEs will benefit most from the upsurge in broadband penetration as they will be able to attain positive productivity effects. Last but not least, private households will also benefit thanks to price cuts resulting from tougher competition.

The figures can be expected to develop as follows (calculations by the Network Economy Group):

Market volume	**2004**	**2007**	**2010**
User figures (millions)	6.9	15.9	24.3
Access services and basic services (in billions of euros)	7.4	13	20.2

Displacement effects	**2004**	**2007**	**2010**
Services	-2.8	-5.8	-8.7
Infrastructure	-0.4	-0.6	-1.1
Terminals	-0.5	-0.4	-0.3
Total	**-3.7**	**-6.8**	**-10.1**

Productivity effects (in billions of euros)	**2004**	**2007**	**2010**
Access services and basic services	0	6.2	6.5

Net effects (in billions of euros)	**2004**	**2007**	**2010**
Market volume	7.4	13	20.2
Productivity effects	0	6.2	6.5
Displacement effects	-3.7	-6.8	-10.1
Total	**3.7**	**12.4**	**16.6**

"Internet television" means television programmes which are broadcast via xDSL. To use them, consumers need the appropriate hardware and an xDSL or FTTx line with adequate bandwidth.

GROWTH POTENTIAL DUE TO TRIPLE PLAY SERVICES

It should be noted at this juncture that triple play services, and internet television, are not particularly widespread in Germany. By contrast, internet television (IPTV) has already become established as a substitute for cable in Italy and France, where a wide audience watches television via xDSL lines. Germany has a high number of "multi-channel households", i.e. households which can receive 30 free TV channels, and this is currently presenting difficulties for companies endeavouring to market broadband-based pay TV offerings.

Digital television (HDTV), which uses conventional MPEG2 or MPEG4 coding on IP networks, also needs to be included in this segment. This method allows HDTV signals to be transmitted via broadband internet networks without requiring any additional processing. However, the issue of standardisation has not yet been completely resolved [40)].

The calculation of the market volume only takes into account those TV services which are offered on the basis of broadband internet platforms, e.g. DSL or UMTS networks. The TV-only services provided via cable TV networks are not included unless they are part of a triple play package.

INCREASING ACCEPTANCE OF VIDEO ON DEMAND

Video on demand (VoD) services allow subscribers to choose and play a film from a selection of video films at any time. Near-VoD (NVoD) is similar but users cannot dial into the video archive at any time. Instead, they can dial into the "stream" of a popular film at fixed intervals and the film then starts at a particular time (e.g. every quarter of an hour). More or less the same technique is also used for "time-shifted TV" (TSTV) via IP networks.

As broadband penetration increases, so does demand for VoD offerings. When asked about internet visions for the year 2010 in a study conducted in 2005, 54% of respondents stated that they liked the idea of video on demand (in the shape of an internet video library) [41)]. If the current market barriers can be overcome, a mass market could develop for these products.

INCREASING UMTS PENETRATION SPURRING GROWTH

[40)] There are currently still two competing standards – 720p and 1080i. Since 720p HDTV is based on a signal with a resolution of 1,280 x 720 pixels and does not use the interlacing used for the PAL standard in traditional analogue television, this standard is most likely to be successful in Europe. Furthermore, there are already more terminals, such as LCD and plasma screens or digital projectors, for the 720p standard. And the number of channels possible on the distribution and backbone networks is higher. It is for these reasons that the standard is also supported by the European Broadcast Union (EBU).
Although the 1080i standard offers a considerably higher resolution (1,920 x 1,080 pixels), it uses interlacing, a method which has now become technically superfluous. It is possible that the 1080p standard, which combines the advantages of 720p and 1080i, will replace 720p in the medium to long term.

[41)] TNS Infratest (N)Onliner-Atlas 2005

Mobile services (mobile gaming and mobile music) are taken into account on a pro rata basis in this segment because they are seeing more growth as UMTS becomes more widespread. The online advertising segment is also included in this section.

A Market volume

DELINEATION OF MARKET VOLUME FOR CALCULATION PURPOSES

The market volume was calculated on the basis of the following premises:

- triple play revenue was completely attributed to broadband internet. However, telephony and TV broadcast services contained in triple play offerings were included in the basic services and communication services segment on a pro rata basis;
- the area of TV broadcast services only takes into account TVoDSL and triple play via CATV networks, conventional TV broadcast services are not included;
- revenue from TV sets is only taken into account on a pro rata basis for the broadband market. The calculation uses the share of triple play customers on the broadband internet market as its basis;
- revenue from games consoles is also only taken into account on a pro rata basis. The calculation uses the share of broadband internet customers on the overall internet market as its basis;
- all revenue from music on demand/music downloads and from online advertising is included in the entertainment segment; and
- revenue from MP3 players (the actual devices) is not taken into account.

SUBSTANTIAL MARKET POTENTIAL IN ENTERTAINMENT SERVICES

The results show that the market volume for entertainment services came to 0.2 billion euros in 2004. However, this low figure should not blind readers to the fact that the market potential in this segment is substantial. The market is still at the beginning of a development process which will bring significant growth.

The development of the broadband entertainment market will largely depend on the number of private users, on the one hand, and the range of new services and willingness to pay for online services, on the other. The broadband user figures, in particular, already developed very positively in 2005 and will continue to enjoy sustainable growth over the next few years. Although Germany is just starting out when it comes to broadband entertainment services, most broadband internet providers are already beginning to offer broadband entertainment services and intend to expand them rapidly, which means that the situation is set to change markedly in 2006. The success of legal music download platforms and mobile games is already a sign that customers in Germany are also willing to pay for online content. In addition, whereas the lack of suitable terminals for broadband entertainment services (such as multimedia PCs, next-generation game consoles and digital HDTV displays) once posed a barrier to the proliferation of such services, the fact that they are now readily available means that that is no longer an issue.

Based on these pull effects, the carriers and service providers, which are now investing heavily in this market, will generate an additional push effect through large-scale marketing campaigns. The number of users will increase sharply on the back of major media events, such as the 2006 World Cup in Germany, making it possible to gradually raise revenue per customer.

The area of online advertising is also experiencing strong growth and depends directly on the number of broadband users because advertising income depends on the level of proliferation.

MARKET VOLUME: 9.3 BILLION EUROS POSSIBLE BY 2010

Taking all these factors into consideration, the market for entertainment services can be expected to grow from 0.2 billion euros in 2004 to 9.3 billion euros in 2010.

B Benefits

CONSUMER BENEFITS NOT QUANTIFIED

Entertainment services are used by private households. However, the benefit gained by them cannot be quantified in monetary terms.

In some cases, carriers and service providers will see considerable benefits. However, rather than taking the form of cost-cutting potential or productivity gains, they will come in the guise of new markets and business models. Since this study cannot draw any valid conclusions in this regard, it cannot quantify the benefits.

C Displacement effects

DISPLACEMENT EFFECTS ON CONVENTIONAL BROADCASTING

Consumer services will be precisely the area where there will be significant displacement effects, with TV and video offerings via broadband internet luring customers away from conventional broadcasting services.

ONLINE GAMES: DISPLACEMENT EFFECTS IN RETAIL SECTOR

Audio and video streaming/downloads will cause major displacement effects in the conventional electrical goods and media retail segment. This may lead to an almost complete disappearance of offerings for certain age groups in the traditional retail sector. Conventional-style video libraries will also increasingly be squeezed out of the market as broadband penetration grows. With online games becoming more widespread, computer and video games will primarily be sold via online platforms, which will is also likely to cause negative displacement effects in the traditional retail sector.

GROWTH IN ONLINE ADVERTISING AT EXPENSE OF OTHER MEDIA

Significant displacement effects will also occur as a result of online advertising though their impact will be totally offset by the market volume. There are two reasons

for this. First, online advertising budgets will grow at the expense of budgets for other media and, second, broadband forms of advertising will increasingly displace narrowband online advertising too.

Providers' infrastructure investments, on the other hand, will not cause any measurable displacement effects as they will be investments in new business models. These investments will be made by new market players – or at least players new to the particular market segment in question (e.g. Deutsche Telekom entering a new market segment as opposed to simply providing telecommunications services).

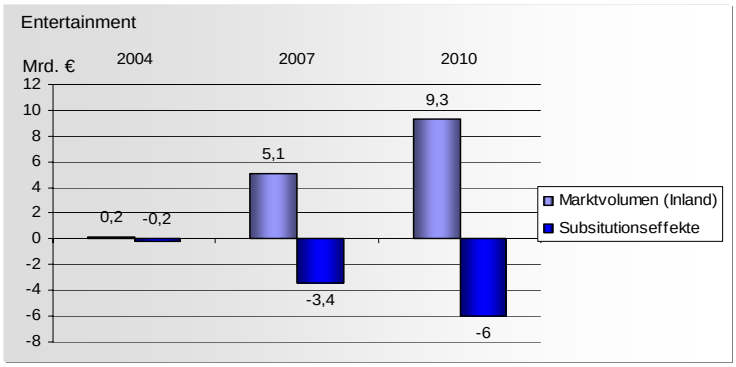
DISPLACEMENT EFFECTS WILL RISE TO 6 BILLION EUROS BY 2010

Taken together, the displacement effects came to 0.2 billion euros in 2004 and will rise to 6 billion euros by 2010. However, this also illustrates that market growth in the entertainment services segment will be genuine and not exclusively due to displacement of conventional offerings.

D Indirect effects

LIMITED EXPORT POTENTIAL IN ENTERTAINMENT SEGMENT

Since the entertainment market is restricted by cultural and linguistic borders, the export potential of entertainment services is extremely limited. Moreover, there is an increasing tendency to produce content tailored to specific, precisely defined customer sub-groups. The fact that broadband internet platforms can be particularly useful as distribution channels for special-interest content tends to be detrimental in terms of the ability to distribute content globally. No appreciable positive export effects are evident in the areas of online games, terminals and network equipment as these markets are dominated by providers from other countries. Consequently, it is not possible to identify any quantifiable indirect effects for this segment.



Grafik: MICUS Management Consulting GmbH

Figure 7: Development of the entertainment segment – market growth will significantly offset the displacement effects (billions of euros)

E Calculation of the net effects

In addition to the market volumes, the displacement effects are of relevance when calculating the net effects. Since the displacement effects will be smaller than the market volumes, positive net effects are possible in the coming years, with the figure set to reach 1.7 billion euros by 2007 and 3.3 billion euros by 2010.

SUMMARY OF FINDINGS: PAGE 45

4.3.2 E-commerce (B2C)

The e-commerce (B2C) market segment is comprised of online shopping activities where private users order online on the internet and sometimes pay online too [42)]. Commercial trade via internet/auction platforms is also included here, but not C2C business.

ONLINE SHOPPING INCREASINGLY REQUIRES BROADBAND TECHNOLOGIES

Internet-based selling of goods to consumers has long since become a widespread phenomenon. The product presentations in online shops are constantly being adapted to the technical possibilities, particularly with regard to transmission rates. In addition to the static shop interfaces, multimedia components (e.g. high-resolution photos and 3-D images of products) are increasingly being used, for which broadband lines are, at the least, advantageous.

MARKET POTENTIAL FOR SMEs

Although online shopping is already in widespread use, it still offers considerable potential for the market. SMEs in particular benefit from the cheap cost structure compared with traditional sales channels. But SMEs are precisely the segment which needs to catch up with the rest of the market since they have often not consistently exploited the possibilities presented by online selling. This aspect is becoming even more significant because online shopping allows small-sized providers to participate in the international/global market too. This has a positive effect on broadband penetration. Heightened competition means that, in addition to the possibility of ordering online, marketing will gain in significance and that will have a positive impact on the shift towards broadband described above.

The effects were calculated on the basis of the following market model:

MARKET MODEL FOR CALCULATING EFFECTS

1 Supply side: Market volume will be generated by vendors and service providers in the field of e-commerce software

[42)] This segment includes online purchasing of products (e.g. software) but not downloads of games and videos.

2 Demand side: Trade volume [43] will be generated by companies which sell products via online shops. By using these technologies, they will achieve productivity effects
3 Displacement effects: As online trade develops, it will displace conventional mail-order and retail business
4 Effects on foreign trade: The net exports generated by online trade need to be taken into consideration

A Market volume

The market for e-commerce software and services will continue to enjoy high growth in the medium term too. In 2004, the market volume for e-commerce software in Germany totalled 0.5 billion euros (the market volume for e-commerce software and services is assessed for B2C and B2B together since it is not possible to divide up the quantities for the two segments here). Germany's share of the European e-commerce market and e-commerce software and services markets currently stands at 30% [44].

MARKET VOLUME FOR E-COMMERCE SOFTWARE CAN BE EXPECTED TO DOUBLE TO 0.9 BILLION EUROS BY 2010

Though market growth consolidated between 2002 and 2004, increasing broadband penetration will cause the market to develop further over the next few years. The European e-commerce software market is forecast to reach a volume of 2.1 billion euros by 2006 [45] and Germany's share of that will come to 0.6 billion euros. The market is expected to grow by 10% p.a. over the next couple of years, resulting in the rapid development of the market volume for e-commerce software and services. Consequently, the market volume can be expected to reach almost double its current figure by 2010, climbing from 0.5 billion euros in 2004 to 0.9 billion euros in 2010.

Entertainment services: Summary of findings

The above assessment of the how the market will develop indicates the following:

1 There is major market potential for service providers
2 New, interactive business models will be rolled out on the basis of broadband internet
3 There is also major market potential for suppliers of infrastructure and telecommunications equipment
4 Significant displacement effects will occur in the area of broadcast services
5 Productivity effects arising from the use of broadband internet will not be possible in the entertainment services segment

In addition to operators of online platforms for music, video and online games, the main winners in the entertainment services segment are producers of specialist

[43] The trade volume is often considered to be the e-commerce B2C market volume. Here, however, it refers to the market for software and services (e.g. online shop components) at the beginning of the value chain.
[44] BITKOM (http://www.bitkom.org/files/documents/Praesentation_Berchtold_CeBIT-PK_03.03.2005.pdf)
[45] The European Market for E-Commerce Software (Report 3887), 2005, Frost & Sullivan

software for streaming and peer-to-peer applications. On the user side, private households will benefit but this effect cannot be evaluated in monetary terms.

The following effects (in billions of euros) can be expected (calculations by the Network Economy Group):

Market volume – Entertainment	**2004**	**2007**	**2010**
Services	0.1	1.4	4
Infrastructure	0	1	1
Terminals	0	2.4	3.8
Total	**0.1**	**4.8**	**8.8**

Market volume – Online advertising	**2004**	**2007**	**2010**
Total	**0.1**	**0.3**	**0.5**

Displacement effects – Online advertising	**2004**	**2007**	**2010**
Total	**0.1**	**0.3**	**0.5**

Displacement effects - Entertainment	**2004**	**2007**	**2010**
Services	-0.1	-1.2	-2.9
Infrastructure	0	0	0
Terminals	0	1.9	2.6
Total	**0.1**	**3.1**	**5.5**

Net effects	**2004**	**2007**	**2010**
Market volume (Germany)	0.2	5.1	9.3
Displacement effects	-0.2	-3.4	-6
Total	**0**	**1.7**	**3.3**

B Benefits

E-commerce trade volume

BROADBAND TECHNOLOGY DRIVING E-COMMERCE MARKET

The e-commerce (B2C) trade volume is set to grow even more strongly than the market volume for e-commerce software and services, having enjoyed a tenfold increase in turnover from 1999 to 2004 and being forecast to continue growing. However, the first saturation effects can now be seen as growth has started to slow down slightly. A key point with regard to broadband's influence on this trend is that broadband customers tend to make more, bigger online purchases than customers with narrowband lines. This may be due to the fact that the pages are loaded more quickly and the systems are more stable. This example indicates clearly that increasing broadband availability has a positive effect on the development of the e-commerce market. In fact, it can be expected that market growth over the next few years will predominantly stem from the higher rate of broadband penetration. Conversely, growth in the e-commerce sector will lead to more demand for broadband lines on the part of online retailers.

DOUBLE-FIGURE E-COMMERCE GROWTH RATES IN PERIOD UP TO 2010

Against this backdrop it comes as no surprise that all of the forecasts assume that the volume of e-commerce (B2C) trade will carry on growing at a considerable rate over the next few years. Whilst growth in the online shopping segment was up 15% on the previous year in 2004, it is set to stabilise at 10% p.a. in the coming years.

In 2004, the volume of online shopping trade in Germany's retail segment (excluding mail order) came to 13 billion euros [46] and the volume of online mail-order trade totalled 4.9 billion euros [47]. Thus, the overall trade volume for e-commerce in 2004 amounted to 17.9 billion euros. Broadband-enabled customers accounted for 40% of that sum [48]. Their share will grow to 70% by 2007 and 90% by 2010 owing to higher broadband penetration, which means that an increasing portion of the trade volume will be broadband-based. It should also be borne in mind that, on average, a broadband shopper buys twice as much on the net as a narrowband consumer, thereby generating more turnover.

THREEFOLD INCREASE IN E-COMMERCE TRADE VOLUME BY 2010

As a result, the share of broadband trade volume will grow, climbing from 57% in 2004 to 95% in 2010. The broadband-based trade volume in the e-commerce (B2C) segment will grow from 10.2 billion euros in 2004 to 30 billion euros in 2010.

Productivity effects

PRODUCTIVITY EFFECTS IN RETAIL AND MAIL-ORDER TRADE

However, the productivity effects which e-commerce produces for companies play a more important role than trade volume when determining the macroeconomic impacts. E-commerce brings about real productivity gains in the form of cost reductions, particularly in the sales area, as a result of, for example, fewer field staff or sales rooms/staff.

This means that retailers can cut costs by 10% through savings on staff and rent. The mail-order segment can decrease the costs involved in administrative processes (e.g. order-handling), resulting in an average cost reduction of 2%.

PRODUCTIVITY EFFECTS OF OVER 2 BILLION EUROS BY 2010

The productivity effects thus generated came to 0.8 billion euros in 2004 and will climb to 2.3 billion euros by 2010. These productivity effects in the retail and mail-order trade will help make the two sectors more competitive.

E-commerce (online shopping) can also help private customers cut costs and reduce the time required to purchase consumer goods. However, this study does not quantify these benefits.

C Displacement effects

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[46] Source: *Hauptverband des Deutschen Einzelhandels* (German Retail Association)
[47] Cf. *Bundesverband des deutschen Versandhandels* (Federal Association of German Mail Order Traders), January 2005, excluding C2C trade
[48] Source: (N)Onliner-Atlas 2005

LION'S SHARE OF E-COMMERCE TRADE VOLUME WILL BE GENERATED BY DISPLACING CONVENTIONAL TRADE

Recent years have shown that the entire consumer market depends – at least in the short term – on disposable household income and economic growth. With the economic growth trend at around 1.5%, the high growth rates in the e-commerce segment are bound to be achieved through displacement of conventional trade in the majority of cases.

In 2004, the broadband-based displacement effects totalled -10.2 billion euros and they are set to increase to -30 billion euros by 2010. However, the displacement effects in the retail and mail-order segments are a necessary consequence of efforts to harness the cost-cutting potential of e-commerce, which means that they will help raise competitiveness in the consumer segment, a particularly stagnant area.

D Effects on foreign trade

Existing studies illustrate that the impact of e-commerce on exports cannot be quantified [49)]. Nonetheless, it *is* possible to estimate the effects based on the facts described below.

There are two key success factors in terms of export, i.e.:

SUCCESS FACTORS FOR E-COMMERCE-BASED EXPORT

- economies of scale – the medium-term market opportunities will be better for large companies and
- logistics infrastructure – a highly developed logistics infrastructure makes it possible for smaller, specialised suppliers to tap into an international customer base too. This means that new customer groups can be harnessed.

Germany is well-positioned with regard to both of these factors. Whilst it is true that the biggest (by customer numbers) B2C e-commerce vendors on the German market are currently American firms, more than three quarters of customers purchase their goods from German enterprises, as reflected in those companies' good position on the German market. German companies have built a solid foundation for exports via e-commerce and 16% of them were already selling goods abroad using e-commerce platforms in 2004 [50)].

Export opportunities are boosted by the strong domestic demand though it should be pointed out that the German market is particularly large (30% [51)] of the Western European e-commerce market) compared with other European countries. Interestingly, Germany's GDP only accounted for 21.3% of Western European GDP in 2004 [52)].

[49)] Cf. http://www.zew.de/en/forschung/projekte.php3?action=detail&nr=289&abt=ikt

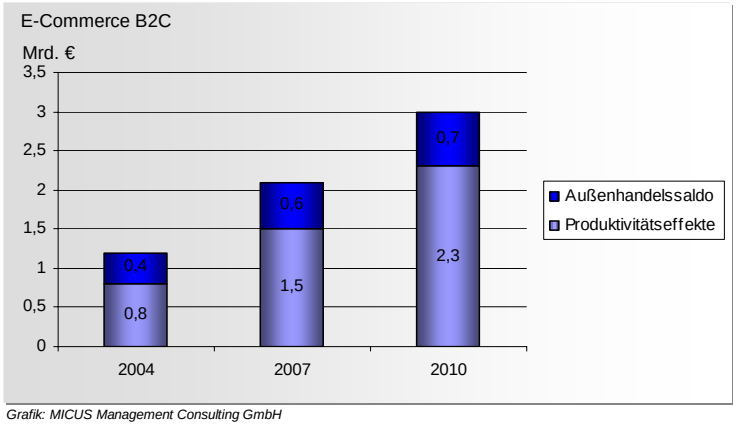
[50)] *Statistisches Bundesamt* (Federal Statistical Office): "Informationstechnologie in Unternehmen und Haushalten 2004" (Information technology in enterprises and households 2004)

[51)] Source: BITKOM (Federal Association for Information Technology, Telecommunications and New Media) /EITO, 2005

[52)] Source: EUROSTAT

POSITIVE E-COMMERCE (B2C) FOREIGN TRADE BALANCE

The research carried out for this study confirms the assumption that the reason why the German share of the Western European e-commerce market is so much bigger than Germany's share of Western European GDP is the country's exports. The findings pointed to a positive foreign trade balance of 0.4 million euros in 2004 and 0.7 billion euros in 2010. The ongoing improvement of the foreign trade balance is especially due to the broadband-based market growth of 10% p.a. A particularly positive aspect is that the retail and mail-order segments, which were previously quite nationally oriented, will be able to post positive net exports.



Grafik: MICUS Management Consulting GmbH

Figure 8: Net effects in the e-commerce (B2C) segment, in billions of euros

E Calculation of the net effects

The national market volume is not particularly relevant when calculating the net effects since it is derived from displacement. The productivity effects and the positive foreign trade balance play a much more important role.

SUMMARY OF FINDINGS: PAGE 50

The net effects therefore came to 1.2 billion euros in 2004 and will increase to 3 billion euros by 2010.

4.3.3 E-commerce (B2B)

The term "e-commerce (B2B)" refers to electronic sales and purchases (e-procurement) of goods.

E-PROCUREMENT – A CORE COMPONENT OF E-COMMERCE (B2B)

A core component of e-business applications is e-procurement, which enables companies to buy goods and services over the internet.

This trend is being promoted by the increasing division of labour in industry (vertical integration), which is raising the requirements for the way in which different businesses work together at various levels of the value chain. This in turn is raising the requirements concerning procurement management. E-procurement solutions provide assistance in meeting those requirements.

GOOD BASIS BUT SMEs NEED TO CATCH UP

However, although e-procurement solutions are readily available, their potential has not yet been exploited. 56% of companies which actually buy online state that online purchases account for less than 5% of their procurement volume [53)]. To date, exchange of goods between companies has primarily been prompted by large businesses increasingly integrating internet-based processes into their operations. Although this has led to small and medium-sized enterprises (mainly suppliers to the larger companies) following suit, the SMEs still have a great deal of catching up to do.

E-commerce (B2C): Summary of findings

1 Nationwide broadband availability will boost the development of e-commerce (B2C) and create growth in the e-commerce software and services segment
2 In the short term, market growth in the e-commerce (B2C) segment will have a displacement effect on conventional mail-order and retail trade. However, macroeconomic growth can be achieved on the basis of the productivity effects
3 E-commerce will lead to productivity effects (cost reductions), particularly for retailers, and therefore result in competitive advantages
4 Thanks to the good export opportunities, e-commerce (B2C) is already generating positive net exports now

In addition to carriers and providers, the main winners in the e-commerce (B2C) segment are vendors of e-commerce software and services. The winners on the user side are online retailers and multi-channel enterprises. Positive effects can also be expected for logistics/delivery service providers.

The figures can be expected to develop as follows (figures in billions of euros; calculations by MICUS Management Consulting GmbH):

E-commerce software	**2004**	**2007**	**2010**
Market volume	0.5	0.7	0.9

Trade volume – B2C e-commerce	**2004**	**2007**	**2010**
Growth rate p.a.	15%	10%	10%
Trade volume, B2C e-commerce	17.9	23.8	31.7
Share attributable to broadband	57%	82%	95%
Broadband-based trade volume	10.2	19.6	30

[53)] Cf. Berlecon Research: “IT im Supply Management 2004” (IT in supply management 2004)

Productivity effects	**2004**	**2007**	**2010**
Broadband-based trade volume	10.2	19.6	30
Productivity effects, retail	0.7	1.4	2.1
Productivity effects, mail order	0.1	0.1	0.2
Total	**0.8**	**1.5**	**2.3**

Displacement effects	**2004**	**2007**	**2010**
Displacement effects, B2C e-commerce	-17.9	-23.8	-31.7
Displacement effects, broadband-based	-10.2	-19.6	-30

Foreign trade balance	**2004**	**2007**	**2010**
Trade volume, B2C e-commerce	17.9	23.8	31.7
Export	2.9	3.9	5
Import	2.5	3.3	4.3
Foreign trade balance	0.4	0.6	0.7

Net effects	**2004**	**2007**	**2010**
Productivity effects	0.8	1.5	2.3
Foreign trade balance	0.4	0.6	0.7
Total	**1.2**	**2.1**	**3**

INFLUENCE OF BROADBAND ON B2B E-COMMERCE

E-commerce (B2B) – the counterpart to e-procurement – will be positively influenced by the availability of broadband. It will enable large amounts of data (e.g. charts) to be transported more quickly and e-commerce processes to be tightly integrated into internal systems so as to cultivate a smooth, efficient workflow. E-commerce also offers a means of securing acceptance for broadband lines by converging e-commerce applications with other value-added services, such as video telephony, in the ordering process.

The highest level of e-business integration and use will be attained by companies which use the applications to automate dealings with suppliers and customers and not simply to integrate internal processes. However, in order to fully automate and integrate business processes from the supplier right through to the customer, they *will* have to harmonise their internal processes, the aim being to integrate the merchandise management systems with the e-procurement and e-business platforms.

As far as this aspect is concerned, Germany's businesses rank average by international standards. 32% have already integrated their internal processes and applications, 25% are currently doing so or planning the details. It can be assumed that, the more they integrate, the more they will use broadband services.

The effects were calculated on the basis of the following market model:

MARKET MODEL FOR CALCULATING EFFECTS

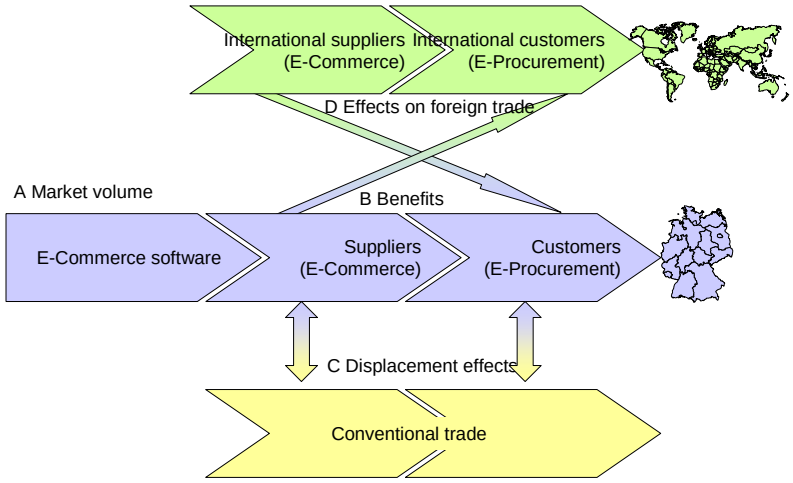


Figure 9: The value chain for e-commerce (B2B)

1 Supply side: Market volume on the supply side will be generated by vendors and service providers in the field of e-commerce software (see B2C e-commerce)
2 Demand side: Market volume on the demand side will stem from online trade between suppliers and customers
3 Displacement effects: Online trade will be conducted at the expense of conventional trade
4 Effects on foreign trade: The net exports figure is made up of imports from international suppliers and exports to international customers

A Market volume (supply side)

Since the supply-side market volume in the area of e-commerce software and services has already been calculated under e-commerce (B2), there is no need to show it separately here.

B Benefits

PRODUCTIVITY EFFECTS ON SUPPLIER SIDE

The benefits which companies can achieve through e-commerce (B2B) are linked to the development of the trade volume, which stood at 180.3 billion euros in Germany in 2004 [54)]. However, there is still abundant market potential. Based on a conservative forecast, double-digit growth rates can be expected over the next few

[54)] Source: BITKOM (Federal Association for Information Technology, Telecommunications and New Media), "Daten zur Informationsgesellschaft. Status quo und Perspektiven Deuschlands im internationalen Vergleich" (Data on the information society. Germany's current situation and prospects compared with other countries"), 2005 edition (figures from 2004)

years [55]. American studies assume that the development will start to slow down in 2007 (due to saturation) and it is likely that the same will be true of the German market [56]. Consequently, the annual growth rate up until 2007 can be expected to be 18% with a fall to 15% forecast for after 2007. So the market volume will swell from 180.3 billion euros in 2004 to 450 billion euros in 2010. These figures can be used to calculate the productivity effects both for suppliers and customers.

INCREASE IN E-COMMERCE (B2B) TRADE VOLUME FROM 180 BILLION EUROS IN 2004 TO 450 BILLION EUROS IN 2010

Suppliers which use e-commerce will enjoy positive effects thanks to, in particular, reduced sales costs, shorter time to market and better customer retention. Of these effects, the reductions in sales costs are the main ones that can be quantified – sales costs will drop from an average of 15% of total turnover to 12% as a result of e-commerce [57]. This will lead to an upsurge in the productivity effects on the supplier side from 3.2 billion euros in 2004 to 8.1 billion euros in 2010. Some of these effects will be passed on to the customers, who will also be able to cut costs though this shift is not relevant in macroeconomic terms.

PRODUCTIVITY EFFECTS ON CUSTOMER SIDE

E-commerce will also deliver advantages for businesses which procure goods and/or services since, for example, they will be able to buy better or cheaper products/services and reduce process costs. A suitable method for determining the productivity effects is to calculate the process costs separately for A, B and C articles [58]. In 2004, 75% of the e-commerce (B2B) market volume came from B and C articles and 25% from A articles [59]. It should be noted that companies' confidence in e-procurement is on the rise and so the share of electronically procured A articles will probably increase to 35% by 2007 and 45% by 2010. E-commerce enables customers to bring down costs by an average of 30% [60]. Consequently, the productivity effects related to process costs came to 1.7 billion euros in 2004 and will be around 3.6 billion euros in 2010.

PRODUCTIVITY EFFECTS TOTALLING 12 BILLION EUROS ARE POSSIBLE BY 2010

These calculations indicate that there is major cost-cutting potential on the customer side too. As a result, productivity effects totalling just under 12 billion euros are possible for suppliers and customers by 2010.

C Displacement effects

[55] According to a BITKOM/EITO forecast, the market volume will come to 580.6 billion euros in 2008.
[56] Cf. 8th Factual Report *Monitoring Informationswirtschaft* (Monitoring the information economy), p. 288
[57] Source: Authors' own survey; cf. Impulse/IBM study on "E-business im bundesdeutschen Mittelstand" (E-business in German SMEs) (http://www.impulse.de/downloads/E-Business_2004.pdf)
[58] The process costs for B and C articles amount to 4% of procurement costs, the figure for A articles is 1%.
[59] Source: Authors' own survey; cf. also case study at http://www.unitec.it/de/tesi/augsburg/cap4.2.html
[60] Source: Authors' own survey; see also case studies at http://www.ecin.de/strategie/beschaffung/ and http://www2.intershop.de

E-commerce will displace conventional trade. As this will result in shifts within one and the same sector, there will not be any effects of macroeconomic relevance.

D Effects on foreign trade

INTERNATIONAL ONLINE TRADE WILL RESULT IN PRODUCTIVITY EFFECTS AT HOME AND ABROAD

The growth in the e-commerce (B2B) segment will not cause the (overall) market to grow though such growth *could* occur if online trade causes export surpluses. The productivity effects attained by the market players at home and abroad will play a key role in this context. In international online trade, both the German and the foreign trading partner will benefit from the cost reductions brought about by e-commerce. Consequently, the competitiveness of the German company *and* of the foreign partner will improve.

INDICATORS OF E-BUSINESS' CONTRIBUTION TO SUCCESSFUL FOREIGN TRADE OPERATIONS

It is not possible to calculate precisely whether these effects will have a positive or negative overall impact on the German economy. However, there *are* indicators which can serve as a basis for some preliminary conclusions. The E-Business Sophistication Index [61)], for instance, ranks Germany highly. Another indicator is the level to which companies conduct e-business with their customers and suppliers [62)]. These figures show that more German companies are engaged in e-business with their suppliers than is the case with their counterparts in France, the USA, the UK and Italy. On the other hand, when it comes to the level of e-business with customers, German suppliers rank average.

POSITIVE E-BUSINESS FOREIGN TRADE BALANCE OF 6.4 BILLION EUROS IN 2004

As part of this study, a projection was done, taking into account both the e-commerce foreign trade volumes and the level of e-business conducted between customers and suppliers. The results showed that e-commerce generated a positive foreign trade balance of 6.4 billion euros in 2004.

A pivotal aspect in this context is that the productivity effects on the supplier side are higher than those on the customer side. Suppliers can reduce costs by 1.8% of their total turnover whereas customers will see cost reductions of just under 1% (see the calculations for the productivity effects). Germany as an export nation will profit from this situation because there is potential for extremely large cost reductions on the supplier side. The fact that precisely the level of e-business conducted between German suppliers and their customers is below average by international standards shows that the cost-cutting potential has not yet been fully exploited.

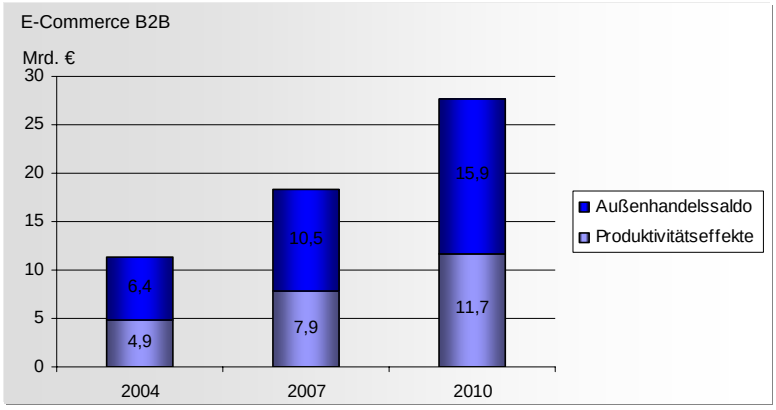
KEY IMPORTANCE OF E-COMMERCE (B2B) FOR GERMANY AS AN EXPORT NATION

[61)] Cf. 8th Factual Report *Monitoring Informationswirtschaft* (Monitoring the information economy), p. 294
[62)] Cf. 8th Factual Report *Monitoring Informationswirtschaft* (Monitoring the information economy), p. 304

As the trade volume rises, the foreign trade balance can also be expected to increase and to reach as much as 15.9 billion euros by 2010 – if the prevailing conditions remain constant. This projection underlines the major significance of e-commerce (B2B) for Germany's export-oriented economy.

E Calculation of the net effects

The calculation takes into account the cost cuts triggered by e-commerce and e-procurement plus the effects on foreign trade. Added together, they result in net effects amounting to 11.3 billion euros for 2004. Due to the strong growth in this segment, that figure may reach as much as 27.6 billion euros by 2010. Although the figures show that Germany is already very well-positioned in this segment, it is also clear that there is still major market potential, particularly for SMEs.



Grafik: MICUS Management Consulting GmbH

Figure 10: Overview of the effects in the e-commerce (B2B) segment:
high productivity effects and positive foreign trade balance (in billions of euros)

SUMMARY OF FINDINGS: PAGE 57

4.3.4 Online IT services

The online IT services segment comprises on-demand services and business process outsourcing (BPO) in the following areas:

- back-office applications,
- system integration/networks,
- desktop support,
- data centres,
- ERP systems and
- web-based applications

DEFINITION OF ONLINE IT SERVICES

MAJOR SIGNIFICANCE OF COMPUTING AND SOFTWARE ON DEMAND

The services can include hardware outsourcing and online procurement of software and related services. Computing on demand, which involves additional, external server capacity being provided as required, is already very common, for example. It allows customers to keep a minimum level of resources and not have to be geared to peak loads. The software mainly comprises business-management applications (e.g. CRM, ERP and accounting systems) which allow companies to cut their software costs substantially compared with solutions installed in house.

Apart from the required transmission rates, the main thing that makes services such as BPO or on-demand offerings typical broadband applications is the necessity for always-on functionality.

The effects were quantified on the basis of the following market model:

MARKET MODEL FOR CALCULATING EFFECTS

1 Supply side: Market volume on the supplier side will be generated by providers of online IT services
2 Benefits: On the demand side, companies which use the services will attain productivity effects
3 Displacement effects: Online IT services will cause displacement among vendors of hardware and software and in the conventional IT outsourcing segment [63)]
4 Effects on foreign trade: In terms of the foreign trade balance in this segment

A Market volume

HIGH MARKET POTENTIAL FOR ONLINE IT SERVICES

An analysis of the current market situation highlights the high potential in this segment. Whereas online IT services accounted for around 17% of the IT market in 2004, the Gartner market research institute anticipates that some 30% of all IT services will be offered on demand by as early as 2006 [64)]. Whilst the average growth rate on the IT market is roughly 3%, the figure is 5% for IT services and growth rates of over 9% are forecast for the outsourcing segment for 2006 [65)]. In 2004, the market volume came to 10.3 billion euros [66)] and it will have reached 15.4 billion euros by 2010 – representing an annual market growth rate of 7% [67)].

The high growth rates in this segment point to considerable benefits, which are calculated in the following section.

B Benefits

[63)] "Conventional outsourcing" means that certain parts of a company (e.g. its data centre) are spun off. With online IT services, on the other hand, a service is provided online by an external company.
[64)] http://www.roadmap-it.de/download/niknews8.pdf
[65)] Cf. EITO, Detecon
[66)] Cf. Detecon forecast 2005; www.detecon.com
[67)] Authors' own survey, see also: Detecon forecast 2005, www.detecon.com

COST CUTS BASED ON USE OF ONLINE IT SERVICES

Use of online IT services will result in significant productivity effects (cost reductions) on the demand side. Online procurement of software, for instance, enables large companies, but particularly small companies, to save money [68]. For example, SMEs can save 66% of their software costs by buying CRM systems online and large companies can save 31% [69]. Rental of computing and server capacity can also lead to substantial cost cuts. Companies' computing capacity is often not utilised to the optimum because it is usually geared to peak demand times [70]. As a result, costs can be greatly decreased by outsourcing computing capacity [71].

It should be borne in mind that the cost-cutting potential of over 50% quantified for suppliers is based on the top figures cited. It can be assumed that the mean savings over several years will be lower, at approximately 20%. Significant productivity gains will be achieved nonetheless. The cost cuts triggered by productivity effects totalled 2.5 billion euros in this segment in 2004 and are set to climb to 3.7 billion euros by 2010.

E-commerce (B2B): Summary of findings

Taken together, the findings show that broadband availability will be crucial for companies seeking to engage in e-commerce. If they wish to conduct a large number of their transactions online, they will not be able to do without high transmission speed, high system stability and always-on functionality. Nationwide broadband availability is therefore key to ensuring that German businesses remain competitive on the international e-commerce market as well as being a major factor in strengthening the German economy.

- Significant positive macroeconomic effects will be achieved
- German companies' international competitiveness will increase and this could result in higher net exports

Although German industry is already very well-positioned in this segment, there is still substantial development potential – especially in the SME sector. The figures can be expected to develop as follows (calculations by MICUS Management Consulting GmbH):

E-commerce software	**2004**	**2007**	**2010**
Market volume	0.5	0.7	0.9

E-commerce B2B	**2004**	**2007**	**2010**

[68] Example: 80% of the customers of Salesforce.com, the world's largest CRM on demand provider, based in America, have less than 20 users. Cf.: http://www.computerwoche.de/index.cfm?page-id=256&artid=80000&main_id=80000&category=26&currpage=1&kw=

[69] Soreon Research "Software-on-Demand: Kosten senken bei CRM, Finanz- und Office-Software" (Software-On-Demand: Reducing the Costs of CRM, Financial and Office Software), March 2004. Another example cited was that SMEs can save 72% on software costs in the field of accounting and large companies can save 83%.

[70] Cf. http://www.roadmap-it.de/download/niknews8.pdf The utilisation rate for mainframes is currently only 60%.

[71] Cf. http://www.teltarif.de/arch/2003/kw09/s9987.html According to this information, a large car manufacturer which rents computing capacity on demand saves a fifth of its costs.

Trade volume	180.3	296.2	450.5

Productivity effects, customer side	**2004**	**2007**	**2010**
Market volume, e-commerce (B2B)	180.3	296.2	450.5
Purchasing volume, B/C articles	135.2	192.6	247.8
Process costs	3.8	5.4	6.9
Reduction of process costs using e-procurement for B/C articles	1.6	2.3	3
Purchasing volume, A articles	45.1	103.7	202.7
Process costs	0.3	0.7	1.4
Reduction of process costs using e-procurement for A articles	0.1	0.3	0.6
Total reduction of process costs	1.7	2.6	3.6

Productivity effects, supplier side	**2004**	**2007**	**2010**
Market volume, e-commerce (B2B)	180.3	296.2	450.5
Sales costs as a share of turnover	27	44.4	67.6
Reduction of sales costs using e-business	3.2	5.3	8.1

Productivity effects	**2004**	**2007**	**2010**
Reduction of sales costs using e-business	3.2	5.3	8.1
Total reduction of process costs	1.7	2.6	3.6
Total	**4.9**	**7.9**	**11.7**

Foreign trade balance	**2004**	**2007**	**2010**
Foreign trade balance	6.4	10.5	15.9

Net effects	**2004**	**2007**	**2010**
Productivity effects	4.9	7.9	11.7
Foreign trade balance	6.4	10.5	15.9
Total	**11.3**	**18.4**	**27.6**

C Displacement effects

SUBSTANTIAL DISPLACEMENT EFFECTS WITHIN IT SECTOR

As online IT services develop, there will be a shift in supply within the IT sector, causing substantial displacement effects. This will predominantly affect conventional outsourcing and sales of hardware and software. However, the significant growth rate in the area of online IT services (7% as opposed to 3% for the IT market) will more than offset the substitution effects. The overall outcome will therefore be market growth (e.g. through SMEs acquiring new customers). By 2004, the development of the IT services/outsourcing segment had generated -8 million euros in displacement effects in other IT segments (which means that 2.3 billion euros of the 10.3 billion euros in market volume was due to market growth). The displacement effects will reach -9.5 billion euros by 2010.

D Effects on foreign trade

MARKET DOMINATED BY INTERNATIONAL PROVIDERS

In the short term, the development of the online IT services segment will result in services being imported because most of the market leaders in the segment are from abroad, particularly the USA [72]. The German companies chiefly act as distribution partners. However, there are good market opportunities in Germany, in the area of on demand software for example, in particular for small, specialised companies [73].

NEGATIVE FOREIGN TRADE BALANCE IN ONLINE IT SERVICES SEGMENT

As there is currently no detailed information about the effects on foreign trade in this segment, a projection was done for the purpose of the study, based on imports and exports in the IT segment. Since a large number of the providers are from abroad, the foreign trade balance in this segment is negative. It came to -2.5 billion euros in 2004 and will fall to -3.7 billion euros by 2010. This effect can be offset within the economy as a whole since use of online IT services will raise the competitiveness of businesses (customers) in Germany.

ADDITIONAL BENEFITS FROM IMPORTED SERVICES

The import surplus will lead to additional productivity effects because use of imported services makes productivity gains possible in the same way as described in Section B, Benefits. This will result in additional import-related productivity effects, rising from 0.6 billion euros in 2004 to 0.9 billion euros in 2010.

E Calculation of the net effects

POSITIVE NET EFFECTS OF 6.8 BILLION EUROS BY 2010

The calculation of the net effects took into account the productivity effects triggered by both domestic and imported services plus growth on the market for online IT services. The result is negatively influenced by the effects on foreign trade. Consequently, the net effects came to 2.8 billion euros in 2004 and will reach 6.8 billion euros by 2010.

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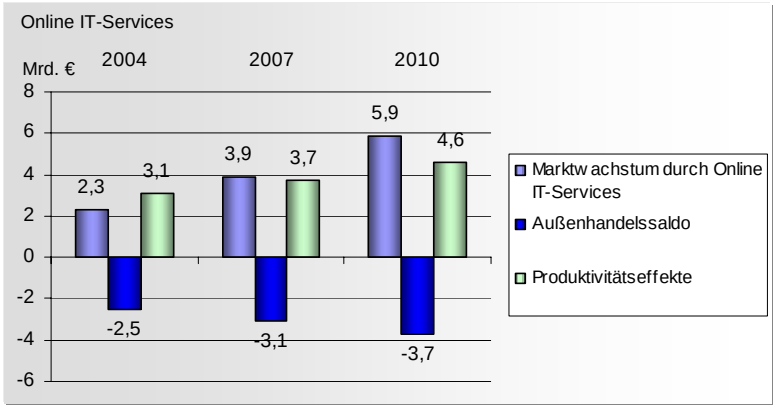
[72] Cf. http://www.crmondemand.com/crm/forrester-research.jsp Forrester Research, for example, cites eight companies, all from the USA, as the market leaders in the field of distribution software.

[73] Cf. http://www.computerwoche.de/index.cfm?pageid=254&artid=77774&type=detail&kw=on%20demand&rc=260 Unlike the general software market, the market for on demand software is dominated by small, specialised firms, not large ones.



Grafik: MICUS Management Consulting GmbH

Figure 11: Development of the IT services segment: Market growth and productivity effects can significantly offset the negative foreign trade balance (in billions of euros)

Nevertheless, the result highlights two aspects, i.e.:

- development in this segment will have a positive impact on the German economy despite negative effects on foreign trade and
- this is a segment with considerable growth potential.

SUMMARY OF FINDINGS: SEE BELOW

4.3.5 Home working/teleworking

SIGNIFICANCE OF BROADBAND CONNECTIONS FOR TELEWORKING

This segment comprises temporary or permanent work performed outside of official business premises (especially home working). It covers activities which require an office workspace (laptop/PC and telephone) but not other forms of home working. Numerous professionals, in the fields of sales, teaching or freelancing (architects, graphic designers, translators, tax consultants or solicitors), telework. An internet connection and software/hardware are usually essential for their teleworking activity.

Online IT services: Summary of findings

Online IT services enable companies to cut costs as well as creating market growth in the IT sector. A large chunk of the services are imported, which results in a negative effect on foreign trade, but this can be offset by increasing competitiveness on the part of German companies. Overall, development in this segment will lead to significant positive effects for the economy as a whole – the potential here has by no means already been fully exploited.

The figures can be expected to develop as follows (figures in billions of euros; calculations by MICUS Management Consulting GmbH):

Market volume, online IT services	**2004**	**2007**	**2010**
Market volume, online IT services	10.3	12.6	15.4

Productivity effects, businesses	**2004**	**2007**	**2010**
Productivity effects, businesses	2.5	3	3.7

Foreign trade balance	**2004**	**2007**	**2010**
Import	5.1	6.2	7.6
Export	2.6	3.1	3.9
Foreign trade balance	-2.5	-3.1	-3.7
Import-related productivity effects	0.6	0.7	0.9

Displacement effects	**2004**	**2007**	**2010**
Market growth triggered by online IT services	2.3	3.9	5.9
Displacement effects in IT sector	-8	-8.7	-9.5

Net effects	**2004**	**2007**	**2010**
Productivity effects, businesses	2.5	3	3.7
Market growth triggered by online IT services	2.3	3.9	5.9
Net effects, domestic	4.7	6.9	9.6
Foreign trade balance	-2.5	-3.1	-3.7
Import-related productivity effects	0.6	0.7	0.9
Net effects (incl. foreign trade)	2.8	4.5	6.8

As well as having the same technology as at official business premises, new products are appearing for home workplaces, especially networked applications based on virtual private networks (VPNs). High download and upload bandwidths are necessary to be able to use home office applications efficiently, particularly if the home worker has to communicate closely with the company (via the company's intranet, for instance) or access and share files. The market for home office applications will grow as teleworking becomes more widespread. Increasing broadband availability/high bandwidths will advance the development of the convergence technologies.

DESCRIPTION OF MARKET MODEL

The effects were quantified on the basis of the following market model:

1 Supply: The supply side consists of vendors and service providers in the field of software and hardware. In addition, the extra communication costs are a key cost factor in teleworking but these have already been included in the calculation of the infrastructure market volume and are thus not posted separately here
2 Demand: The demand side consists of companies which use teleworking as a means of enhancing efficiency.

A Market volume

The market volume in the area of teleworking covers costs for hardware and software (including communication), furniture and additional costs (expendables, power), which come to a total of 700 euros p.a. per teleworkplace [74)].

In 2004, 6% [75)] of workers with PC workstations in Germany teleworked most or all of the time, whilst 14% teleworked occasionally. Since it cannot be assumed that everyone in the latter group has been equipped with a teleworkplace, the actual number of teleworkplaces is lower. It can therefore be assumed that teleworkplaces currently account for 8% of all workplaces. The market volume was calculated on the basis of the following premises:

DELINEATION OF BROADBAND-BASED TELEWORKING MARKET FOR CALCULATION PURPOSES

1 At the end of 2004, there were 39 million people in employment [76)]. It is assumed that the number of jobs which could, in principle, be performed by means of teleworking will remain constant until 2010.
2 The growth rates in the area of teleworking are double-digit but will decrease constantly over the next few years as saturation sets in [77)]. They stood at 18% in 2004, will fall to 8% in 2007 and to 4% in 2010.
3 Up until 2003, the share of broadband-based teleworkplaces was small. Since 2004, growth in the area of teleworking has chiefly been broadband-based. Jobs which require ongoing communication with the company headquarters, other branches or customers can also be performed on a homeworking basis thanks to the availability of broadband. In addition, narrowband teleworkplaces will be gradually upgraded to broadband over the next few years. The share of broadband-based telworkplaces stood at 45% in 2004 and can be expected to increase to 70% by 2007 and 90% by 2010.

BROADBAND-BASED MARKET VOLUME OF 2.3 BILLION EUROS POSSIBLE BY 2010

This results in a market volume of 0.8 billion euros for 2004 and 2.3 billion euros for 2010. This in turn indicates that increased broadband penetration will lead to a continuous upswing in the market volume in the period up to 2010.

B Benefits

BUSINESSES WILL REALISE COST REDUCTIONS WORTH 6.7 BILLION EUROS BY 2010

On the demand side, teleworking will generate real productivity gains for businesses – in the form of accelerated processes, higher flexibility and lower costs for facilities (e.g. desk-sharing costs). This will enable the costs per workplace to be cut by an average of 5% net [78)]. It should also be borne in mind that a large number of

[74)] The extra communication costs are estimated at around 500 euros p.a.. However, they are already included in the calculation of the market figures for the infrastructure segment.
[75)] Source: destatis, microcensus
[76)] Source: destatis
[77)] Cf. Gartner Group: Forecast: Teleworking, Western Europe, 2000-2010
[78)] This figure takes into account the extra costs involved in teleworking (market volume).

teleworking jobs are done by qualified employees. The productivity effects thus come to 2.2 billion euros for 2004 and will already have reached 6.7 billion euros by 2010.

There will also be employees on the part of the employees (more planning flexibility and shorter travel times, for instance) but they are not quantified in monetary terms in this study.

C DISPLACEMENT EFFECTS

DEFINITION OF DISPLACEMENT EFFECTS

Displacement effects may occur as a result of the lower number of commuters on the roads and public transport. The significant traffic-related effects forecast in earlier studies have been questioned or at least greatly qualified in more recent studies, which is why they are not considered here.

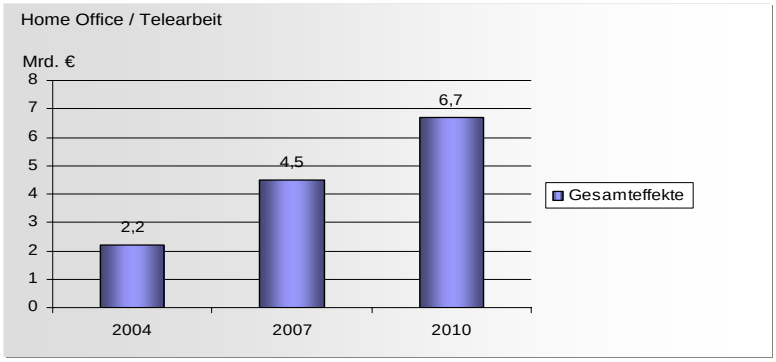
Since the influence of teleworking on the real estate market (lower demand for office space) cannot be verified on the basis of what is currently known, it is also not examined here.

D Effects on foreign trade

The benefits (cost reductions) on the part of businesses will lead to an increase in international competitiveness. It should be noted that Germany has a lower teleworking ratio than, say, the Scandinavian countries, but it cannot be said that Germany is significantly below the international average. The effects on foreign trade are therefore not quantified in this study.

NO QUANTIFIABLE EFFECTS ON FOREIGN TRADE

E Calculation of the net effects



Grafik: MICUS Management Consulting GmbH

Figure 12: Development of net effects in the home working/teleworking segment (in billions of euros)

The net effects correspond to the benefits because there are no displacement effects or effects on foreign trade. The net effects therefore come to 2.2 billion euros for 2004 and 6.7 billion euros for 2010. Although teleworking only represents a small market segment for providers, the net effects are high compared with other service segments.

SUMMARY OF FINDINGS: PAGE 65

The figures show that growth in the home working/teleworking segment will be significantly boosted by broadband technology.

4.3.6 Transaction-based e-government

Over the past few years, a variety of e-government services have developed at all levels of government in Germany. Special campaigns, such as “BundOnline 2005”, have greatly expanded the range of e-government services. As a result, at the time this study was conducted (October 2005), 66% of all German public services – from simple information queries through to data exchange for companies – were available via the internet [79)].

E-government at the local level is even more important than the e-government services provided by Germany’s national and federal-state governments since 80% of contacts between public authorities and the public occur on a local level.

WIDE RANGE OF E-GOVERNMENT PROJECTS ONLY INCLUDES A FEW BROADBAND-SPECIFIC SERVICES

Customers can use narrowband technology to access the majority of the applications, i.e. information portals or electronic application-filing. Broadband-specific services (which are necessary due to high data volumes) only exist in a few cases. However, applications requiring broadband connections are almost bound to materialise if e-government is truly seen as the electronic version of a “customer-supplier relationship”. The following observations concentrate on this area of transaction-based e-government. It comprises interactive online services (e.g. procedures for filing applications) provided by the national, federal-state and local governments. Online services used to present information and facilitate communication are not included since they are not typical broadband applications.

The effects were calculated on the basis of the following market model:

*MARKET MODEL TAKES INTO ACCOUNT BENEFITS FOR PUBLIC AUTHORITIES **AND** BUSINESSES*

1 Supply: The supply side consists of service providers (IT vendors and consulting firms), which generate the market volume
2 Benefits: The direct customers for the IT services are public authorities, which achieve tangible benefits by implementing e-government services. The customers for

[79)] This puts Germany in the middle of the international ranking. By way of comparison, in Sweden (the top-ranking country) 89% of public services are available online.

the e-government services are businesses and the public and they can also attain significant benefits
3 Displacement effects and effects on foreign trade are of secondary importance in this segment

Home working/teleworking: Summary of findings

Teleworking enables businesses to cut costs significantly and raises their international competitiveness. The increasing rate of broadband penetration is making it possible for jobs which require a sophisticated ICT infrastructure to be performed on a teleworking basis. This will create growth on the ICT market.

Positive macroeconomic effects will arise as costs are reduced. All in all, the development of broadband technology will give a huge boost to growth in the home working/teleworking segment.

The results of the calculations were as follows (calculations by MICUS Management Consulting GmbH):

Market volume	**2004**	**2007**	**2010**
IT-equipped teleworkplaces (000s)	2,411	3,228	3,726
Broadband-based teleworkplaces (000s)	1,085	2,259	3,353
Market volume (in billions of euros)	1.7	2.3	2,6
Market volume, broadband-based (in billions of euros)	0.8	1.6	2.3

Productivity effects	**2004**	**2007**	**2010**
Broadband-based teleworkplaces (000s)	1,085	2,259	3,353
Cost reductions (in billions of euros)	2.2	4.5	6.7

Net effects (in billions of euros)	**2004**	**2007**	**2010**
Cost reductions	2.2	4.5	6.7
Net effects	2.2	4.5	6.7

A Market volume

E-GOVERNMENT MARKET WILL CONTINUE TO GROW OVER NEXT FEW YEARS

The market for IT services for e-government is large and growing. The budget for *BundOnline 2005* alone totalled 1.45 billion euros [80)]. The budget for e-government in Western Europe is estimated to have been 38 billion euros in 2004 [81)], of which 25% was the German budget.

Since only some of the services which could be put online have actually been made available online so far and most authorities are still in the planning and roll-out phase, particularly with regard to application-filing procedures, the market still holds potential

[80)] Source: www.heise.de
[81)] Source: www.move-online.de, study by IDC

for growth. Past experience on e-government projects has shown that, rather than being a simple task involving standard IT components, making application-filing procedures online-capable actually entails a sizable amount of programming work. For IT service providers, this means that the lion's share of their turnover in this segment presently stems from project business. However, it is beginning to become apparent that annual costs of around 20% of the investment volume are incurred after the projects go live, thereby constituting a permanent source of revenue for them. The growth rate in this segment comes to 5.3% [82)], which is significantly higher than the average growth on the IT market (3%).

In line with this, the market volume can be expected to expand over the next few years. It stood at 9.5 billion euros in 2004 and will reach 12.7 billion euros by 2010. It should be borne in mind, however, that not all of the market volume is broadband-based and that only the transaction-based e-government services are taken into consideration for the purposes of this study.

SIGNIFICANCE OF BROADBAND-DEPENDENT TRANSACTION-BASED SERVICES WILL RISE

A survey carried out for this study showed that approximately one third of all potentially online-capable services are transaction-based but only around 25% of them had actually been implemented online. It should be noted, though, that putting transaction-based services online is a much more complicated process than making information and communication services available online. This study therefore uses a cost factor of 1.5 to calculate the market share attributable to transaction-based services. The market volume totalled 3.2 billion euros in 2004. Though the figure is already very high, it should not be forgotten that only a fraction of the potential has been harnessed so far.

MARKET VOLUME FOR TRANSACTION-BASED SERVICES WILL CLIMB FROM 3.2 BILLION EUROS IN 2004 TO OVER 7 BILLION EUROS IN 2010

B Benefits

Effects for public authorities

Transaction-based e-government enables public authorities to raise their productivity by a substantial degree. The savings made as a result of *BundOnline 2005* alone are estimated at 400 million euros per year [83)]. The following aspects should be taken into account when examining the productivity effects:

- e-government offers total potential savings of 5%;
- the savings potential does not match the actual savings made. It depends on the extent to which online provision is implemented and on the market penetration/frequency of use of the services. If a service is made available online but the majority of users still opt for the conventional method using analogue services, no significant savings will be made; and
- past experience shows that where savings potential is fully exploited, the actual savings take roughly four years to materialise.

[82)] Source: move-online.de, study by IDC
[83)] Source: www.move-online.de

BENEFITS OF OVER 1 BILLION EUROS FOR PUBLIC AUTHORITIES

The total savings potential in the area of transaction-based services – most of which arises from reductions in payroll costs – can be estimated at 4.2 billion euros, which is approximately 50% of the overall savings potential offered by e-government. As authorities have only implemented some of these services to date and the savings will not materialise fully until a later stage, the actual productivity effects are lower. They came to 0.6 billion euros in 2004 and will reach a volume of 1.4 billion euros by 2010.

AS WELL AS REDUCING COSTS, PUBLIC AUTHORITIES WILL ENHANCE THEIR PERFORMANCE AND QUALITY

Apart from these directly monetary effects, the main impact of e-government will be to enhance public authorities' services by, for example, shortening approval times and doing away with waiting and travelling times for the public and businesses. The measurable effects this will have for businesses are described in the following section.

Effects for businesses

*BUSINESSES CAN CUT COSTS **AND** RAISE TURNOVER*

The benefits to be drawn from transaction-based e-government will enable businesses to cut costs *and* to raise turnover/productivity.

Appreciable cost reductions will be made possible by virtue of lower transaction costs (as it will no longer be necessary to actually physically *go* to the authorities). The results of a survey among businesses which use *BundOnline 2005* services reveal the following picture [84)]:

- 32% of the businesses surveyed stated that they had saved up to 30% of their costs,
- 25% said the figure was between 30 and 60% and
- 8% cited a figure above 60%.

3.5 BILLION EUROS IN COST REDUCTIONS

Businesses incur annual costs of 15 billion euros through their dealings with public authorities [85)] – two thirds of which (10 billion euros) is for transaction-based services. Transaction-based online services can bring costs down by 35% [86)] (3.5 billion euros).

Moreover, accelerated processes will have a significant impact on productivity and turnover as, for example, swifter approval procedures will shorten the time to market

[84)] Source: Federal Ministry of the Interior, *BundOnline* project group in the IT department, September 2005
[85)] Source: *Deutsches Institut für Wirtschaftsforschung* (German Institute for Economic Research)
[86)] Source: Projection based on the results of the *BundOnline* customer survey

for companies' products. Consequently, in an average of 10% of cases, process acceleration brings about real turnover growth of an average of 3% [87)].

There are another two factors to be taken into account when examining the benefits actually attained, i.e.:

1 The potential for benefits in this segment has by no means been fully exploited. A large share of the e-government services implemented to date are intended for the public but the public does not gain any benefit which could be measured in monetary terms. By contrast, there are numerous possible services with benefits for the economy which *could* be measured in monetary terms

2 A distinction has to be made between availability of online services and actual use. Studies point out that market penetration does not occur until four years after the service has been implemented. For instance, a study from 2004 found that 23% of businesses which use e-government services use transaction-based services [88)].

PRODUCTIVITY EFFECTS FOR BUSINESSES WILL EXCEED 3 BILLION EUROS BY 2010

The productivity effects (cost reductions and turnover gains) therefore already came to 1.4 billion euros in 2004 and will rise to 3.1 billion euros by 2010. As well as raising the competitiveness of the German economy, the productivity effects achieved by businesses can also help refinance tax-financed provision of online services. This point in itself gives a clear indication of the importance of transaction-based e-government as a positive locational factor for businesses.

C Displacement effects

NO DISPLACEMENT EFFECTS OR FOREIGN TRADE EFFECTS OF MACROECONOMIC RELEVANCE

Since this is a new market segment, no significant displacement effects are anticipated. Displacement effects are therefore not quantified in this study.

D Effects on foreign trade

The calculation of the productivity effects has already highlighted the importance of transaction-based e-government as a locational factor, i.e.:

- German businesses will become more competitive and
- e-government can encourage new businesses to set up in Germany.

However, these indirect effects will not be quantified at this juncture.

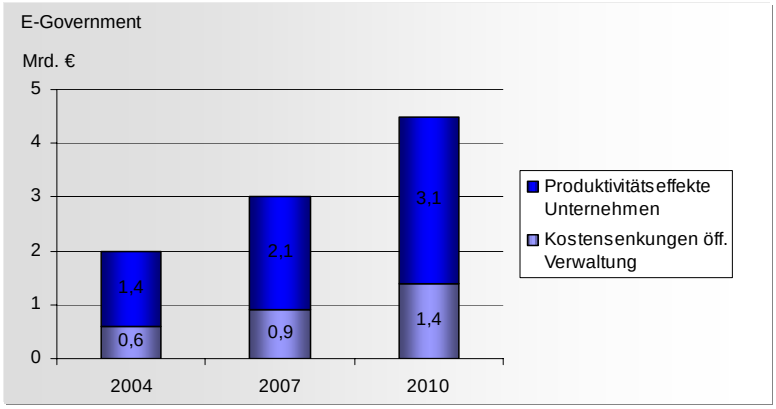
In addition to the macroeconomic effects, German IT service providers could also benefit if e-government in Germany develops in a vigorous manner. For example, export opportunities will open up for standard IT components which are already being

[87)] This calculation is based on the gross value added, which was 2,003 billion euros in 2004 (source: destatis). 10% of that is 200 billion euros and 3% of that is 6 billion euros, which represents the potential productivity gain. How much of that potential is exploited will depend on the degree to which online services are implemented and penetrate the market.

[88)] Source: *Deutsches Institut für Wirtschaftsforschung* (German Institute for Economic Research)

successfully deployed in Germany (e.g. solutions for application-filing procedures or payment platforms). However, it is not possible to quantify these effects at present.

E Calculation of the net effects



Grafik: MICUS Management Consulting GmbH

Figure 13: Net effects in the e-government segment: Major productivity effects for businesses plus cost reductions for public authorities (in billions of euros)

The (publicly financed) market volume in the e-government segment was not taken into account in the calculation of the net effects. However, the benefits attained by public authorities and businesses *are* of macroeconomic relevance. The resulting net effects come to 2 million euros for 2004 and 4.5 billion euros for 2010. This highlights once again the need to push ahead with e-government projects, particularly in the area of (broadband) transaction-based services.

NET EFFECTS WILL RISE FROM 2 BILLION EUROS IN 2004 TO 4.5 BILLION EUROS IN 2010

The calculations reveal that e-government could be one of the key segments in the broadband market. However, for that to happen, e-government services will have to be designed to be broadband-specific. In other words, a tailored broadband strategy is required for e-government in order to harness the market potential.

SUMMARY OF FINDINGS: PAGE 71

4.3.7 E-health

Telemedicine (i.e. the use of health telematics to overcome the geographical separation of patient and doctor or of numerous doctors) comprises applications such as the e-health card/electronic patient record, teleconsultation and telecooperation, telemonitoring, medical training and services for the medical profession.

WIDE RANGE OF POTENTIAL USES FOR BROADBAND-BASED E-HEALTH APPLICATIONS

The purpose of telemedicine is to improve healthcare, shorten waiting times and hospital stays and avoid multiple examinations. At the same time, the technology offers considerable rationalisation potential, given that 20 to 40% of healthcare services involve data collection and communication. Some of the applications, such as online transmission of high-resolution X-ray images or video broadcasts of operations, are only possible using broadband technology.

HIGH MARKET POTENTIAL FOR E-HEALTH SERVICES

Even though the market for broadband-based e-health services is currently still small, there is substantial growth potential for the period up to 2010. However, it is also evident that Germany is lagging behind other countries and that the market volumes could actually be markedly higher *now* – given the right framework (see international comparison). If the market potential is to be harnessed in a way which generates positive macroeconomic impacts, the necessary services need to be implemented quickly.

For this study's quantitative assessment, e-health is defined in a narrower sense. The assessment covers specific applications in the healthcare sector, particularly the following three areas, which are all heavily dependent on broadband availability: inter-hospital/doctor networking for the purpose of data exchange, telemedicine and e-health cards. It does not take into account use of generic online applications such as e-procurement or e-learning.

The effects were calculated on the basis of the following market model:

MARKET MODEL FOR CALCULATING EFFECTS

1 Supply: Market volume will be generated by providers of specialised IT services for the healthcare sector
2 Benefits: Productivity effects will be attained by the healthcare community – doctors, hospitals, pharmacies and health insurance companies. The ultimate beneficiaries are the patients, who enjoy stable health insurance fees and better-quality treatment. However, the ensuing effects are not calculated here.
3 These are evolving markets – displacement effects are of minor significance.
4 Potential effects on foreign trade also need to be taken into account (export and import of e-health services).

A Market volume

MARKET POTENTIAL OF PUBLIC E-HEALTH PROJECTS

The calculation of the market volume had to take into consideration that the roll-out of the e-health card is still at the planning stage and is scheduled for 2006 (the test phase has just started). It is estimated that 1.7 billion euros will be invested in the e-health card and that the system will cost 150 million euros per year to run. Since it is currently not possible to specify exactly when the card will be rolled out, the market volume for the period 2005 to 2007 was averaged for quantification purposes. As of

2008, the e-health card is also intended to be used to record medicines prescribed for the patient, which will create an additional 100 million euros in annual costs. The electronic patient record is scheduled to be introduced in 2010, generating an additional market volume of 450 million euros per year.

TELEMEDICINE – A MAJOR GROWTH MARKET

Whereas the e-health card is still at the planning stage, telemedicine and inter-hospital/doctor networking are already in use to a certain extent. In particular, broadband applications are already being used to exchange large electronic documents (e.g. x-ray images) between hospitals/doctors and there is huge market potential in this field [89)]. Telemedicine, on the other hand, is still in its infancy in Germany. But developments in other countries, e.g. the USA, indicate that high growth rates can be expected in this segment. According to a forecast by Frost & Sullivan, the European market for telemedicine will grow by an average of 42.5% per year in the period up to 2010 [90)].

BROADBAND-BASED MARKET VOLUME WILL TOTAL 1.5 BILLION EUROS BY 2010

B Benefits

The potential benefits to be drawn from e-health are sizable. It is forecast that costs can be decreased by 10 to 20% just by using telemedicine. In fact, part of that potential can be harnessed in the form of productivity effects as early as 2010.

E-government: Summary of findings

Transaction-based e-government offers high potential, i.e.:

1 High market potential with additional growth opportunities
2 Market growth without any appreciable displacement effects
3 Significant benefits for public authorities and businesses
4 Increase in Germany's competitiveness as a business location

A nationwide broadband infrastructure is essential if efficient transaction-based services are to be implemented. The significantly positive macroeconomic effects illustrate the necessity for the national, federal-state and local governments to swiftly expand their range of transaction-based e-government services.

The results were as follows (calculations by MICUS Management Consulting GmbH):

Market volume (in billions of euros)	**2004**	**2007**	**2010**
Market volume, total	9.5	11	12.7
Market volume, transaction-based services	3.2	4.9	7.4

[89)] In 2005, 6% of doctors used the internet to exchange patient data (cf. study: "Wirtschaftliche und politische Chancen der Informationsgesellschaft" (Economic and Political Opportunities of the Information Society) – Deutsche Telekom, Siemens, The Boston Consulting Group)
[90)] http://www.healthcare.frost.com

Productivity effects, businesses (in billions of euros)	**2004**	**2007**	**2010**
Cost reductions, businesses	0.5	0.8	1.2
Turnover effects, businesses	0.9	1.3	1.9
Productivity effects, businesses	1.4	2.1	3.1

Productivity effects, public authorities	**2004**	**2007**	**2010**
Degree to which online services are implemented	25%	38%	58%
Cost reductions (in billions of euros)	0.6	0.9	1.4

Net effects (in billions of euros)	**2004**	**2007**	**2010**
Cost reductions, public authorities	0.6	0.9	1.4
Productivity effects, businesses	1.4	2.1	3.1
Total	**2**	**3**	**4.5**

The following aspects must be borne in mind:

1 From 2007 onwards, the e-health card can save 0.5 billion euros per year
2 Recording of medicines prescribed for the patient will save an additional 0.2 billion euros per year from 2008 onwards
3 In 2010, when the electronic patient record is rolled out, additional savings of 0.2 billion euros will be possible
4 The productivity effects in the areas of telemedicine and networking are linked to market growth. In 2004, as much as 120 million euros was saved in the two areas (combined). The more these technologies are used, the larger the productivity effects will be

BENEFITS WILL CLIMB TO 1.4 BILLION EUROS BY 2010

Consequently, the productivity effects could increase more than tenfold by 2010. They stood at 0.1 billion euros in 2004 and are set to total 1.4 billion euros in 2010.

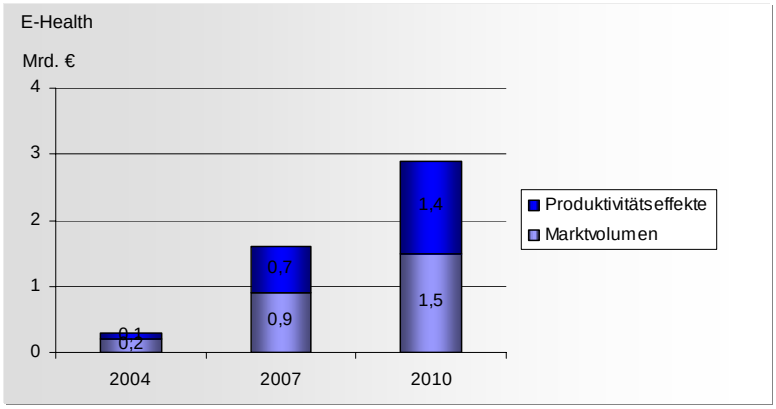
C Displacement effects

This is a new market segment so displacement effects are of minor significance. IT intensity in the healthcare sector is low compared with other sectors. It is assumed that 20% of hospital budgets will be invested in IT infrastructure alone by as early as 2005.

D Effects on foreign trade

NO RELEVANT POSITIVE EFFECTS ON FOREIGN TRADE ARE TO BE EXPECTED IN SHORT TERM DUE TO CURRENT MARKET SITUATION

E-health technologies have high export potential. The market is growing rapidly worldwide and is opening up opportunities for German businesses too. However, countries such as the USA, which started out from a different position, are still in the lead at the moment. As a result, it is not possible to quantify the positive effects on foreign trade at this time.



Grafik: MICUS Management Consulting GmbH

Figure 14: Net effects in the e-health segment: Rapid growth in market volume and productivity effects (in billions of euros)

The calculation of the net effects took into account both the market volume and the productivity effects. The resulting net effects are set to rise from the 2004 figure of 0.3 billion euros to 2.9 billion euros in 2010. These figures are relatively modest compared with the market volumes already achieved in other industrial nations. However, they underline the major potential in this segment, a segment which stands out from others as a growth market without any significant displacement effects.

SUMMARY OF FINDINGS: SEE BELOW

A concerted effort on the part of all relevant market players would be conducive to ensuring that that potential is harnessed as quickly as possible.

E-health: Summary of findings

The e-health market holds high potential, i.e.:

1 There are considerable growth opportunities for service providers and specialised vendors
2 The market growth can be achieved without any real displacement effects since this is a new market
3 Efficiency in the healthcare sector can be raised significantly
4 The segment should be developed quickly to keep up with the rest of the world. That means, for example, that the possible applications offered by the e-health card should be used as much as possible

A nationwide broadband infrastructure is essential if efficient e-health services are to be developed. The main winners will be IT service providers, healthcare professionals and, last but not least, patients (through stable health insurance fees, for example).

Despite the major potential, the German market is still at the teething stage compared with other markets. However, the fact that the market volumes are presently still small should not blind readers to the fact that experts already see e-health as a key segment of the broadband market. It would therefore be advisable to devise a market development strategy dedicated to ensuring the market potential can be tapped into as soon as possible.

The results (in billions of euros) were as follows (calculations by MICUS Management Consulting GmbH):

Productivity effects	**2004**	**2007**	**2010**
Savings, e-health card	0	0.5	0.5
Savings, records of medicines prescribed	0	0	0.2
Savings, patient record	0	0	0.2
Productivity effects, networking/telemedicine	0.1	0.2	0.5
Total	**0.1**	**0.7**	**1.4**

Market volume	**2004**	**2007**	**2010**
Market volume, e-health card	0.1	0.6	0.7
Market volume, networking/telemedicine	0.1	0.3	0.8
Total	**0.2**	**0.9**	**1.5**

Net effects	**2004**	**2007**	**2010**
Market volume, total	0.2	0.9	1.5
Productivity effects	0.1	0.7	1.4
Total	**0.3**	**1.6**	**2.9**

4.3.8 E-learning

BENEFITS OF E-LEARNING OFFERINGS

This study subsumes internet-based and computer-based learning under the term “e-learning”. However, successful e-learning offerings do not simply transfer existing analogue courses onto the internet – instead, they make full use of the possibilities offered by the internet. They provide considerable cost-cutting potential but only if they are used regularly and by a large number of people. This is because developing e-learning content is relatively costly. Creating an e-learning course, for example, costs an average of 60,000 to 70,000 euros [91)].

In addition to the funding activities of the EU and Germany’s national government, recent years have seen a rising number of private-sector initiatives aimed at increasing use of e-learning. These initiatives take the form of alliances between relatively large companies, such as the MIT21 alliance or the E-Learning Industry

[91)] Source: *E-Government Computing*, issue from July 2005, "Sparsame Fortbildung" (Economical further education)

Consulting Group. Smaller companies usually try a different tack, setting up communities of interests, sometimes with the support of chambers of industry and commerce or other organisations.

HIGH POTENTIAL FOR BROADBAND E-LEARNING

Although the market for broadband-based e-learning is still small at the moment, it offers great growth potential. This study takes into account the areas of web-based training and blended learning but not computer-based training (CBT), which involves providing the teaching content on, for example, data storage devices.

A distinction needs to be drawn between commercial offerings for businesses (especially for in-company continuing training) and offerings for private users (language courses, for instance). The market for private users is currently still small (and dominated by free content) and is therefore not covered here. The calculation of the market volume also excludes e-learning offerings which companies produce and use in house. However, non-commercial offerings from public institutions (e.g. e-learning offerings supplied by institutes of higher education) *are* included in the assessment.

As the offerings assessed here all require broadband (both on the supplier's and the customer's side), the effects identified are broadband-based.

The assessment is based on the following market model:

PREMISES USED IN CALCULATION OF EFFECTS

1 Supply: The supply-side market volume stems from service providers, technology vendors and content providers. Since it is often the case that all of these tasks are performed by one single provider (a full-service provider), the calculation does not separate the software vendor and content provider categories
2 Demand: Productivity effects will mainly be achieved by businesses
3 Displacement effects: Development in the e-learning segment will result in displacement effects on conventional (continuing) training
4 Foreign trade: Both the potential for export and for import of e-learning content should be examined in order to ascertain the effects of foreign trade

A Market volume

The e-learning market is growing. It is still in its infancy and holds huge potential for development though it has been developing more slowly than assumed in earlier forecasts [92)]. The market potential is currently estimated at 250 million euros but the actual revenue generated is much lower. The 15 largest providers of CBT and e-learning services in Germany generated a turnover of around 100 million euros in

[92)] Earlier forecasts anticipated an increase from 120 million euros in 2000 to 1.3 billion euros in 2004. These figures include CBT (cf. "Status quo und Zukunftsperspektiven von E-Learning in Deutschland" (Status quo and outlook for e-learning in Germany) – report commissioned by *Neue Medien in der Bildung + Fachinformation*, 2004)

2004, though it should be pointed out that this was the total turnover, i.e. it also included revenue from other products [93)].

MARKET VOLUMES CURRENTLY SMALL BUT MAJOR GROWTH POTENTIAL

In 2004, the market volume for e-learning in the sense used in this study came to 80 million euros [94)]. However, significant growth can be expected over the next few years, with an average growth rate of 30% up to 2010. The reasons are twofold. First, the market will expand as a result of products and business models being developed for SMEs. And second, business users will increasingly enjoy economies of scale (and thus cost advantages over conventional teaching methods) over the next few years, which will have a positive influence on demand. Consequently, the market volume can be expected to increase to 0.4 billion euros by 2010.

B Benefits

IN ADDITION TO IMPROVING QUALITY, E-LEARNING WILL CONTRIBUTE TO QUANTIFIABLE PRODUCTIVITY GAINS

In the e-learning segment, it is possible to identify quantifiable productivity effects which can be confirmed by empirical evidence. Past studies have demonstrated that companies which use e-learning have seen improvements, particularly with regard to their business performance [95)].

Two aspects are of relevance when calculating the effects, i.e.:

- theoretically speaking, there is no limit to the number of participants on an e-learning course. As a result, substantial economies of scale are possible; and
- positive effects arise due, in particular, to lower travel expenses and shorter periods of absence.

The ability to realise the economies of scale is one of the keys to the success of e-learning offerings. Although one single lesson is relatively expensive to produce, in theory it can be used for an unlimited number of participants. Since the market is still emerging, the economies of scale achieved so far are small.

CRUCIAL FOR SUCCESS OF E-LEARNING: REALISATION OF ECONOMIES OF SCALE

In view of the required economies of scale, e-learning offerings are currently of most benefit to large businesses. Development of offerings and price/business models for SMEs, on the other hand, is still in the initial stages. Increasing the level of modularisation and re-use can compensate for SMEs' disadvantage due to their

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[93)] Cf. ranking list drawn up bz the Hightext publishing house, April 2004, http://www.ibusiness.de/branche/ranking/db/ranking.0238sn.9566sn.html

[94)] Cf. *Monitoring Informationswirtschaft* (Monitoring the information economy), 6th Factual Report, 2003, NFO Infratest GmbH & Co. KG on behalf of the German Federal Ministry for Economics and Labour. The report cites a market volume of 50 million euros.

[95)] Cf. "E-Learning – die verkannte Chance?" (E-learning – an unrecognised opportunity?) Summary of an online study by Pixelpark AG and Deutsche Medienakademie Köln. The findings show that almost 15% of the top 350 companies expect e-learning to bring about a clearly measurable, monetary improvement for their business: a whole 37% expect negligible effects.

small economies of scale. In the light of these facts, it can be expected that the overall productivity effect per e-learning lesson will remain constant.

Furthermore, it should be borne in mind that some of the current e-learning products (corporate TV, for example) were produced in house by the companies themselves. Although they are not reflected in the market volume, they do create productivity effects. It can be assumed that around one third of the courses presently in use were produced in house. However, that figure will fall by half by 2010 to be replaced by commercial offerings.

PRODUCTIVITY EFFECTS ALREADY TOTALLED 0.3 BILLION EUROS IN 2004

In particular, businesses will be able to cut costs as a result of course participants being absent for shorter periods and travel expenses being reduced. In these areas, e-learning can bring about significant savings, averaging at 30% [96]. Furthermore, the fees payable to the e-learning provider (for producing the course and, in some cases, conducting the training) amount to 25% of the overall e-learning costs. Based on these figures, the productivity effects for 2004 are calculated to be worth 0.3 billion euros. This figure could rise to 1.4 billion euros by 2010. The results highlight the fact that the productivity effects by far exceed the supply-side market volume.

IMPROVEMENT OF TRAINING QUALITY THROUGH E-LEARNING

Besides the quantifiable effects, the main benefits are that individuals can choose how much time to spend on the course, the products can make use of multimedia, the content can be updated constantly and the courses can have a modular structure and be geared to specific target groups [97]. These factors will make a significant contribution to the improvement of training quality.

Positive effects are also possible in the non-commercial area due, for example, to an improved level of education resulting from publicly available e-learning offerings However, it is not possible to quantify the macroeconomic impact of such effects.

C Displacement effects

HARDLY ANY DISPLACEMENT EFFECTS: BLENDED LEARNING WILL COMBINE E-LEARNING AND CONVENTIONAL METHODS

The market for commercial courses is dependent on companies' budgets for continuing training and can therefore be considered constant in the short term. However, since new demand may be generated by e-learning offerings in the medium term, the development of the e-learning segment will only have a displacing effect on some of the other training courses.

Moreover, e-learning directly displaces CBT (e.g. courses on CDs). That displacement constitutes a shift in supply within one sector and is therefore not quantified here. In addition, e-learning is often seen as a substitute for conventional continuing training. However, it is becoming clear that e-learning will establish itself

[96] Existing examples of good practice have cost reductions of as much as 45%; cf. *E-Government Computing*, issue from July 2005, "Sparsame Fortbildung" (Economical further education).
[97] Cf. http://www.lernet-info.de/frames/lernet_open.html

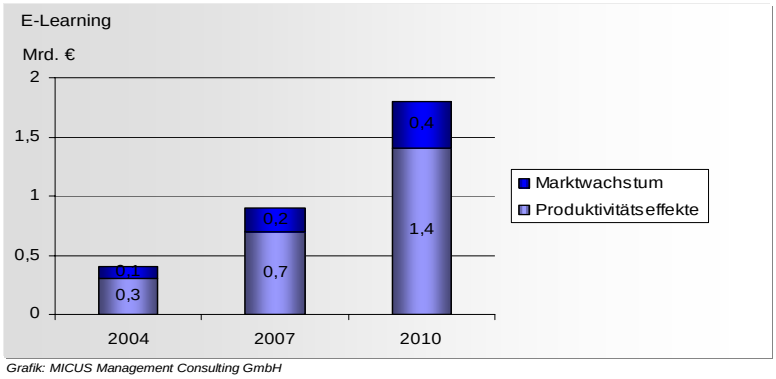
as a mixture of online offerings and face-to-face training (i.e. blended learning), not merely by itself. This means that suppliers of conventional training will also tend to benefit from the additional demand in the e-learning segment, with the result that there will not be any real displacement effects in the period up to 2010.

D Effects on foreign trade

E-learning may become an export commodity – though German suppliers mainly produce for the German market at the moment [98)]. E-learning is not expected to have any significant effect on foreign trade in the medium term.

The productivity effects will also enhance companies' international competitiveness although German businesses still need to catch up with their international counterparts. Countries such as Norway, Denmark and Finland have the highest per capita expenditure on e-learning – Germany's expenditure is currently much lower [99)]. It is not possible to identify any quantifiable effects on foreign trade at the moment.

E Calculation of the net effects



Grafik: MICUS Management Consulting GmbH

Figure 15: The rapid development of the net effects in the e-learning segment highlights the segment's high market potential (in billions of euros)

The net effects, derived from the productivity effects and market growth, come to 0.4 billion euros for 2004 and will climb to 1.8 billion euros by 2010.

98) 59% of the companies surveyed only concentrate on the national market and 35% offer their products throughout the German-speaking countries). Approximately 21% of the companies are geared to the European market and 25% to international markets. These figures are derived from the sector classifications for the reference clients cited most. Cf. "Der europäische Markt für E-Learning 2002" (The European E-Learning Provider Market in 2002), HighText-Verlag; quoted on http://www.wissensmanagement.net/online/archiv/2002/09_1002/e-learning.shtml

99) *Monitoring Informationswirtschaft* (Monitoring the information economy), 6th Factual Report, 2003, NFO Infratest GmbH & Co. KG on behalf of the Federal Ministry of Economics and Labour

In order to develop the market for broadband-based courses, it would be advisable to devise a strategy which aims to open the e-learning market and fully exploit and communicate the possibilities offered by broadband technology.

SUMMARY OF FINDINGS: PAGE 80

This would enable e-learning to become a core component in private and in-company continuing training in a very short period of time.

5 Macroeconomic analysis – growth, productivity, employment

This analysis distinguishes between direct and indirect macroeconomic effects.

The direct effects comprise the individual effects identified in the different market segments. They break down as follows:

DIFFERENCE BETWEEN DIRECT AND INDIRECT EFFECTS

- market volume: market volume generated via hardware, software and IT services;
- net market growth [100)]: market volume minus the displacement effects plus the direct growth effects on the user side – this includes market growth generated by improved export success due to the use of broadband services; and
- productivity effects [101)]: the effects on the user side are taken into account.

The indirect effects result from the productivity effects. There are two different situations, as follows:

1 The productivity effects lead to cost reductions but not market growth
2 Additional growth is generated on the basis of the productivity effects, e.g. due to better export opportunities.

CONSOLIDATING AND EXPANSIONARY IMPACTS OF PRODUCTIVITY EFFECTS

It can be observed that attaining productivity effects usually has a consolidating effect to start with, that is to say cost reductions result in businesses being downscaled. This can be followed by an expansion, for example entry into new market segments and higher export successes. This in turn can result in growth and more employment, particularly in SMEs. It should be noted, though, that this development occurs at different times in different companies depending on when the productivity effects are attained.

[100)] In relation to gross value added
[101)] The productivity effects in terms of total factor productivity

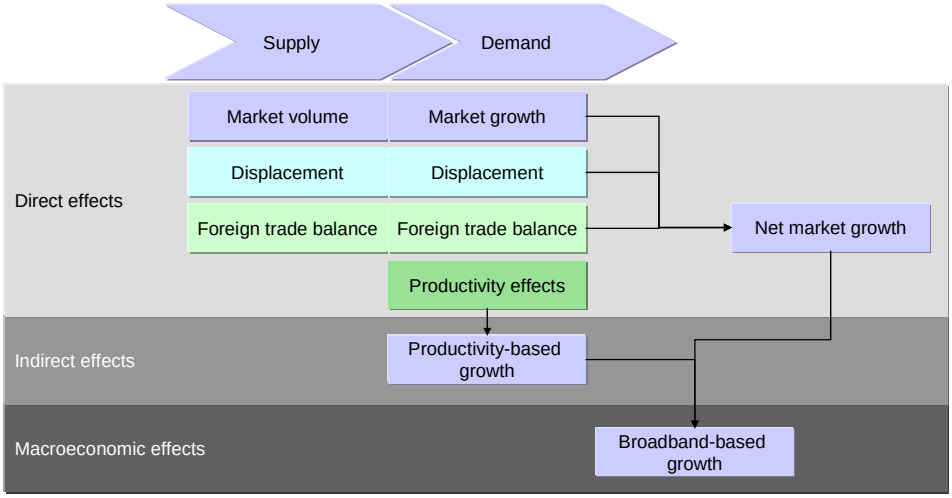


Figure 16: Calculation of the macroeconomic effects

By assessing the effects in the market segments, based on real examples, it can be concluded that the first of the above-described situations occurs in around 70% of cases on average and the second, where productivity effects translate into growth, in 30% of cases [102)].

E-learning: Summary of findings

The situation in the e-learning segment is as follows:

1 The market is still in its infancy but growth rates are high
2 In the period up to 2010, there will be market growth in the e-learning segment and no displacement of measurable proportions
3 E-learning will contribute to productivity growth in the economy as a whole
4 Market growth will depend on whether broadband is available nationwide and whether e-learning providers manage to tap into the SME market

If a suitable market-development strategy is implemented, e-learning could earn itself a permanent place in private and in-company continuing training in a very short period of time. If that were to happen, positive effects far greater than those calculated in this study could be achieved.

The results were as follows (calculations by MICUS Management Consulting GmbH):

Market volume	**2004**	**2007**	**2010**
E-learning (in billions of euros)	0.1	0.2	0.4

[102)] This result is substantiated by the calculations for the individual segments in Chapter 4. If the productivity effects are divided into "savings effects" and growth-inducing effects, the result indicates that 27% of the productivity effects will create growth by 2007 and 28% by 2010.

Productivity effects (in billions of euros)	2004	2007	2010
Total costs, conventional training	1.1	2.3	4.6
Total costs, e-learning	0.8	1.6	3.2
Productivity effects	0.3	0.7	1.4

Net effects (in billions of euros)	2004	2007	2010
Productivity effects	0.3	0.7	1.4
Market growth	0.1	0.2	0.4
Net effects	**0.4**	**0.9**	**1.8**

PROCEDURE FOR CALCULATING MACROECONOMIC EFFECTS

The macroeconomic effects can then be calculated based on the sum of the direct and indirect effects.

Three scenarios were developed for the calculation:

THREE SCENARIOS: BASE CASE, BEST CASE AND WORST CASE

1 **Base case**: This scenario describes the development which is most probable from today's perspective. It is in fact a good-case scenario because it assumes that the infrastructure will be developed quickly. The effects calculated in the various service segments (see Chapter 4) apply in this case.
2 **Best case**: In particular, the best-case scenario assumes a higher level of investment in the basic services segment. This would cause the market volume for basic services to develop more swiftly (+11%) and raise the market penetration rate. As a result, there would be more momentum in the value-added services segment, chiefly due to new customers being acquired in the SME segment. Here too, the market volumes would be around 11% higher on average than in the base case. The entertainment segment is slightly different from the others in that it would benefit significantly from the accelerated development of the basic services.
3 **Worst case**: The worst-case scenario envisages a situation in which important investments in infrastructure do not occur. This would initially lead to slower development of basic services but would also have major repercussions, in particular on the value-added services segments. The foremost precondition for the market for value-added services to actually develop at all is infrastructure availability. Consequently, growth in the value-added services segment would be stymied to a huge extent if infrastructure development were to slow down. When considering the worst-case scenario, it should be noted that it is based on a slowing-down of development but not a complete standstill [103)].

DEVELOPMENT OF BROADBAND SERVICES ESSENTIAL TO COMPETITIVENESS OF GERMAN ECONOMY

The results of the scenarios illustrate that for the German economy there is no alternative but to rapidly develop the broadband infrastructure and broadband

[103)] If, for instance, some of the key market players in the area of infrastructure were to decide not to make necessary investments, the gaps would be filled by other players or other technologies sooner or later.

services. If that development were not to occur, the outcome would be a marked deterioration in German enterprises' competitive position and distinct disadvantages for Germany as a centre of business.

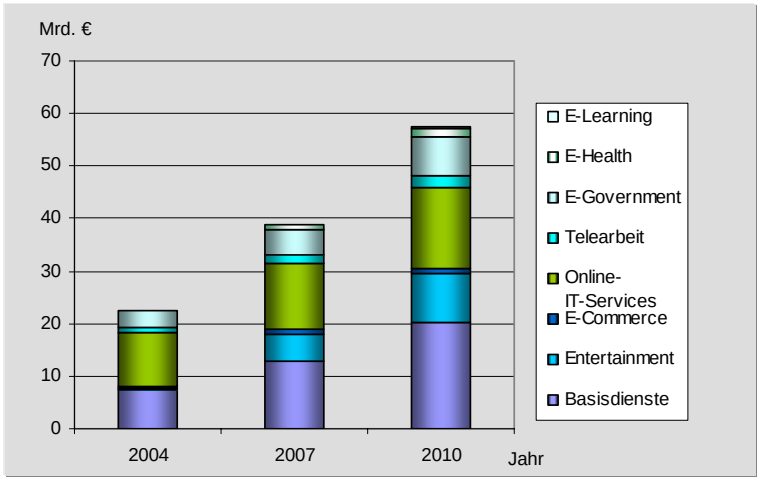
The effects in each of the three scenarios were calculated on the basis of the above-mentioned structure, i.e.:

1Direct effects
2 Indirect effects
3 Macroeconomic effects

5.1 Direct effects

5.1.1 Market volume

The market volume was calculated based on the total of the individual effects in the various service segments.

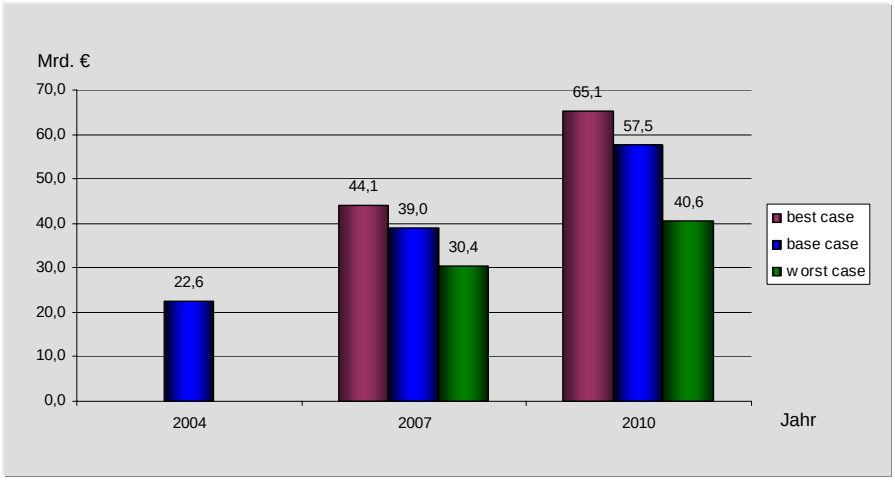


Grafik: MICUS Management Consulting GmbH

Figure 17: Base case: Market volume will total 57 billion euros by 2010

In the base case, the market volume would rise from 22.6 billion euros in 2004 to 57.5 billion euros in 2010.

In the best case, it would actually be possible to top that figure. The market volume would swell to 65 billion euros by 2010. A significant acceleration in market growth could be expected in the basic services and entertainment segments in particular.



Grafik: MICUS Management Consulting GmbH

Figure 18: Comparison of scenarios: In the best case, the market volume would total 65 billion euros in 2010, in the worst case the figure would be 40 billion euros

In the worst case, the basic services segment would develop at a much slower pace and by 2010 only 75% of the market volume possible in the base case would be achieved. This would have an even more dramatic impact on the value-added services. A lack of infrastructure investment would slow down development with the result that growth in the market segments would be half that possible in the base case. The market volume would then only come to around 40 billion euros by 2010.

This comparison of the scenarios shows that the market volume would be 60% higher in the best case than in the worst case by 2010.

Summary of the three scenarios

	Base case			**Best case**			**Worst case**		
Market volume (in billions of euros)	**2004**	**2007**	**2010**	**2004**	**2007**	**2010**	**2004**	**2007**	**2010**
Basic services	7.4	13	20.2	7.4	14.6	22.8	7.4	9.8	15.1
Value-added services									
Entertainment	0.2	5.1	9.3	0.2	6.6	11.6	0.2	2.7	4.6
E-commerce	0.5	0.7	0.9	0.5	0.8	1	0.5	0.6	0.7
Online IT services	10.3	12.6	15.4	10.3	13.9	17	10.3	11.4	12.7
Teleworking	0.8	1.6	2.3	0.8	1.7	2.6	0.8	1.2	1.5
E-government	3.2	4.9	7.4	3.2	5.4	8.1	3.2	4	5.1
E-health	0.2	0.9	1.5	0.2	1	1.6	0.2	0.6	0.7
E-learning	0.1	0.2	0.4	0.1	0.2	0.4	0.1	0.1	0.2
Total, value-added services	15.2*	26	37.3*	15.2*	29.5*	42.3	15.2*	20.6	25.5
Total	**22.6**	**39**	**57.5**	**22.6**	**44.1**	**65.1**	**22.6**	**30.4**	**40.6**

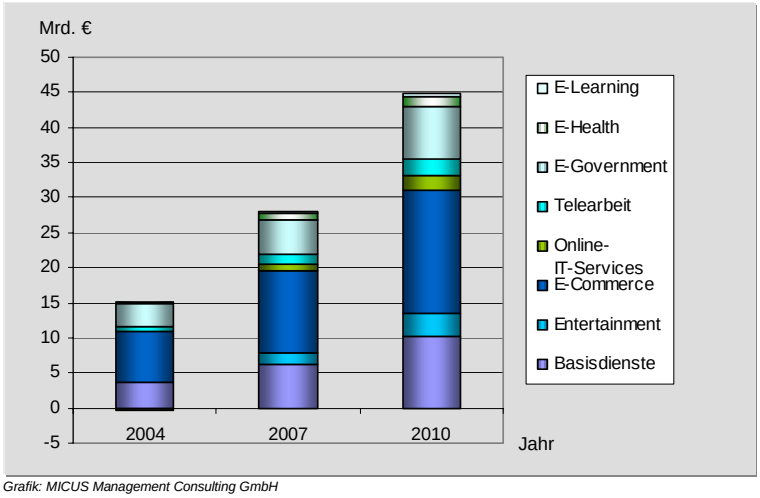
* Rounding differences

5.1.2 Net market growth

The following aspects need to be taken into consideration when calculating market growth:

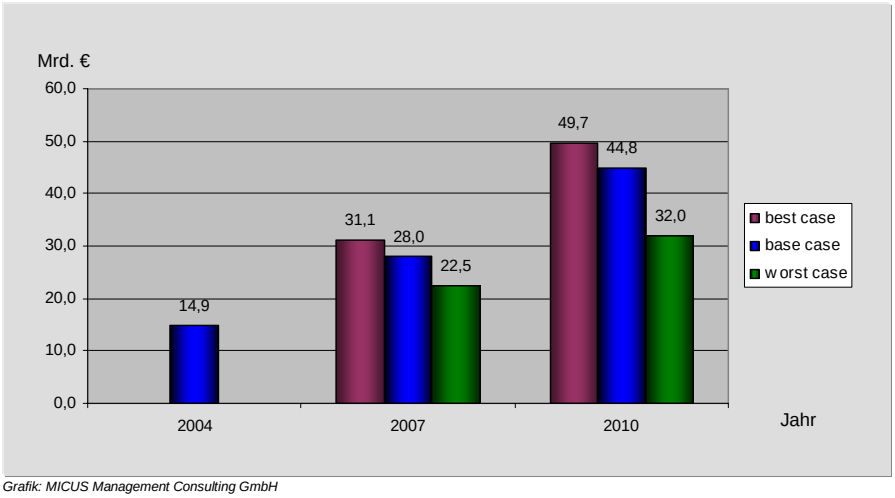
NET MARKET GROWTH FIGURE TAKES INTO ACCOUNT DISPLACEMENT EFFECTS AND ADDITIONAL USER REVENUE

- the development of the market volumes as described in Section A will have a displacement effect on some parts of other market segments. The displacement effects therefore need to be subtracted in the calculation;
- the market volume comprises the revenue from hardware, software and IT services. However, users can also enjoy additional growth – in particular, the direct market growth stemming from positive effects on foreign trade should be taken into account (this is especially relevant in the e-commerce segment).



Grafik: MICUS Management Consulting GmbH

Figure 19: Base case: Net market growth of 45 billion euros can be realised in the period up to 2010



Grafik: MICUS Management Consulting GmbH

Figure 20: Comparison of scenarios: In the best case, the net market growth would be just under 50 billion euros by 2010

In the base case, the aggregated individual effects in the various market segments show that direct market growth could be achieved as a result of broadband. Broadband-based net market growth would climb from 14.9 billion euros in 2004 to 44.8 billion euros in 2010.

In the best case, accelerated market development would lead to an increase in net market growth. This would mean that the figure in 2010 would already be 50 billion euros. The slower market development in the worst-case scenario would also be reflected in lower net market growth, with a figure of around 30 billion euros being reached by 2010. A comparison of the scenarios shows that the net market growth would be 55% higher in the best-case scenario than in the worst-case scenario.

Summary of the three scenarios

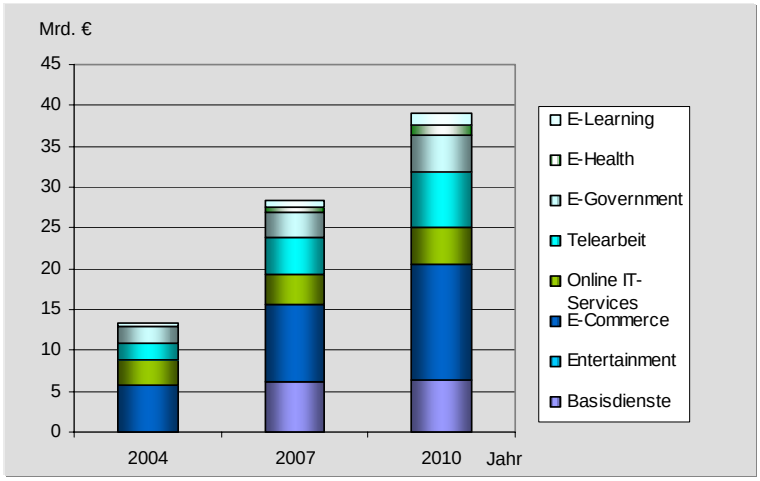
	Base case			**Best case**			**Worst case**		
Net market volume (in billions of euros)	**2004**	**2007**	**2010**	**2004**	**2007**	**2010**	**2004**	**2007**	**2010**
Basic services	3.6	6.2	10.1	3.6	6.9	11.2	3.6	4.7	7.6
Value-added services									
Entertainment	0	1.7	3.3	0	1.9	3.7	0	0.9	1.7
E-commerce	7.3	11.7	17.6	7.3	13	19.5	7.3	10.3	13.5
Online IT services	-0.2	0.8	2.2	-0.2	0.9	2.4	-0.2	0.7	1.8
Teleworking	0.8	1.6	2.3	0.8	1.8	2.6	0.8	1.2	1.5
E-government	3.2	4.9	7.4	3.2	5.4	8.2	3.2	4	5.1
E-health	0.2	0.9	1.5	0.2	1	1.6	0.2	0.6	0.7
E-learning	0.1	0.2	0.4	0.1	0.2	0.4	0.1	0.1	0.2

Total, value-added services	11.3*	21.8*	34.7	11.3*	24.2	38.5*	11.3*	17.8	24.4*
Total	**14.9**	**28**	**44.8**	**14.9**	**31.1**	**49.7**	**14.9**	**22.5**	**32**

* Rounding differences

5.1.3 Productivity effects

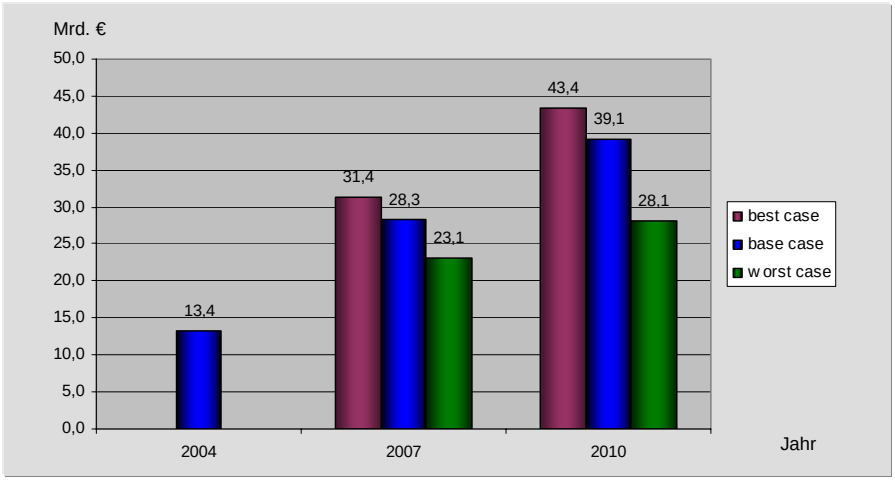
The productivity effects were calculated based on the total of the individual effects identified in the various market segments. In the base case, the productivity effects could be expected to rise to 39 billion euros by 2010 from the 2004 figure of 13.4 billion euros.



Grafik: MICUS Management Consulting GmbH

Figure 21: Base case: Productivity effects of almost 40 billion euros would be achieved by 2010

The development of the productivity effects in the best-case scenario is based on the premise that they would develop in proportion to the market volume. They would thus be 11% higher than in the base case and would total 43.4 billion euros by 2010. In the worst case, the slower market development would result in distinctly smaller productivity effects, which would come to 28 billion euros by 2010.



Grafik: MICUS Management Consulting GmbH

Figure 22: Comparison of scenarios: In the best case, productivity effects would total 43 billion euros, in the worst case they would only come to 28 billion euros

Summary of the three scenarios

	Base case			**Best case**			**Worst case**		
Productivity effects (in billions of euros)	**2004**	**2007**	**2010**	**2004**	**2007**	**2010**	**2004**	**2007**	**2010**
Basic services	0	6.2	6.5	0	6.9	7.2	0	4.7	4.8
Value-added services									
Entertainment	0	0	0	0	0	0	0	0	0
E-commerce	5.7	9.4	14	5.7	10.5	15.6	5.7	8.3	10.8
Online IT services	3.1	3.8	4.6	3.1	4.2	5.1	3.1	3.4	3.8
Teleworking	2.2	4.5	6.7	2.2	5	7.4	2.2	3.3	4.2
E-government	2	3	4.5	2	3.3	5	2	2.5	3.1
E-health	0.1	0.7	1.4	0.1	0.7	1.5	0.1	0.4	0.7
E-learning	0.3	0.7	1.4	0.3	0.8	1.5	0.3	0.5	0.7
Total, value-added services	13.4	22.1	32.6	13.4	24.5	36.2*	13.4	18.4	23.3
Total	**13.4**	**28.3**	**39.1**	**13.4**	**31.4**	**43.4**	**13.4**	**23.1**	**28.1**

* Rounding differences

5.2 Indirect effects

The indirect effects cannot be calculated separately for individual services or market segments. However, it *is* possible to establish their impact on macroeconomic growth.

INTERNATIONAL COMPETITIVENESS – PIVOTAL INFLUENCE ON INDIRECT EFFECTS

It must be borne in mind that, in the current environment, growth permanently in excess of the current growth trend of 1.5% can mainly be attained by means of export [104)]. Export success depends on international competitiveness, to which the productivity effects make a positive contribution. It is not possible to determine the overall extent to which the productivity effects actually do prompt export success since it differs greatly from case to case. The effects can also occur in different segments, e.g.:

- cost advantages resulting from use of online IT services or teleworking increase manufacturers' international competitiveness;
- e-commerce gives SMEs the opportunity to tap into foreign markets; and
- products can be launched on the global market more quickly thanks to efficient e-government services.

PRODUCTIVITY GAINS PROVIDE A BASIS FROM WHICH TO ENTER NEW MARKETS

By contrast, there will also be instances, particularly on saturated markets, where there is no market growth even though productivity has increased. In fact, this is true of most cases. Because, since broadband development is being promoted in other industrial nations too, attaining productivity effects is often the prerequisite for actually being able to remain competitive and does not necessarily mean that there are positive growth effects.

The examples and cases examined during work on this study have reinforced the opinion that there is a ratio of 10:3 between productivity effects and additional growth [105)]. This is reflected in the base case, where an additional market volume of just under 12 billion euros would be possible by 2010.

ADDITIONAL MARKET VOLUME WOULD COME TO 15.2 BILLION EUROS IN BEST CASE AND ONLY 3 BILLION EUROS IN WORST CASE

In the best-case scenario, the higher productivity effects would result in a stronger boost to growth. In addition, the accelerated market development would give Germany an advantage over other countries – an analysis of the productivity effects indicates that the expansion effect would be stronger and the consolidation phase would be overcome more quickly [106)]. Consequently, the additional market volume would already come to 15 billion euros by 2010. The slower development in the worst-case scenario would have a dramatic impact on productivity effects. The lion's share of the productivity effects would have a consolidating effect and only 10% would be able to be translated into market growth. The additional market growth would be correspondingly low at only just 3 billion euros in 2010.

[104)] The calculations assume that the domestic growth trend will be 1.5% over the next few years. They do not take into account any possible change in the consumption rate.

[105)] I.e. productivity effects totalling 10 billion euros result in 3 billion euros of additional growth. This ratio is not constant but it has proved robust in the context of the dimensions considered in this study.

[106)] The model is based on the assumption that 35% of the productivity effects result in turnover growth and 65% have a consolidating effect.

Indirect effects – a comparison of the scenarios

Additional market volume (in billions of euros)	2004	2007	2010
Base case	4	8.4	11.7
Best case	4.7	11	15.2
Worst case	1.3	2.3	2.8

5.3 Macroeconomic effects

The macroeconomic effects are divided into growth and employment effects.

5.3.1 Growth

The growth effects are calculated on the basis of the direct and indirect effects (net market growth and additional productivity-based growth) [107)].

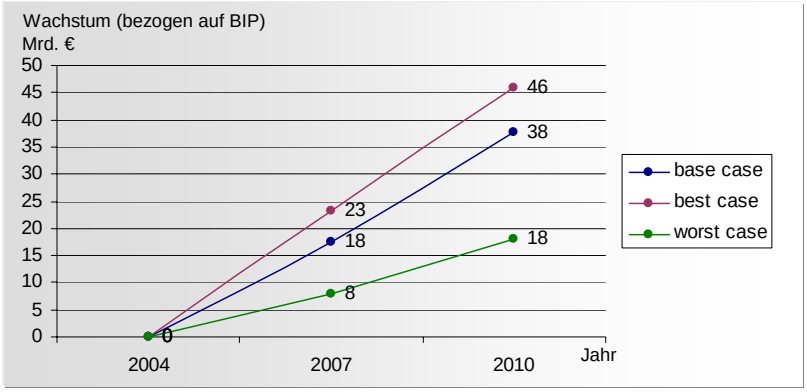
BASE CASE: EXTRA 38 BILLION EUROS POSSIBLE BY 2010 AS A RESULT OF GROWTH

In the base case, broadband-based growth of roughly 57 billion euros could be realised by 2010, representing a 38 billion euro increase on 2004. That translates into broadband-based growth of 0.3% per annum.

In the best case, the broadband-based market volume would already total 65 billion euros by 2010. Taking 2004 as the base year, growth over the coming five years would thus come to 46 billion euros. In the worst case, only 35 billion euros of growth would be achieved by 2010, representing an increase of 18 billion euros on the 2004 figure.

These figures illustrate that the broadband market segments are growth segments and that even small investments, as depicted in the worst-case scenario, would do no more than slow down development. Ultimately, broadband technologies and the innovative market segments to which they give rise help offset, at least in part, stagnation and declining trends in other, mature market segments.

[107)] Growth is calculated on the basis of GDP.



Grafik: MICUS Management Consulting GmbH

Figure 23: Comparison of the scenarios: In the best case, strong growth would result in an additional 46 billion euros compared with 2004; in the worst case, the figure would be 18 billion euros

A comparison of the scenarios shows the differences in development. The slightly convex shapes of the curves, especially in the worst case, reflects the fact that the expansionary impact of the productivity effects takes some time to kick in.

LACK OF INFRASTRUCTURE INVESTMENTS WOULD HINDER DEVELOPMENT OF VALUE-ADDED SERVICES

Furthermore, the marked difference between the base and worst cases indicates that reaching a certain minimum volume on the national market at an early stage is crucial to ensure that the value-added services segment develops in a dynamic manner. Sluggish investment in infrastructure would prevent rapid growth in the segment and thus impede economic development overall.

5.3.2 Employment

When determining broadband's impact on employment, there are four different effects to be considered, some of which run counter to each other, i.e.:

DELINEATION OF EMPLOYMENT EFFECTS FOR CALCULATION PURPOSES

1 Broadband-based jobs will be created in the areas of services, software and hardware
2 Displacement will cause job cutbacks, particularly in the area of conventional, non-broadband technology. This type of effect is not unusual as technology advances. Similar effects occurred when automation was introduced in the manufacturing segment and when computers became a universal phenomenon. Ultimately, they help improve businesses' competitiveness and strengthen the economy

3 Realisation of savings potential will initially result in jobs being shed on the user side (as less staff-intensive broadband technologies are introduced). So the productivity effects will partly be used to save money. On average, two thirds of the money saved will be in the area of payroll costs [108)]
4 In the medium term, new, growth-induced jobs will be created (due to improved export opportunities, for instance). It should be borne in mind though that the creation of a new job in the segments examined here requires an additional turnover of 110,000 euros on average

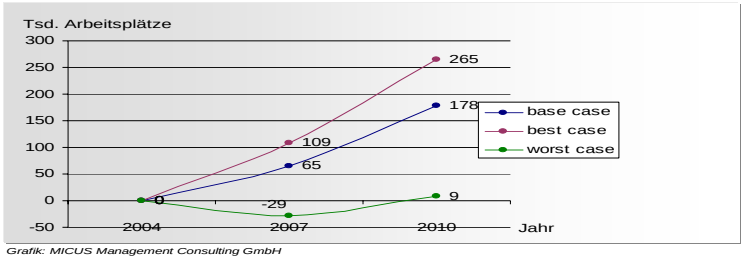
It is therefore necessary to ascertain whether the decrease in staff intensity which arises from the productivity gains can be offset by growth-induced employment effects. The calculations carried out for this study do in fact indicate that broadband can have positive employment effects overall [109)].

178,000 EXTRA JOBS POSSIBLE BY 2010 IN BASE CASE; 265,000 IN BEST CASE

Thus, even in the base case, the growth-induced positive employment effects would more than offset the job cutbacks resulting from efficiency gains. This would mean that 178,000 additional jobs could be created by 2010 (compared with 2004). In the best case, the influence on the labour market would be even more positive, with a total of 265,000 new jobs being created by 2010.

WORST CASE: SLOW MARKET DEVELOPMENT WOULD ACTUALLY RESULT IN JOB CUTBACKS IN SHORT TERM

The worst case presents a different picture. The low productivity effects and the related strong consolidation tendency would have a significant impact on employment. In fact, employment could be expected to drop slightly (by 29,000) by 2007. It would take a few years for a slight rise to occur, with the result that there would be approximately 9,000 extra jobs in 2010 compared with 2004.



Grafik: MICUS Management Consulting GmbH

Figure 24: Employment effects (in thousands): A net total of 265,000 additional jobs could be created by 2010

[108)] These are relatively employment-intensive areas. The full costs per job come to 50,000 euros.
[109)] The calculation used here is based on the concept of the employment threshold. However, the model has been adjusted for broadband-specific effects. According to the employment threshold concept, the employment effects for 2010 would total 162,000 (base case).

A comparison of the scenarios highlights the fact that appreciable positive employment effects could be achieved in the base and best cases but in the worst case broadband development would have hardly any effect on the employment situation. This would have hazardous repercussions for the overall economy in view of the crucial need for the constant decline in employment opportunities in more mature economic segments to be offset by new market segments. It is therefore extremely important for the macroeconomy that broadband use develop dynamically over the next few years.

6 Recommendations for action

The above assessment of the macroeconomic effects illustrates that use of broadband technologies and services offers major market potential with positive effects on both growth and employment. Having said that, the scenario-based analysis also shows that, rather than coming about automatically, that positive development will require all market players and the public sector alike to take action in order for the positive effects of the macroeconomic impacts of broadband use to be attained.

RECOMMENDATIONS FOR ACTION FOR PRIVATE AND PUBLIC PLAYERS

With this in mind, the final sections of this study present recommendations for action to be taken by players in businesses and trade associations, on the one side, and players in politics and public authorities on the other. The recommendations are divided into two areas: infrastructure and value-added services.

6.1 Recommendations for action to develop a high-capability infrastructure

ACTION TO BE TAKEN TO DEVELOP INFRASTRUCTURE

As the international comparison showed, Germany is still lagging behind other leading industrial nations when it comes to the proliferation and use of broadband internet, despite the market having developed very positively in 2005.

It is true that the South Asian examples of positive broadband market development cannot simply be transposed to the German situation since they were introduced in a much earlier phase of market development. Furthermore, it would not be possible to reconcile them with current national and European telecommunications legislation and they would be unrealistic in light of the strain on public budgets.

INTERNATIONAL LOCATIONAL COMPETITION

Nonetheless, Germany is confronted by the broadband situation in countries such as South Korea and Japan because increasing economic globalisation and our country's very strong export orientation mean that we have to compete with them – both as an economy and as a business location. The same applies, of course, to North America and the other European industrial nations.

In order to accelerate broadband internet penetration further, it is therefore important that systematic measures be taken to establish competition between broadband

infrastructures, promote the development of forward-looking infrastructures and implement new business and financing models. The recommendations for action in this area focus on the following aspects:

- promotion/creation of infrastructure competition,
- increased broadband internet coverage and
- improvement and differentiation of service quality.

1. Improve availability of broadband access via TV cables

The poor availability of broadband access via TV cables as an alternative to DSL is a major shortcoming in the private customer segment of Germany's broadband internet market. Investments in upstream capability and service platforms are currently still extremely difficult due to the fact that network levels 3 and 4 are separate and are owned by a variety of stakeholders.

DVB-T (Digital Video Broadcasting – Terrestrial), the imminent roll-out of HDTV and stepped-up marketing of digital programme bouquets by the large network level 3 operators are accelerating the consolidation of Germany's TV cable network market. That consolidation is a key prerequisite for universal digitalisation of the TV cable networks. Bearing in mind the approximately five million upstream-capable CATV lines already in place today, it would not be unrealistic to say that a market share in excess of 10% could be achieved within the next five years.

In view of this development, the government should support the consolidation of the TV cable market. In particular, it should harmonise media and telecommunications regulation in this area so that broadband offerings can be developed on the basis of the TV cable networks. The Federal Ministry of Economics and Technology can perform a coordinating function in this process.

2. Promote competition-based development of the fibre network in Germany

Expanding the presence of modern fibre technology (FTTx) will increase availability of broadband lines as well as making higher bandwidths and better service quality possible. The development of the fibre network in Germany should thus be promoted by means of competition. Investments in fibre upgrades are needed in order to keep the broadband internet market buoyant and to ensure that Germany keeps up with the international pace.

With this in mind, the government should shape the legal and political framework in a way that provides incentive for investment, i.e. so that investment in these types of network innovation yields a return of a level which is customary on the market. On the other hand, steps must be taken to prevent fibre to the curb (FTTC) merely shifting the "bottleneck" within the last mile.

For its part, the private sector should pursue an investment policy which promotes innovation. Major financial investors have already signalled an interest in financing extensive fibre infrastructures if the regulatory environment and the market environment allow them to do so.

It is vital that potential investors be shown that they can actually amortise their investment within a reasonable period. Apart from the business model, the framework put in place by the government has a considerable bearing on investors' decisions. That framework (particularly the degree of deregulation) is an issue on which Germany has to compete with other countries. Continuity and reliability of the regulatory environment are the key factors, especially when it comes to attracting foreign investors to the German market.

In view of the media law aspects involved in the use of the new fibre/VDSL networks (e.g. the ban on state involvement in broadcasting, requirements for broadcasting licences), the national government and the government-owned KfW bank should sell their shares in Deutsche Telekom. This would also effectively rule out the possibility, which has often been conjectured, of a conflict of interest between regulatory and political activity. The national government's share in Deutsche Telekom should be decreased further, as has already been done in, for example, France, Belgium, Holland and the UK.

3. Accelerate implementation of alternative access methods

Alternative access methods can help promote infrastructure competition. Additional access methods would make it easier for providers which mainly operate in the reselling segment at present to offer additional services specific to them. This could also encourage quality-based competition throughout the country.

As part of efforts to regulate access in a consistent manner, steps should be taken to ensure that additional access methods do not devalue investments already made by alternative providers in their own infrastructure (e.g. TAL). It should also be ensured that sufficient investment incentives remain to establish sustainable infrastructure competition.

In addition, mobile telecommunications providers will be able to contribute to infrastructure competition by means of their UMTS offerings since they already have a broad customer base for narrowband services plus very well-developed sales channels, thus covering around 70% of the population. Competition between mobile and fixed-network infrastructures is beginning to take on a more concrete form and is increasing, especially in the area of broadband services. Here too, the providers' business models should be able to develop as freely as possible on the market and regulatory policy should cater for this need.

In this context, it should be noted that regulatory decisions in Germany often take a long time and appear bureaucratic in the eyes of market players. Streamlining the processes in this area would benefit everyone involved and boost the broadband internet market as a whole. There is room for improvement in a whole range of regulated processes.

In view of these facts, it would be advisable to optimise the regulation processes at the national and EU levels as part of efforts to do away with red tape.

4. Increase broadband coverage by using fixed radio access

Broadband internet is currently not available throughout all of Germany. Certain regions still have no broadband internet connectivity at all. Often, regions with exceptionally long access lines (copper twisted pair lines) do not have TV cable broadband networks (copper coaxial cable) either.

Fixed radio access would enable the bottleneck in the last mile to be partially covered at a reasonable cost, both for cable TV internet and xDSL. In addition, fixed radio access technologies make it possible to cut the costs involved in connecting regions which were previously largely cut off from broadband. Providers or specialised service companies should take on this market segment.

The frequencies should therefore be assigned quickly and unbureaucratically. The "licensing light" method introduced by the *Bundesnetzagentur* (Federal Network Agency) would appear to be an effective means of doing this and should be supported. There should not be any requirements for new radio technologies to be available nationwide because the new technologies, e.g. WiMAX, will initially only be able to establish themselves on niche markets.

5. Improve market transparency by introducing "quality marks"

The prevailing broadband networks do not yet allow nationwide provision of the high service quality required for certain broadband services. In particular, the existing network structures do not support symmetric broadband communication sufficiently (the uplink bandwidths are too small), which poses an obstacle to proliferation of peer-to-peer applications and business communication.

Transparency on the market could be enhanced by providers specifying quality and service parameters for their broadband services, which in turn would have a positive influence on potential customers' purchasing decisions. As with the "HD ready" logo used by consumer electronics producers, these specifications could be voluntary and facilitate transparent, quality-based competition. Businesses and trade associations should promote a system of this kind, with the support of the Federal Ministry of Economics and Technology. The *Bundesnetzagentur* just recently started the ball rolling in this direction by publishing quality parameters for broadband internet access methods. Resolute action should be taken to pursue this approach further.

6.2 Recommendations for action to ensure development of the market for broadband applications

ECONOMIC SUCCESS IS LINKED TO DEVELOPMENT OF VALUE-ADDED SERVICES

A major challenge for all market players is the need to focus more on the services which can be offered via broadband lines. Although much has been said about the benefits of innovative services, the need for a broadband line has often not been pointed out. This has given many customers the impression that broadband availability and value-added services are two separate offerings, which means that numerous market opportunities are not being exploited.

In order to boost use and utilisation of the network capacities, which are important aspects, it is therefore necessary to actively market the new services.

LACK OF INFORMATION ON WAYS IN WHICH BROADBAND APPLICATIONS CAN BE USED MUST BE REMEDIED

This study's findings confirm that, in particular, operators, technology service providers and large businesses are aware of the possibilities offered by broadband technology but that there is a significant lack of information among consumers and SMEs. The following recommendations are intended to tackle this issue.

6. Accelerate the development of broadband applications in the areas of e-government, e-health and e-learning and stimulate demand for them

The major improvements and savings which the public and private sectors can expect from e-services often only have a significant effect if the services in the areas of e-health, e-learning and e-government are based on broadband solutions. They are the only way to be able to perform transaction-based services which can be used to streamline administration processes, shorten processing times and serve customers in a more targeted and efficient manner. This is why it is ultimately the implementation of transaction services which provides the necessary basis for saving costs by simplifying processes.

Consequently, public authorities should therefore call for broadband to be included in e-health, e-learning and e-government offerings and their communication activities should make it clear that there is a link between such services and broadband technology.

The government should lead the way by providing examples of good practice. It should be noted though that, ultimately, it is the public and businesses, as the service recipients, who will decide whether the services are accepted and used. So it is vital to have acceptance management in place to record and implement users' requirements. An appropriate strategy should be developed in consultation between the relevant departments of the national government.

7. Launch joint support and communication projects to increase broadband penetration among SMEs

The potential offered by broadband applications should be conveyed to SMEs in a more effective manner. General, abstract advantages described in relation to a company's specific business rarely convince managers to open up to a new technology. Only solutions which contribute to the overall benefit for the company bring long-term success.

National, federal-state and local government should therefore join forces with chambers of industry and commerce and other institutions to set up projects, or expand existing ones, and to increase the focus on broadband issues in order to cultivate broadband use at the SME level. This cooperation could take the following form:

- *ProBreitband*: projects which advise SMEs as to what possibilities and benefits broadband applications offer them and
- *BreitbandROI*: projects which demonstrate the actual return on investment resulting from broadband use and the cost-benefit ratio for broadband-specific applications.

Working with the chambers of industry and commerce will enable independent information about broadband applications to be supplied to business users so as to convince those SMEs (approximately 50%) which have not yet taken up broadband internet of the benefits of doing so.

As well as supporting SME users, it would also be advisable to support the formation of horizontal or vertical clusters in service segments in which there is a high number of SMEs so as to eliminate structural disadvantages. Germany lags behind other European countries when it comes to the establishment of clusters. Some countries, in particular those which were forced to focus on international markets early on because of the small size of their own domestic markets, have already achieved remarkable success by creating clusters. Measures to promote clusters, for developing new broadband services, for example, could be a suitable means of devising good-practice solutions in order to keep up with international competitors. The specifics of the German market would have to be taken into consideration: for instance, large German companies' access to the market and the innovative capacity of small enterprises could be combined in one cluster.

One possibility in this context could be a “Contents and Applications Competition” with prizes for applications which offer high added value and boost take-up. Again, a key success factor would be to highlight the link between services and broadband. The competition could be initiated by the Federal Ministry of Economics and Technology. Platforms which have already proved successful, such as the "Breitbandatlas" (broadband atlas), and institutions such as “Initiative D21”, could provide a useful basis.

8. Promote research in the field of broadband applications at institutes of higher education

Germany’s institutes of higher education (HE) should play a leading role in education and research in the fields of IT and telecommunications, the primary aim being to link up the two areas. To date, such expertise only exists at a few German HE institutes.

In Switzerland, on the other hand, graduates are currently being actively recruited by international ICT businesses to manage R&D laboratories in America. In order to keep up with other international players and to position Germany as a research centre for broadband applications, German HE institutes should place more of a focus on ICT.

Furthermore, those responsible for awarding research funding should attach more significance to the development of broadband-based applications. Having said that, any research project related to broadband should have a clear target group focus, anticipated benefit and a business plan. Each application should be assessed to determine where synergies are possible and how the project fits into the value chain of a market scenario. This will also simplify coordination of funding projects within

and between departments as well as the process of deciding whether a project should be conducted. Research policy should provide the appropriate guidance on these matters.

9. Integrate broadband applications into education and continuing training

E-learning should become a fixed part of education and continuing training. Projects such as "Schulen ans Netz" (“Schools online”) should take even more account of the broadband aspect. For instance, every user in education and continuing training should be made aware that applications such as interactive gaming and video streaming, but also e-business, can only offer high performance if they are supported by broadband. This will play an important role in helping develop media skills.

The expertise needed on the part of teaching staff at schools and training centres should be acquired by means of cooperation between schools, HE institutes and industry associations.

In the interest of increased proliferation, the concept of employees using their work PCs for private purposes should be supported in Germany and made more widely available (see the Initiative D21 lighthouse project entitled "Mitarbeiter-PC-Programme (MPP) als Beitrag zur Informationsgesellschaft" (Employee PC Programmes (MPPs) as a contribution to the information society). As many businesses would like to enable their employees to use their PCs and broadband lines, this potential should be exploited as soon as possible. A good starting point might be to do away with taxation on the hardware, software and services businesses use.

10. Expand on established products such as the “(N)Onliner-Atlas” and the “Breitbandatlas” to create a strategic platform from which to tap into the market potential offered by offliners and narrowband users

By producing the "Breitbandatlas" (broadband atlas), the Federal Ministry of Economics and Technology has taken an initial, important step towards improving the information supplied to users with regard to broadband internet. The atlas should be updated by an acknowledged, independent body and expanded to include quality aspects.

As a logical next step, the broadband atlas should be used as a communication platform with which to encourage more widespread use of broadband.

Projects such as "Internet für alle" (an EU concept officially referred to in English as “Internet for all”) and (N)Onliner-Atlas have shown that professional, reasonably priced services are a vital factor in improving user acceptance. The focus has previously been on increasing the amount of internet use but in future it should shift more to qualitative aspects. The important issues are what purpose the internet is used for and which services are used. The Federal Ministry of Economics and Technology should thus develop strategies, on the basis of existing approaches and in consultation with the relevant social groups, to highlight the quality provided by broadband.

To ensure such a realigned broadband strategy is a success, all of the ministries and market players involved need to work together. In addition, the procedure must be communicated to the public, including the European public, in order to help coordinate the collaboration between the players in Germany but also to strengthen Germany's reputation as a centre of innovation and technology on international markets.

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