

Prospects and Opportunities of the German ICT

Management Summary



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Management summary: eight messages on how to make the German ICT fit for the future

The results of the first phase of the study "Prospects and Opportunities of the German ICT" provide a comprehensive overview of the current and medium-term fields of action in the German information and communication technology (ICT).

This management summary comprises the relevant issues and results of the consultation of experts in eight concise "messages on how to make the German ICT fit for the future".

The answers to an open question from the consultation of experts provide a greater insight to the developments in the ICT sector in the coming years: the experts were asked to assess the prospects of the information and communication technology (ICT) industry in the coming five years, to give their views on whether it is fit for the future and to describe in their own words what they think are the outstanding trends and innovations in the ICT sector.

According to the categorised and aggregated answers, the German ICT industry will see the following outstanding developments and innovations in the coming five years:

The majority of answers can be summarised under the heading "mobility and mobile services". The growing significance of mobile applications and services such as wireless Internet on the basis of mobile broadband networks is also reflected in messages 4 and 5.

Furthermore, the experts questioned regard the development of the Internet as an important field in the future. They mention, for instance, multimedia expansion stages of Web X.O as well as the ubiquitous use of the Internet and its services as innovative areas. Besides this, the experts underline topics regarding equal access of the population to this development of the Internet. This is reflected in many of the messages, but expressly underlined in message 1. It takes account of this overriding future significance of the Internet for society. Altogether the Internet plays a major role in almost all the fields covered here as basic technology.

The significance of the expansion of a modern ICT infrastructure and the realisation of networks throughout the country holds the third place among the most important future topics in the field of ICTs according to the experts' answers. The consultation of experts shows that our communication infrastructures, i.e. scalable and expandable networks, belong to the main challenges for the ICT sector to make it fit for the future; they are dealt with in the following sections on message 2 and in the section "Technological development and driving force".

This area is followed by the innovation fields of assisted systems, i.e. stationary and mobile services such as car-to-x-communication, embedded systems (cf. message 7), convergence through IP-based services (VoIP, IPTV, WebTV etc., cf. messages 2 and 4) and the accumulative category of innovative fields and the

"beacons" of "software as a service, e-government, e-health, e-commerce, e-business and service-oriented architecture (SOA)". In addition, the experts point out that topics such as IT security, data protection and privacy (cf. message 1), green IT and e-energy (cf. message 6) as well as virtuality play an outstanding role in making the German ICT fit for the future.

The following "messages on how to make the German ICT fit for the future" summarise the comprehensive results of this study and help decision-makers in the political, economic and scientific fields to actively and sustainably set the right course to guarantee that the German ICT is fit for the future.

Message 1

We must close the digital divide: responsible and competent access to the information society of the future.

Message 2

Investment in modern infrastructures: networks to make Germany fit for the future as a business location.

Message 3

Accompaniment of the demographic change: ICTs to enhance independence and provision of care.

Message 4

Improvement of the quality of life at home and on the way: Interconnection and convergence increasingly permeate our daily life.

Message 5

More flexibility and efficiency by means of ICTs: new value-added systems in mobile and digital working environments of the future.

Message 6

Efficiency-oriented use of resources due to ICTs: green IT and e-energy secure our future.

Message 7

Embedded systems as a competitive edge for German economy: Enhancement of this driving force behind innovations and growth to guarantee sustainability.

Message 8

(Re-)Activation of entrepreneurship as a driving force behind future innovations in the German ICT industry.

Message 1

"We must close the digital divide: responsible and competent access to the information society of the future."

The status

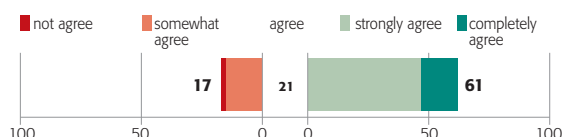
In the future, communication will be largely digitalised. The impact of the information and communication technologies (ICTs) on society, the economy and the scientific world is reflected by the development of the Internet and its services: After a relatively short development period, the medium Internet is already being used by no fewer than 65 percent of all Germans in 2008 (five percentage points up compared with the preceding year, 2007; see (N)OA 2008). However, this also means that 35 percent of the population do not yet make use of the Internet.

The diffusion of the Internet has resulted in a "digital divide" within society.

Decision-makers and experts in the economic, political and scientific fields who were questioned within the framework of this study confirm that this "digital divide" will further broaden in the coming years. They believe that this will lead to a well-educated elite with high incomes, which will shape the German economy and society in the future.

Figure 1.1: The "Digital Divide" will establish an elite, which will shape the German economy and society in the future (in percent)

The "Digital Divide" will further broaden and will lead to a well-educated elite with high incomes, which will shape the German economy and society in the future.



Source: Münchner Kreis, Deutsche Telekom AG, TNS Infratest, EICT 2008; expert interviews; N=538; missing percent to 100: no answer

The requirement

The efforts to close the digital divide within German society as well as throughout Europe are of utmost significance in order to guarantee that we can keep pace with the continuing globalisation of competition, strengthen the undisputed growing importance of ICTs in modern industrial states in the coming years and narrow the gap.

The endeavours in the political and economic fields and the change in society regarding the use of the Internet must continue to take account of this development.

For this reason, we must continue to actively meet the challenge to enable everybody who wishes to use modern ICTs and thus the Internet to have access to them (e-inclusion).

The competent and responsible use of the Internet, access to and use of information as well as digital identity will become a basic skill both in the private and work environments. This is decisive for modern (digital) societies to be fit for the future, for each individual citizen, but in particular for the competitiveness of companies at the European and global levels.

The recommendation

This consultation of experts clearly confirms that the "digital divide" in Germany can be closed since the technical prerequisites for broadband Internet access are fulfilled, there are no economic barriers and society is not technophobic.

Drivers and levers with a positive impact on the further diffusion of the Internet in Germany are in particular to be found in the field of education. Training adults in companies and educational institutions and making children and young people familiar with the Internet at an early stage, e.g. in schools, result in a high IT literacy rate in the population. Responsible and competent participation in the information society of the future means raising

people's awareness of the opportunities and in particular of the risks in connection with the use of modern ICTs. For this purpose, the necessary financial, infrastructural and in particular didactic means must be made available throughout the country.

Especially the generation of "digital natives", who grew up with computer games and the Internet, must be addressed with a special educational campaign in order to be able to tap the potential of this young, technology-friendly generation for society and the economy. An agenda set up at the federal level might give this impetus in the educational field (for which the Länder, federal states, are responsible).

Message 2

“Investment in modern infrastructures: networks to make Germany fit for the future as a business location.”

The status

By the end of 2007, the number of broadband connections in Germany totalled 19.6 million – this is a rise of 4.6 million connections compared with the preceding year. With 18.6 million connections, DSL is currently the dominating broadband technology (see Bundesnetzagentur 2008a). More than 65 percent of German online users have broadband Internet access. Germany is not yet in the lead by an international comparison, but perceptibly improved its global position last year: In view of a share of 26 percent of broadband users in the total population per 100 inhabitants, Germany surpasses the OECD average of 21 percent (see OECD 2008).

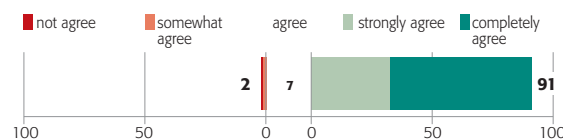
The requirements regarding the capabilities of telecommunications infrastructures will develop dynamically in the coming years. Today's technologies will have reached their limits as early as by 2010 and will increasingly have to be complemented or

replaced by new networks on the basis of optical fibres (glass fibres). This will become necessary especially for reasons of technology convergence and due to convergent IP-based applications such as triple/quadruple play, IPTV, HDTV, video-on-demand, VoIP, the various second-generation applications of Internet services, next-generation media, the Internet of Things and future evolution stages of the Internet (Web X.O). Singapore is currently holding the leading international position as far as high-speed next-generation broadband is concerned:

All private households and offices of this important technology centre are expected to have a fibre-to-the-home access as early as by the year 2012. The vast majority of experts questioned within the framework of this study also mentioned ubiquitous broadband access to the Internet as an essential prerequisite for the future development of multimedia communication and network-based applications.

Figure I.2: Ubiquitous broadband access to the Internet is an essential prerequisite for the future development of network-based applications (in percent)

Ubiquitous access to the Internet with (situative) high broadband is a central prerequisite for the future development of multimedia communication and network-based applications.



Source: Münchner Kreis, Deutsche Telekom AG, TNS Infratest, EICT 2008; expert interviews; N=538; missing percent to 100: no answer

The requirement

„State-of-the-art, competitive ICT infrastructures must be looked after and further developed since they are the basis of the knowledge society.“ (BMW 2007).

This means that we must focus on scalable broadband network infrastructures as the central technological basis for convergence. On the one hand, the broadband infrastructures in Germany must be developed so that we can keep pace with the require-

ments of future applications and services. At the same time, developments must focus on a comprehensive concept to foster investments of the private sector, which make scalable broadband infrastructures possible.

An efficient, permanently innovative telecommunications infrastructure is decisive especially for the new fields of application such as the health sector and electronic commerce.

The recommendation

In order to guarantee that Germany will be fit for the future, we must establish a regulatory framework that stimulates the willingness of companies to invest and creates a reliable framework for private infrastructure investments in access networks, prevents a waste of resources and at the same time secures unhindered access to networks and contents. Stable business models are the basis and give a dynamic impetus. They cover a broad range of applications, products and services and should be made available to as many private and commercial users as possible.

As far as concrete measures are concerned, the ongoing efforts to close the broadband gap must be continued in a first step and

the network infrastructure must then be adjusted to the necessary future capacities within the second step. In this field, the glass-fibre technology makes possible an enormous increase in transmission capacities and must be further developed as the basis of future infrastructures. "Fibre-to-the-home" will be an indispensable prerequisite for many future innovations that are already being developed.

Further dynamism is also to be expected owing to the better use and the modernisation of existing, yet unused radio frequencies and structures ("digital dividend"). In this field, Germany would be able to increase the number of broadband connections quite rapidly – in particular also in rural areas.

Message 3

“Accompaniment of the demographic change: ICTs to enhance independence and provision of care.”

The status

The ratio between persons under 65 years of age to those aged over 65 in the German population, which is 4 : 1 at present, will be 2 : 1 by the year 2050: there will be more than twice as many elderly persons than younger ones. Even today, about 40 percent of the Germans are older than 50 years (see BMI 2008, VDE 2008).

When growing older, people increasingly wish to have a secure environment, support in their everyday lives, social contacts and

individual medical care; their wish to be able to continue to live in their familiar surroundings is great. The number of elderly persons who need help will rise; society as a whole and individuals in particular will have to take care of them.

At the same time, many of the "senior citizens" of the future will be more active and altogether more mobile and open-minded about ICT support since they are ICT-friendly and ICT use will become easier.

The requirement

Apart from innovations in the health sector and medical technology, the development of information and communication technologies will make a particularly great contribution to meet the requirements arising from the demographic change in its various facets.

ICT will be a key technology for society which undergoes demographic change; it can contribute to sustainable and future-oriented improvements of the quality of life and health care, especially for the elderly.

In this context, embedded systems will also play an important role to make the medical sector more efficient and allow people to live in their homes as independently and as long as possible.

First solutions – often still as prototypes – are already very promising.

Owing to the remote monitoring of vital functions (breathing, pulse, oxygen content in the blood, etc.), for instance, data can be transmitted directly to relatives or doctors so that the state of health of those in need of support can be controlled from any place. Falls, for example, which are one of the main causes of problems of older persons, can already be registered by sensor modules that are installed in flats.

Life can in future become easier for the elderly who are less mobile, for those who take care of them and for their relatives.

The recommendation

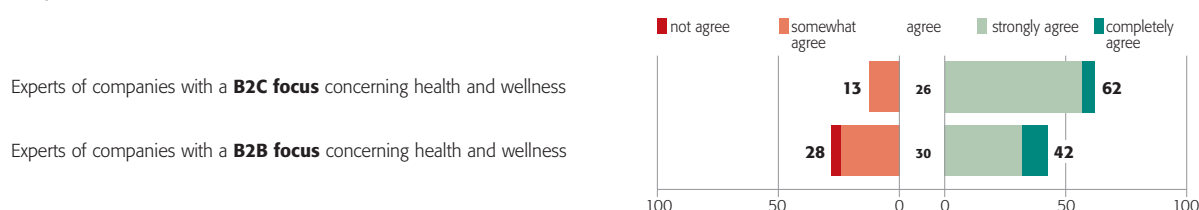
In order to make the German ICT industry fit for the future, it should focus on its strengths in the field of Ambient Assisted Living (AAL) to ensure that these systems will in fact be realised and made available as quickly and inexpensively as possible.

The consultation of experts confirms the significance of innovations in the field of health and wellness. Especially the representatives of companies that do business

with end users underline the future significance and the enhanced use of innovative ICT services in the field of health and wellness for private users.

The German Federal Ministry of Education and Research (BMBF) together with VDI/VDE-IT already contributes to the promotion of research in this field within the framework of the Ambient Assisted Living programme, which it recently launched (see BMBF 2008).

Figure I.3: Innovation in ICT will change the human requirements in the field of health and wellness (in percent)



Source: Münchner Kreis, Deutsche Telekom AG, TNS Infratest, EICT 2008; expert interviews;

Selection: Respondents of private enterprise companies, N=333; missing percent to 100: no answer

Message 4

“Improvement of the quality of life at home and on the way: Interconnection and convergence increasingly permeate our daily life.”

The status

In 2007, about 3.3 billion people worldwide made use of mobile communication infrastructures - by 2010 there will already be an estimated five billion users of mobile services (see ITU 2008). In the course of the replacement of the current GSM technologies by the new, third-generation (3G) UMTS technologies, revenues from mobile and fixed-network phone calls will increasingly play a minor role, while mobile data services will become more significant in the coming years. Many countries - especially the BRIC states and further dynamic developing countries - will seize the opportunity of mobile Internet use and "skip" the phase of stationary Internet use.

In the year 2007, Germany recorded a total of 97.2 million mobile phone contracts, with a ratio of 100 citizens to 118 contracts – the trend towards two or three mobile phones thus is continuing. Apart from personal communication, mobile calls are becoming the most important type of real-time communication. No

fewer than 8.7 million mobile users regularly have broadband UMTS Internet access (see Bundesnetzagentur 2008b). According to forecasts, there will be almost 16 million users in Germany in 2008. The most significant aspect is the trend towards the mobile use of the Internet and its services. Telecommunication firms, producers of terminal equipment and media companies compete for technologies, i.e. broadband infrastructures and terminal equipment (including mobile TV), tariff structures, i.e. increasingly falling tariffs and mobile applications, i.e. proven applications and Internet services, on the one hand, and completely new mobile services and products, on the other hand.

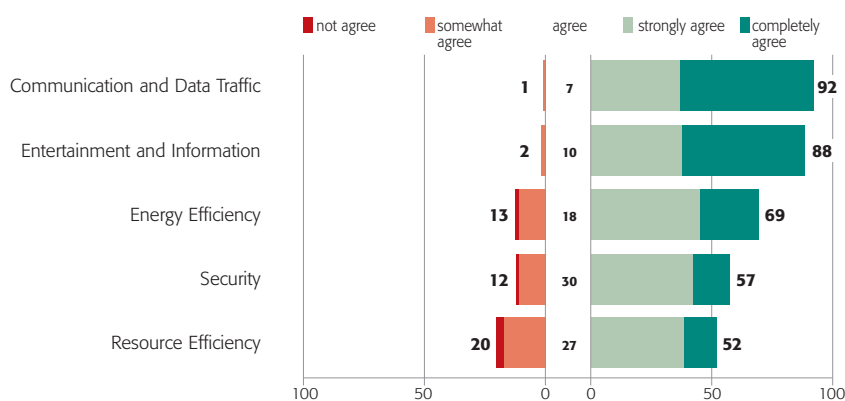
This has resulted in a development race which will lead to an enormous diffusion of mobile ICT systems and applications in the coming months and years. Internet and media applications that have so far been stationary will very soon be mobile and be converged owing to modern terminal equipment.

The requirement

The growing wish of the population to make more flexible use of new information and communication technologies also in the private environment must be met.

Especially since the significance of IP-based services – the "digital home" – and new types of entertainment continue to grow.

Figure I.4: Significance of innovation in information and communication technology for the "digital home" (in percent)



Source: Münchner Kreis, Deutsche Telekom AG, TNS Infratest, EICT 2008; expert interviews; N=538; missing percent to 100: no answer

The recommendation

The German ICT sector should continue to focus on its strengths in the field of networks and system integration. Mobile data services and the business models that are based on them belong to the largest fields of innovation of the ICT industry and should be further developed to become innovative products that are competitive at the international level. The "digital home" will allow the connection of systems and terminals that are not yet connected and result in completely new applications. At the same time, the convergence of telephony, the Internet and television makes further progress.

Both developments offer enormous potentials.

In order to be fit for the future, the representatives of the sectors concerned must soon agree on common standards to guarantee that the equipment (entertainment electronics, mobile phones, home automation, household appliances, phones, computers) are compatible.

It is, however, also essential that all parties involved ranging from the ICT sector over architects and producers of household equipment to the construction industry discuss the opportunities in a dialogue on Germany as a business location.

Message 5

“More flexibility and efficiency by means of ICTs: new value-added systems in mobile and digital working environments of the future.”

The status

The continually falling prices together with the growing capacities of ICT systems have resulted in a fundamental change in organisational structures in the last few years. The changes range from e-factory to mobile and home offices. Decentralisation instead of hierarchy is the main characteristic of these systems. This is due to both information and communication systems.

Future decentralised organisational structures offer the potential to combine higher capacities with more flexibility, motivation and autonomy for individuals.

The requirement

ICT-supported work processes must make a considerable contribution to enhance efficiency and at the same time take account of the employees' need for more flexibility and independence.

In this context, mobility has become an important economic factor in view of the growing globalisation.

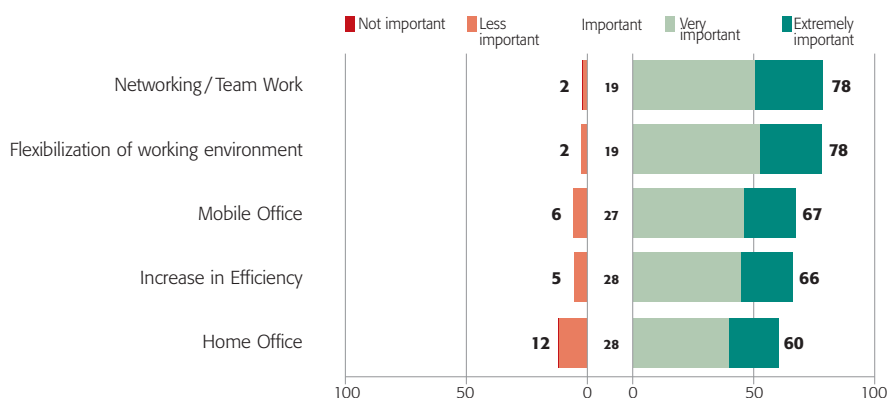
While away from the office, people wish to make productive use of this time. The wish to have access to data and systems at any time and place will play an outstanding role in the future.

The results of human work become more important. When, where and how these results are achieved becomes less significant; the production procedures become more flexible and virtual.

ICT-supported types of cooperation thus result in change: being present is no longer necessary, what counts are the results of the work. In the value-added process, they connect specialised firms and experts within and outside companies, within Germany and abroad and thus support highly-efficient and flexible work. Time and space are no longer important for organisational structures.

This is also reflected in the consultation of the experts: the experts regard the significance of mobile offices as greater than the role of home offices. For this purpose, ICT systems and infrastructures must become available both publicly and in companies. The financing question, however, remains to be solved. The economic and regulatory prerequisites must be attractive for private parties to make them expand the broadband mobile infrastructure throughout the country and develop innovative services, user concepts and adequate business models in a mobile environment.

Figure I.5: Driver for ICT innovations, which will change our working environments (in percent)



Source: Münchner Kreis, Deutsche Telekom AG, TNS Infratest, EICT 2008; expert interviews; N=538; missing percent to 100: no answer

The recommendation

“Skilled labour is the most important resource for Germany as a high-tech business location. It is clear that only those who invest in ICT skills now will be able to attract investments and highly-qualified employees in Germany in the medium term.” (BMWi 2007).

The growing shortage of skilled labour can be counteracted effectively with attractive ICT offers that take account of the companies' needs. The interplay between more competition, on the

one hand, and a rising pressure to innovate, on the other hand, necessarily leads to optimised processes – the ICT sector can make a significant contribution in this context. We must support concepts such as "open innovation", which help to open up the innovation processes of companies and facilitate the active strategic use of outside factors to enhance potentials. Besides, the awareness for IT security must be further raised to ward off attacks and to guarantee secure innovative products and a reliable infrastructure in the work environment.

Message 6

“Efficiency-oriented use of resources due to ICTs: green IT and e-energy secure our future.”

The status

In the year 2007, the use of ICT infrastructures resulted in an estimated total of 830 million tonnes of CO₂ emissions (this corresponds to about two percent of total global CO₂ emissions).

At the same time, the use of ICTs in the fields of home automation and energy management could help to reduce CO₂ emissions by up to 3.71 billion tonnes annually according to estimates (see SMART 2020 Report).

Since the publication of the most recent UN World Climate Report in 2007 at the latest, the vast impact of climate change on our lives in the future has been recognised as the greatest challenge.

Energy efficiency and sustainability are intensively discussed solutions to reduce greenhouse gas emissions and guarantee sustainable energy supply.

The requirement

It is necessary to use energy resources efficiently and cautiously for both economic and ecological reasons, now and in the future.

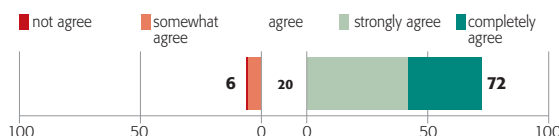
In this context, the consistent modernisation of technical infrastructures in Germany is indispensable. In technical terms, green IT and e-energy are one of the main pillars to secure our future since they contribute to the efficient use of resources and energy saving and help Germany to reach its aim to reduce its

dependency on the energy markets as far as possible.

Besides, green IT and e-energy create the preconditions for the responsible use of resources. Technologies that register and adjust consumption enhance transparency – if German households knew their electricity consumption and the related costs they would save about ten percent of electricity (see FAZ 2008) – and therefore should be installed throughout the country.

Figure I.6: The efficient use of ICT for an optimized energy use can help to generate significant competitive advantages (in percent)

ICT-Systems are attributed to an essential share of the worldwide energy consumption. Industry participants optimizing its products concerning energy consumption will have a significant competitive advantage in the medium term.



Source: Münchner Kreis, Deutsche Telekom AG, TNS Infratest, EICT 2008; expert interviews; N=538; missing percent to 100: no answer

The recommendation

The promotion of ICT systems that make private energy consumption transparent, for instance by means of state support of "smart meters", can make a considerable contribution to more energy efficiency as an integral part of the measurement and control of private energy consumption.

In order to fully tap the enormous potentials of the e-energy market environment in the future, a coordinated strategy involving all parties concerned, i.e. policy-makers and the ICT sector as well as the energy industry, is one essential element. The competitiveness of Germany as a business location also depends on its ability to enhance energy efficiency by means of both climate-friendly electricity generation and the intelligent, scalable, i.e. expandable, combination of energy systems.

In the medium and long term, the optimisation potentials owing to green IT will become significant competitive advantages due to cost reductions and a better image of innovative firms.

Examples are low-energy IT and communication components, automatised deactivation of appliances or the prevention of the stand-by function. All parties concerned ranging from policy-makers to end-users must be made aware of these and many more opportunities, which must be realised by taking specific measures within the framework of a closely coordinated agenda at the federal level.

Politicians must set the course to create incentives for citizens for an energy-efficient "digital home" as rapidly and inexpensively as possible. The promotion of intelligent systems, especially of embedded systems, to enhance energy efficiency and rational use of resources is a useful and innovative approach, whose full potential for the future will have an enormous impact not only on the ICT sector, but on all economic and social fields.

Germany at present holds a very good position in this innovative field – this position has to be turned into a lasting strength.

Message 7

“Embedded systems as a competitive edge for German economy: Enhancement of this driving force behind innovations and growth to guarantee sustainability.”

The status

Embedded systems play an increasing role both in our private and work environments. In the home environment alone, these software/hardware components are integrated in almost all mobile phones, TV sets, cars, household appliances and other electronic appliances.

Apart from the primary function that they fulfil, the advantage of second-generation embedded systems is the fact that they autonomously fulfil specific tasks and can communicate for the user with other systems – these systems are called "autonomous intelligent embedded systems". In the year 2006, a total of three billion components were produced worldwide; this corresponds to a market volume of 138 billion euros (see BITKOM 2008b/2007).

The requirement

Owing to their important cross-sectoral function and their role as innovation drivers, embedded systems belong to the most significant ICT growth fields and thus must be outlined as one of the most important fields of action for Germany as a business location. We must make various industries concerned aware of this potential and promote it as priority innovation field and driver.

By the year 2010 the market will have reached a total turnover volume of approximately 194 billion euros. Currently the German ICT sector is characterised by a pronounced strength in the innovation and growth field of embedded systems. It holds a leading position worldwide especially as regards research and development activities. Another strength is the important cross-sectoral function that embedded systems fulfil.

Especially the close links of the ICT sector with industries such as the car industry and mechanical engineering and their suppliers helped to enhance the effects in the last few years. Further promising fields for the future in this context include the energy sector, i.e. power generation and energy distribution, as well as e-health and "mobile health".

The consultation of experts, which was conducted within the framework of this study, confirms this assessment.

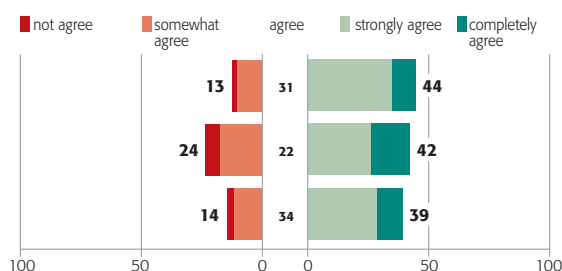
Furthermore, embedded systems can help to successfully meet the requirements in the fields of environmental protection and to overcome energy bottlenecks.

Figure I.7: Economic Relevance of Embedded Systems (in percent)

Embedded Systems revolutionize the product-, services- and process world and will become innovation drivers in all business fields.

Without Embedded Systems Germany as a business location will not be able to handle the growing problems in the future (increase of old people, globalization)

The development of Embedded Systems is the activator for a structural change in the German ICT and manufacturing industry



Source: Münchner Kreis, Deutsche Telekom AG, TNS Infratest, EICT 2008; expert interviews; N=538; missing percent to 100: no answer

The recommendation

In order to be able to fully tap the enormous potential resulting from the current position of German industry in the field of embedded systems in the future and to increase the competitive advantage, we must promote and foster the training of experts. The relevant university study courses must put more emphasis on embedded systems, and parallel research activities must be intensified to be able to implement the new trends and further develop them to become internationally acknowledged standards and trans-sectoral products. This helps to maintain the competitiveness and innovative strength of Germany as a business location and even expand and improve it. In this context, especially the ICT sector, the car industry, the health sector and the energy industry could be pioneers and beacons to establish a recognised "embedded system" trademark.

Furthermore, we must improve the position of Germany as a business location by establishing, expanding and promoting a separate embedded-systems industry. This would enable the manufacturing industry, on the one hand, to expand its activities in the field of embedded systems via this cross-sectoral function and, on the other hand, to focus on its core competences by putting more emphasis on, for instance, basic and innovation research.

On the way towards establishing embedded systems as strategic growth field, the enormous potential of embedded systems as innovative technology should be underlined within the framework of a PR strategy involving all parties concerned in the political, scientific and economic fields.

Message 8

“(Re-)Activation of entrepreneurship as a driving force behind future innovations in the German ICT industry.”

The status

In spite of the positive economic trend of the last few years and the resulting improved conditions for business start-ups, the number of business start-ups totalled no more than 860,000 in the year 2007 and thus reached its record low since the beginning of the new millennium (see KfW-Gründungsmonitor 2008). SMEs are the backbone of the German economy – as innovators and buyers of ICTs. For this reason, business start-ups in this sector are very important. Since the new-economy bubble burst in 2001, the number of high-tech business start-ups has risen, but it is still below the 1995 level in spite of a robust economic trend. Fortunately, the development of ICT business start-ups in the fields of software and services has been positive in the last few years (see ZEW 2008). As regards, however, the

total framework conditions for business start-ups by international comparison, Germany holds only the 16th place among 37 countries (see GEM 2006). In addition, the potential of ICT start-ups also depends on the number of university graduates in the fields of mathematics, information technology, natural sciences and technology (MINT). The quality and quantity of ICT specialists have a great impact on whether the innovative strength can unfold its full potential. The shortage of skilled labour in the ICT sector was underlined at the Second National IT Summit in 2007 as being of utmost significance for Germany as a business location. In 2008, there were 45,000 vacancies in the ICT industry (43,000 in 2007); this is one of the greatest cross-sectoral growth impediments (see BITKOM 2008a).

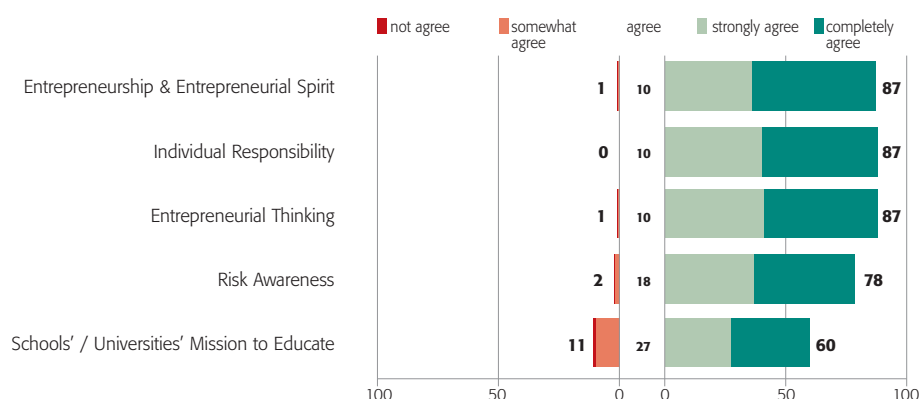
The requirement

In order to counteract this trend in Germany, a country that is characterised by SMEs, the promotion of the MINT subjects must start in the schools. Young people's enthusiasm for these topics must be aroused by means of new didactic concepts. New career opportunities must be pointed out and traditional role models must be overcome. One essential aspect is the practical orientation, which guarantees professional qualification at an early stage. This must go hand in hand with challenging and supporting more

entrepreneurial courage and spirit as well as fostering a culture of self-employment.

The experts who were questioned within the framework of this study confirmed this assessment: About 87 percent regard "entrepreneurship and entrepreneurial spirit", "entrepreneurial thinking" and "individual responsibility" as "extremely important" or "very important" to foster business start-ups.

Figure I.8: Important aspects for a change in mentality and the resulting total number of start-ups (in percent)



Source: Münchner Kreis, Deutsche Telekom AG, TNS Infratest, EICT 2008; expert interviews; N=538; missing percent to 100: no answer

The recommendation

The decision-makers in the political, economic and scientific fields must redefine Germany as a business location. Being innovators, business start-ups are very effective generators of our economic growth and thus help to make Germany fit for the future. They foster structural change owing to innovative ideas and new technologies. Germany, the "land of ideas", must again be able to autonomously create sustainable business models that are competitive at the international level on the basis of its innovations. In this context, the promotion of innovation clusters as well as the support of young companies with regard to the internationalisation of their business approaches, which is essential in the ICT

sector, can make a decisive contribution. For this reason, a lasting rise in the number of business start-ups requires in particular a fundamental change in mentality: entrepreneurship and entrepreneurial spirit must be firmly rooted in the minds of young people as positive ideas. In addition, secure financing is an indispensable precondition for innovation and growth. Therefore politicians must – especially against the background of the current financial crisis – give utmost priority to the creation of framework conditions that are competitive at the international level in order to mobilise a much broader range of private venture and equity capital possibilities and adequate credit financing.

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