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Internet revolution and new economy



Technology and work - the 21st century and its challenges

- The internet is a driving force of transformation in society. **In sectors using information and communications technology (ICT) as platform for innovation, the meaning of the term "work" is undergoing fundamental change.** These changes are particularly lasting as regards working conditions and qualification requirements in highly innovative business areas.
- The demographic trend is leading to lower supply of qualified young people and a sustained rise in the average age of the workforce. With a given increase in the capital stock and a falling participation rate, dynamic macroeconomic growth is only possible if productivity rises considerably. **Information and communications technology is a major key, which creates challenges for employees, companies and economic policy.**
- New technologies are helping to **accommodate employees' individual preferences regarding working hours and location.** The concept of teleworking offers advantages for both employees and companies. Whether an employee will be offered telework will depend on the nature of the job and the person's individual work morale.
- It is expected of the modern employee that he/she easily cope with the ever more quickly changing demands of the job. Thus, his/her **level of qualification is becoming an increasingly relevant factor.** It gives food for serious thought that – despite the demand for university graduates – the ratio between university entrants to school leavers who are qualified to attend university from the same class is on the decline. Germany is noticeably losing ground when it comes to human capital.
- There is a huge shortage of highly qualified workers. **Besides immigration, improved integration of domestic human capital into the labour market is an important factor to counter the lack of qualified staff.**
- Modern knowledge-management concepts may contribute to a more efficient use of existing knowledge in a company. **Even though companies generally support the concept of knowledge management, only very few concrete projects are actually realised.**
- Germany is insufficiently prepared for the high demands of the future. **Instead of unbending regulation, the German labour market needs more freedom to come up with flexible solutions.** As regards Germany's future competitive position, all groups of society are called upon to implement joint concepts for a flexible labour market.

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Technology and work – the 21st century and its challenges

Transformation of production processes

In today's information society, the internet is the most important technology and the driving force of societal and economic transformation. In sectors using information and communications technology (ICT) as the platform for innovation, the meaning of the term "work" is undergoing fundamental change. Global connectivity is leading to problems of definition between work and leisure, between professional output and play. There are lasting changes as regards working conditions and qualification requirements in innovative business areas. As regards competitiveness, highly skilled staff, education and training as well as knowledge management are all playing an increasingly important role. There is already an appreciable shortage of qualified labour especially in the high-tech sectors – despite the high overall unemployment rate. In a knowledge-based society, the relationship between employees and employers is characterised by greater dynamic. Ulrich Klotz, member of the Board of the German Metalworkers' Union (IG Metall), has outlined the changes caused by the technological revolution as follows: "The work will still be there, but not the stable job. In the future, a job will come to be seen again as something you do rather than something you have"¹.

In the post-industrial information society, work with material products has been pushed to the sidelines while digital goods and services have taken centre-stage. Today, two in five employees in Germany are using a computer for at least half their working day, and every third employee has access to the internet. Highly qualified jobs in the high-tech sector are increasingly becoming a driving force for economic prosperity. Technological innovation and economic growth are mutually reinforcing. Both are based on complementary investment in physical and human capital. For this reason, modern economic and structural policy is increasingly defined by educational measures.

The various groups in society should familiarise themselves in good time with the structural developments in the process of work, which have been triggered by modern ICT. In order to ensure future economic growth, an ageing society needs technological progress and a highly qualified workforce. Any analysis of the impact of technology on the conditions of work in the 21st century must therefore deal with **demographic changes, structural prerequisites** in the labour market, **geographic organisation** of labour market processes, the **educational system, management of existing knowledge, immigration** and the willingness to **integrate new groups** in society. This report seeks to make a valuable contribution to such analysis.

Still strong demand for high-tech jobs

The direct employment effect of the "new economy" (in the narrow definition) has been comparatively small so far. In examining the labour market effects, though, exact differentiation is required. On the one hand, the European Commission estimates that three-fifths of the 10

Technology gives new meaning to the term "work"

High-tech jobs as driving force for economic growth

Ageing society places hopes on technological progress

¹ Klotz, U. (1999): Die Herausforderungen der Neuen Ökonomie; in: Gewerkschaftliche Monatshefte, 10/99; p. 590

million jobs created especially in the “old economy” of the EU since 1995 call for higher qualifications. Roughly one million jobs were counted in 2001 in the entire e-business sector in Germany, according to BITKOM (Bundesverband Informationswirtschaft, Telekommunikation und neue Medien). On the other hand, the 320 companies listed on the Neuer Markt employ just under 180,000 people; this is 0.5% of the total labour force.

In general, long-term technology-driven structural changes are concealed by cyclical effects. The hardware segment (mobile phones, computers, microchips), which has always been highly cyclical, built up considerable capacities in the boom phase and has therefore been particularly hard hit by the recent turmoil. Even though cyclical factors are responsible for the fact that there are 30,000 less jobs for computer and software specialists now than in the boom phase, the fundamental trend towards knowledge-based IT jobs is still intact.

Concern about greying population slows down development

Demographic patterns, which for a long time were a motor of growth, are now increasingly turning into an obstacle to progress. The demographic trend is leading to lower supply of qualified young people and a sustained rise in the average age of the workforce. If the current population development continues unchanged, the supply of labour will decline by at least a quarter of a million per year until 2010. Should the factors dampening employment (e.g. poor staff mobility, legal constraints) fail to be removed, the unemployment problem will persist for some time despite the scarcity of labour.

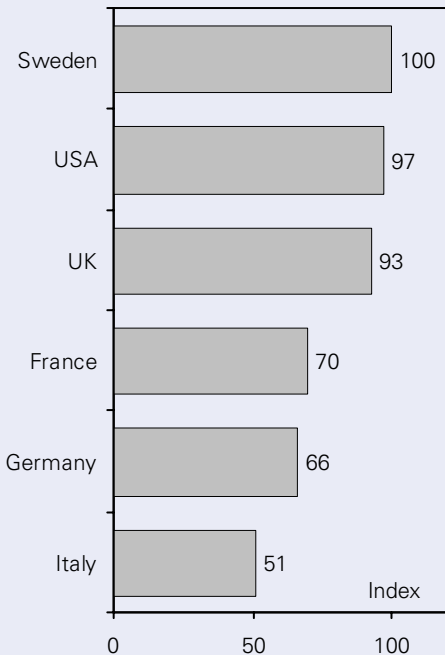
The Mannheim Research Institute for the Economics of Aging (MEA) forecasts a more than 15% decline in the German labour force over the next 40 years. With a given increase in the capital stock and a falling participation rate, dynamic macroeconomic growth is only possible if productivity rises considerably. So every worker in Germany will have to increase output by roughly one-sixth by the middle of the century in order to maintain the current level of consumption and investment. Technology is a major key to the necessary productivity gains. An economy’s innovation drive, however, depends on whether there are suitable framework conditions.

Greater flexibility required

Numerous research institutes have highlighted the strong rigidities in the German labour market. Usually, the analyses in this context refer to full-time employment, i.e. employees with an unlimited contract, who work full time and have a direct reporting line. Flexible employment, a particularly important factor in the high-tech segment, which is often not subject to collective bargaining agreements, is usually discussed insufficiently.

Several indicators suggest that employees have used the limited freedom provided by the legal framework in Germany to react with some flexibility to new requirements outside traditional employment contracts. Correspondingly, the traditional employment contract, which often gets in the way of greater labour market flexibility, is losing in importance. As regards the employment intensity ratio (EIR), i.e. the ratio between full-time equivalent employment (FTE) and the unadjusted employment rate, Germany ranks higher than the EU average.

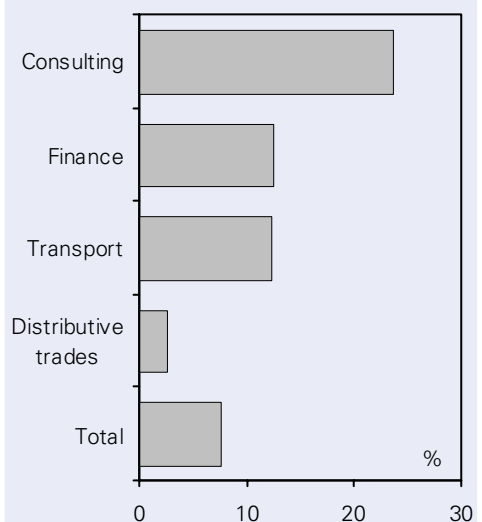
Ranking of framework conditions for the new economy



Individual indicators, each making up one-fifth: OECD product market regulation index, OECD labour market regulation index; stock market capitalisation in percent of GDP; share of population in the two highest categories of education and share of R&D spending in GDP; no education indicators for France and Italy

Source: OECD, 2001

Change in self-employment ratio in Germany by industry, 1995-1998



Source: Federal Statistical Office, 2000

According to the German Institute for Employment Research (IAB), traditional full-time employment still accounted for 70% of total jobs 15 years ago; today the ratio is slightly over 50%. This implies that nearly every second job today differs from the usual conditions of an employment contract. Moreover, the number of self-employed grew by just under 6% each year between 1990 and 1998, i.e. twice as quickly as the total workforce (just over 3%). This trend is particularly obvious in sectors with great demand for highly qualified labour. The number of self-employed in the corporate services segment rose especially strongly (1995-1998: 24%).

Flexible employment models are being developed above all in the dynamic sectors. The traditional pattern shaped by full-time employment is being watered down by new flexible contracts. However, first positive signals must not conceal the fact that the government, trade unions and employers face considerable challenges if they want to pave the way for Germany's future as a business location.

Making use of organisational freedom in the workplace

In some areas, technical innovation is helping to accommodate employees' individual preferences regarding working hours and location. Offering employees to individually organise the flow of work, e.g. as teleworkers, will become increasingly important as firms compete for highly qualified staff. Modern employees do their work in SOHO (Small Office, Home Office). Corporate structures and production procedures must suit these innovative forms of work.

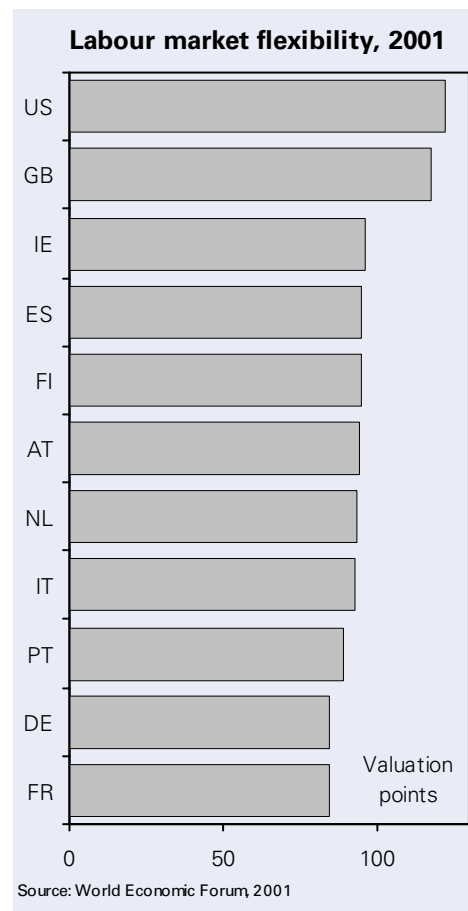
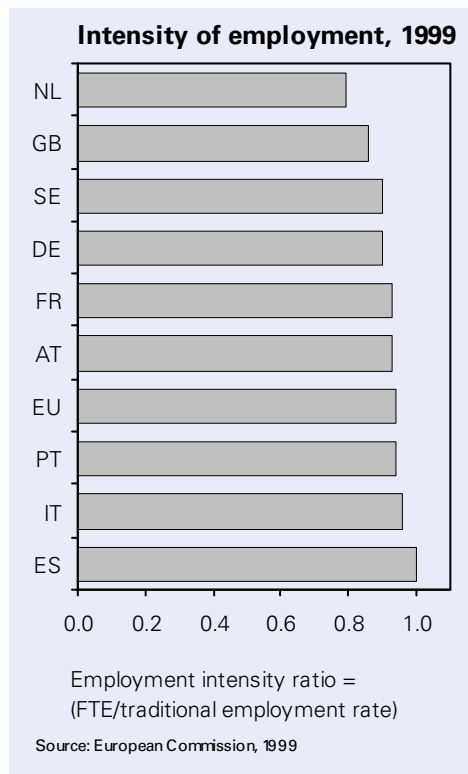
The concept of telework is closely related to progress with ICT and aims to move work processes to places outside the company's premises. How a tele-workstation is equipped depends on the kind and amount of data to be exchanged. The transfer of highly complex data or graphics requires much more sophisticated infrastructure than simple text file transmission.

Teleworking differs fundamentally from the traditional "cottage industry" and can take place at the following locations:

- a) in the employee's own home;
- b) in a mobile office at changing locations;
- c) in a satellite office, i.e. offices of the same company that are easier to reach than the employee's original place of work;
- d) in a neighbourhood office used jointly by several companies.

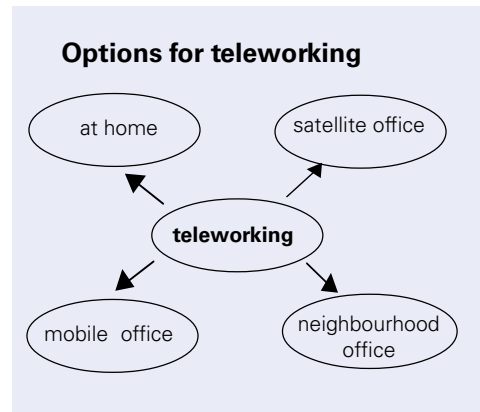
Telework offers advantages for both employees and companies. Less time spent commuting and greater freedom in organising one's own work flow will likely boost employee motivation and productivity. Greater job satisfaction should reduce an employee's willingness to change jobs. Declining demand for office space in city centres will lower rent costs for companies. Besides, "overseas teleworking" enables companies to benefit from lower wage costs in other countries.

Whether an employee will be offered telework will depend on the nature of the job and the person's individual work morale. Not every task or every employee is suited for teleworking. Besides tax and legal issues (tax write-down on home offices, social security, right to return to the original job) and the question of who covers the costs of the work station (furniture, material and telephone costs), teleworking harbours the risk that the employee is decoupled from the company's internal flow of work and information. Teleworkers must not lose contact with the company and turn into "electronic hermits." As employees no longer



need to be present on the company's premises, teleworking also means less control. This creates potential for conflicts especially at the middle management level. The corporation must gear its leadership style to target-oriented leadership and result-oriented control in the form of "management by objectives". In light of the potential problems mentioned above, teleworking usually includes arrangements under which, for example, an employee works from home for three days every week and comes to the office on two days.

The generally wider options offered by modern ICT are used in only very few cases in Germany at present. Currently, only every twentieth employee is a teleworker. Especially compared with the Scandinavian countries, Germany is far behind in this respect.



Knowledge matters

It is expected of the modern employee that he/she easily cope with the ever more quickly changing demands of the job. According to an IAB estimate, the share of non-skilled jobs in total employment will decline by one quarter between 1995 and 2010 in Germany. The intensity of knowledge in the entire economy rises in line not only with the intra-sectoral trend described above, but also with structural changes towards the knowledge-intensive services sector (share of academics in the sector's total workforce in 1990: 6.4%; 1998: 8.2%) and away from industry (1990: 4.5%; 1998: 6.1%).

Job experience is rapidly losing in importance. The half-life of knowledge is declining noticeably. For computer-based professions it is currently estimated at less than four years. Qualification requirements are changing rapidly. The technological revolution triggers the need for continued training. In Germany, participation in further training has doubled over the last two decades but still only every second adult is taking part in in-house courses. This is putting the brakes on both individual careers and productivity growth in the overall economy.



German education sector lagging behind

In view of the relevance of knowledge for markets it gives food for serious thought that young people gear their choice of a university subject only marginally to labour market developments. The ratio of university entrants to school leavers who are qualified to attend university from the same class is on the decline – despite the higher demand for university graduates in the business sector. Over the last decade, the ratio has fallen by 10 percentage points to 70%. As regards employees with a university degree, Germany ranks fifth among the 55 to 64 year-olds worldwide but is only No 21 in the 25-44 age group.

The standing conference of the German ministers of education estimates that in five years' time only 35,000 engineers will finish their degree course and enter the labour market; in the mid-1990s there were still 50,000. Germany has noticeably lost ground when it comes to human capital and is now at a crossroads.

Urgent need for skilled workers

Owing to the scarce supply of qualified labour, companies in industry and the services sector were unable in 2000 to hire staff for one in four vacancies – despite the high unemployment rate. The Centre for European Economic Research (ZEW) has calculated that in the research-intensive services sector every second vacancy in the technological/scientific segment remains open. The shortage of skilled workers is particularly striking in the ICT segment: in 2000, there were 90,000 vacant posts, that could not be filled; throughout the EU the figure was

Further training ratio* by qualification in Germany

	1989	1997
Without qualification	4.7	9.0
Apprenticeship	10.9	15.0
Master craftsmen and technicians	20.9	26.0
Technical college	22.1	31.6
University	25.3	31.3

*Further training over the last two years in percent of the workforce
Source: ZEW, 2001

well above 500,000. One in four companies in research-intensive industries is having to extend the amount of time allocated to its innovative projects because of a scarcity of qualified staff. According to an IAB survey on the effects of the shortage of highly qualified experts, 38% of companies said their staff worked overtime, while 19% intended to implement more intensive rationalisation plans.

The effect of scarce qualified labour can be described as follows: the lack of skilled workers is pushing up expert remuneration and thus curbing the attractiveness of a location in the eyes of potential investors. Companies are moving production sites to places with ostensibly more favourable economic conditions. The short supply of highly skilled labour is thus also dampening labour market momentum for the less qualified.

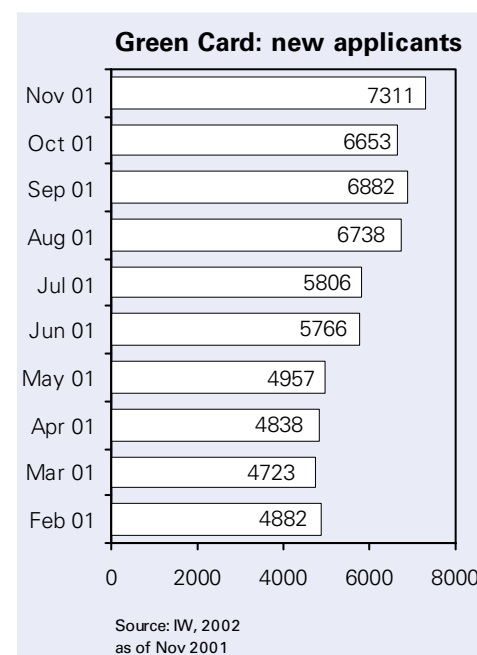
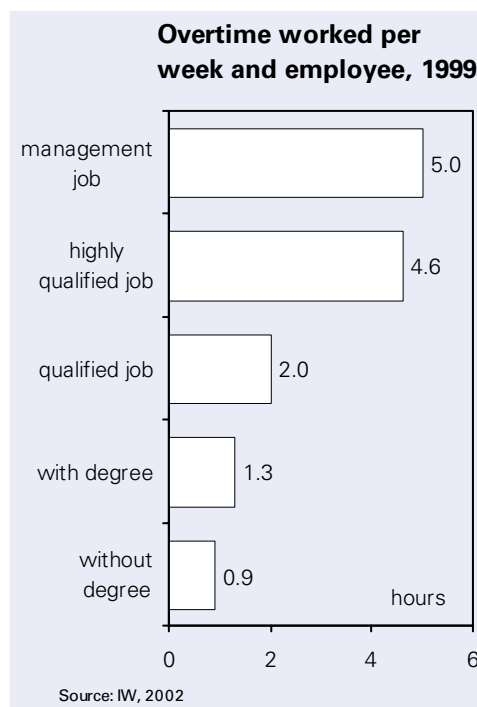
Labour force potential not fully tapped in Germany ...

Besides immigration of foreign workers, the discussion also centres on making better use of domestic human resources. Labour market imbalances also have a geographical dimension and are due to workers' limited mobility. Numerous political factors such as land purchase tax and conditions attached to unemployment benefits lead to extreme immobility and lack of flexibility. Moreover, labour and social legislation are making integration of older people and women into the labour force particularly difficult. Both groups enrol too rarely in training courses. This harbours the risk that older people and women participate only partly in technological progress and lack the qualifications required by modern companies.

... or in other industrial countries

An influx of almost 500,000 foreign workers each year, which would be required to ensure continued labour market vitality, would cause tremendous societal problems. Regulated immigration to the German labour market can generally help ease the shortage of skilled labour but is not a fully satisfactory solution. However, economic policymakers are increasingly considering India, for example, with its four million newly trained IT specialists per year as a potential source of high-tech experts. An element of the German government's active labour market and immigration policy was the introduction of a Green Card system (like in the USA) in August 2000 and the passing of new legislation on immigration in March 2002. Both measures aim especially to better integrate highly qualified workers. The Green Card is a combined work and residence permit, limited to a period of five years. A Green Card is issued only after bureaucratic and individual consideration of the applicant's level of qualification and gross annual salary (at least EUR 51,000). By November 2001, the Federal Employment Service had registered almost 60,000 applicants. To date more than half of the total number of Green Cards available has been issued; nearly 90% of the successful applicants have a university degree. This controlled immigration is mainly benefiting small and medium-sized firms: roughly 60% of all Green Card holders work in companies with less than 100 employees. For the most part, Green Card holders work in urban areas that are home to particularly innovative industries, such as Munich (2,000 Green Cards), Frankfurt am Main (1,800), Stuttgart (just under 600), Hamburg, Berlin and Düsseldorf (300 each).

Despite the Green Card arrangement and the immigration law, demand for highly qualified staff will continue to exceed supply in the foreseeable future. The German labour market must become more attractive to those trained in high-tech jobs. Disadvantages of the Green Card



Flexible immigration criteria required

scheme are the bureaucratic application process, restrictive immigration for family members and the still relatively short period of residence. Ideally, the state would merely lay down general rules or quotas instead of examining every single case. Flexible criteria can take into consideration medium-term requirements specific to individual industries and regions. In this regard, the immigration law clearly is a step in the right direction.

New organisation of knowledge

Beside the scarcity of qualified labour, the knowledge base existing among a company's staff is not always used adequately in internal processes. As Jochen Röpke, an economist, says: "In a knowledge-based society, there is no shortage of information and knowledge. The bottleneck is the degree of cooperative and productive use of knowledge on the basis of a division of labour."² According to estimates by IDC, an economic research institute, the world's 500 largest companies lose about USD 12 bn per annum because internal knowledge is not tapped adequately. Researchers at Göttingen University found that more than half of all German companies actually use only a small part of their employees' knowledge.

Knowledge can be divided into two categories: implicit and explicit knowledge. Implicit knowledge in the form of individual experience has a major impact on day-to-day decisions, is mainly linked to a certain person and hard to transfer. Thanks to the internet, explicit knowledge, which was previously stored in libraries and archives, is available today almost throughout the world. Here technological progress has put an end to traditional restrictions on the origin of industrial work processes.

Modern concepts of knowledge management, especially personalisation and codification, are aiming to improve the use of available knowledge. Personalisation is to foster communication of knowledge among a company's staff. In order to promote the exchange of knowledge, institutionalised channels, networks and forums are being created. Codification, by contrast, aims to document and systemise knowledge electronically. Document Management Systems (DMS) help to gather and organise information and use it throughout a company.

Even though, according to a survey conducted by Hohenheim University, four-fifths of all companies assume that knowledge management has a positive impact on shareholder value, less than one in three firms is actively pursuing the concept. The discrepancy between theory and practice regarding measures to reduce the bottleneck of skilled labour is jeopardising competitive positions.

Germany only partially prepared for future demands

Modern information and communications technology has triggered fundamental, structural changes in work processes. Technology is casting a new light on the term "work" in the 21st century. Even though long-term, technology-driven structural changes are concealed by cyclical effects, the fundamental trend towards demand for higher qualifications is still intact.

Demographic patterns, which for a long time were a motor of growth, are now turning into an obstacle to progress. More and more, dynamic macroeconomic growth seems to be attainable only by means of considerable productivity growth. Innovation drive at the corporate level is a major key to the necessary productivity gains.

Use of knowledge is the true bottleneck

Personalisation and codification aim to improve the use of knowledge

Knowledge management concepts realised too seldom

Need for innovative companies

² Röpke, J. (2000): Preface to: Rassidakis, P.: Wege der Selbstevolution; Frankfurt am Main

Flexible employment models are being developed above all in the dynamic sectors. Nonetheless, substantial efforts will have to be made in order to pave the way for Germany's future as an important location for business.

In some areas, new technologies are helping to accommodate employees' individual preferences regarding working hours and location. The much-discussed concept of teleworking offers advantages for both employees and companies but cannot be applied in all sectors. Corporate structures must be adjusted to the new requirements.

It is expected of the modern employee that he/she easily cope with the ever more quickly changing demands of the job. The technological revolution triggers a need for continued training. Well-trained staff will be the No 1 bottleneck in the future. Besides immigration, improved integration of domestic human capital into the labour market is an important factor to counter the lack of qualified staff. Elements of the German government's active labour-market policy are the introduction of a Green Card and the passing of an immigration law. Both measures aim especially to better integrate highly qualified workers. Despite the Green Card scheme and the immigration law, demand for highly qualified staff will exceed supply in the foreseeable future. Regulated immigration to the German labour market alone cannot solve the problem of scarce skilled labour.

Beside the scarcity of qualified labour, the knowledge base existing among a company's staff is not always used adequately in internal processes. In this context, knowledge management concepts aim to make better use of available knowledge. Even though the projects are generally seen as important, too few are actually being implemented.

Germany is not fully prepared yet for the high demands of the future. Instead of regulation, the labour market needs greater scope for individual and flexible solutions. As regards Germany's future competitive position, all groups of society are called upon to draw up and realise joint concepts for a flexible labour market.

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Bottleneck of the future: highly qualified staff

Demand for high-tech experts will continue to exceed supply

Labour market needs greater scope for flexible solutions

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