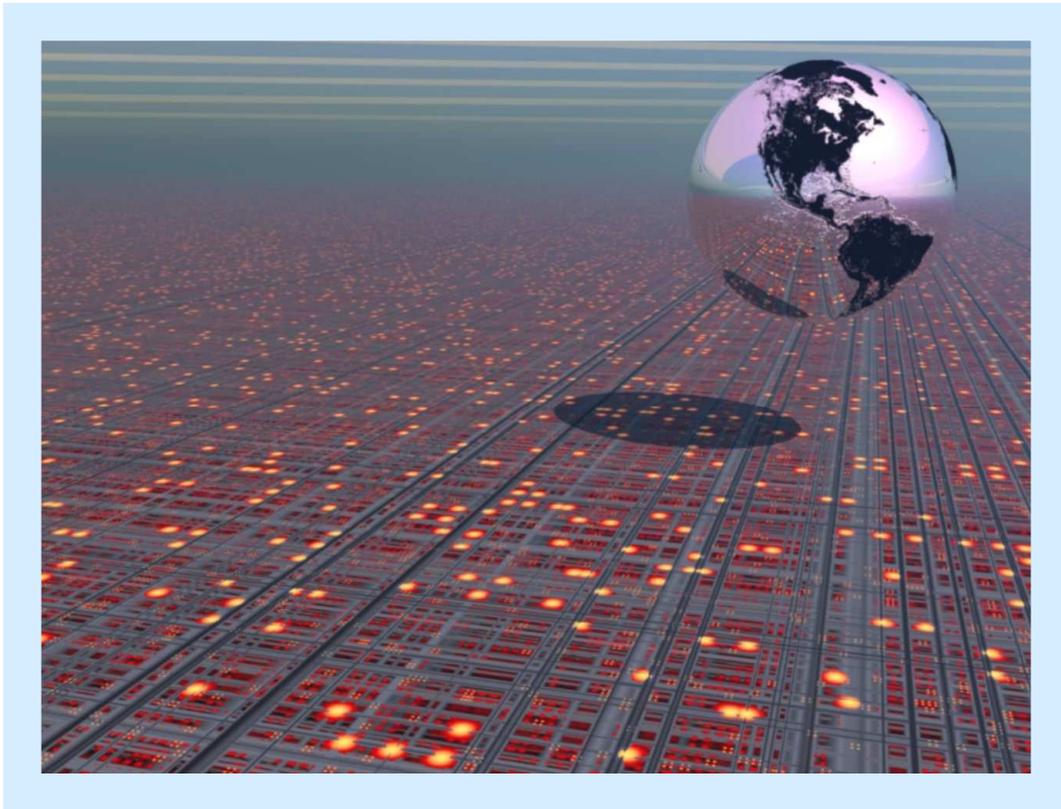




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# The Digital Revolution

**PEOPLE OF THE 21ST CENTURY BETWEEN ACCELERATED PROGRESS,  
TREMENDOUS CHANGES AND UNPRECEDENTED CHALLENGES**

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## 1 Introduction

This article examines the developments in our society caused by digitalisation, the way our society usually deals with changes and new requirements as well as the way it should be dealt with in the particular matter of digitalisation. It is described the past development and actual degree of distribution of digital devices and the internet in the second chapter, which considers especially the pace of innovations and distribution in digitalisation. Then the past, current and future changes in social and work life and their requirements are examined in the third chapter. The fourth chapter describes substantial changes in the future work life, which also have an impact on society. There the topic of responsibility for and necessity of digital progress is explained in more detail. Especially the digital development as an economic factor and a chance for our society gets elucidated. The descriptions are supported by statistics and current examples.

## 2 Accelerated Progress in Digital Development

If somebody talks about the topic of *accelerated progress in our modern society*, the digital world is the major topic to talk about. In the last decades the society, that means our social and work life, changed in great parts. But to talk about massive alteration in social and work life concerning digital aspects, the last ten years are enough to give proof of such a development by reviewing basic statistic data and outlining happenings in this area.

A survey shows for example that in *Germany* in 2003 61.4 per cent of the surveyed people had a PC, while in 2013 85.2 per cent had one, with PC defined as either a fixed or a mobile personal computer (*Federal Statistical Office of Germany* 2014, p. 14). That is an increase by one third and means that in 2013 17 out of 20 households were in possession of a PC. Moreover the proportion of people having a mobile phone increased from 72.5 per cent in 2003 to 92.7 per cent in 2013. Furthermore 46 per cent of the people in 2003 had internet access (including mobile internet access), while 80.2 per cent had such an access in 2013 (*Federal Statistical Office of Germany* 2014, p. 14). These data show that approximately nine out of ten persons in 2013 had a mobile phone and only every fifth person had been without internet access. From this can be drawn that especially mobile communication and internet access have had a strong increase in its importance in the past ten years.

This findings are supported by the role and necessity of internet in daily and also work life. In the area of communication, the social mass media like *Facebook* and *twitter* developed fast in recent years and these media is given huge attention to. These mass media is not only a fundamental of our modern social life, it already has developed a vast economic relevance, because of its deep entrenchment in society. This has also been noticed by experts from different economic sectors, whom offer marketing and selling strategies for companies working with such media. The same guidelines are also valid for

professional social media like *XING* or *LinkedIn*, which help their users to build up professional networks, some companies recruit their staff in this way and these networks are also very familiar in the working routine of many modern companies.

Besides the social media there are also comprehensive changes in the habits of people in our society. Particularly elementary procedures like buying daily goods, making an appointment, a regular visit to any of the authorities or effecting an insurance policy have moved to internet portals, where all these things can be done quite comfortably. These changing habits are the adaptation of everyday procedures to the digital world and its possibilities, which are mostly motivated by a decrease of time, labour and money needed to conduct these procedures. Additionally these methods help to make everyday life more comfortable for people. Also services and products, for instance buying goods online with delivery in only a few days, seems to get more attractive to customers than other ways of purchasing goods do. This development can be proven by looking at the growth of companies like *amazon* or *Google*, which provides fast and modern services with intuitive and comfortable handling that fits the requirements of today's people in our society. These companies are the well-known examples and biggest ones, but there are many more services and products available online than there were ten to fifteen years ago. For instance, it is already possible to search online for real estate, a flat, to book a holiday, to subscribe to newspapers and magazines or the ticket for public services, to order goods for furnishing, for the garden, for babies, children or even pets. Moreover it is possible to order new glasses fitting the correct dioptr number (for instance in Germany at *MISTER SPEX* or *Brille24.de*), to order books, clothing or other goods of everyday life. It is even possible to study online or to do the daily shopping online (even with home delivery). Elementary parts of our life have moved to the internet and are available to be done more easily online.

If the last ten years are compared, the private use of computers and internet in Germany increased from circa two thirds in 2004 to four fifths in 2013 (in the first quarter of each year), which means that minimum four out of five people frequently use computers and internet (see *fig. 1*). It should be considered that there are differences between the age bands (*fig. 1* shows the overall average of all age bands), the purpose of the use and the frequency. The most common purposes for using the internet and computers are sending and receiving e-mails (91 per cent) and searching for information about goods and services (88 per cent), while calls and video calls or private selling of goods and services is less common (with 27 per cent each). (*Federal Statistical Office of Germany 2013, p. 199*)

Another example gives the fact that even the unemployment benefits calculation in Germany (officially named '*Grundsicherung für Arbeitsuchende*') includes components for cost of computer and internet (referred to as *cost of telecommunication*). This fact has an extensive relevance, because the changes in our society, which are socially accepted, are officially acknowledged by an integration in

social welfare benefits representing the minimum subsistence level. Therefore the internet and computers as resources can generally be addressed to be substantial for our modern society.

Nutzung	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	Angaben in %									
Computer	67	70	73	74	76	76	78	79	79	80
Internet	58	61	65	68	71	73	75	76	77	79

**Fig. 1: Computer- und Internetzugang im ersten Quartal des jeweiligen Jahres von Personen ab 10 Jahren (computer and internet access in the first quarter of each year of persons from 10 years age in per cent)**

The remarkable characteristic about this digital evolution, which retrospectively seems to have a development with accelerated progress over the last decades, is the pace of integration of new technology in society. Especially in high technology branches the development pace increased intensively and time to bring new products to market as well as the product life cycle gets shorter, for instance in the development of new smartphones, televisions or software/software components. The pace of development is one special aspect of the digital world. Another aspect is the social development caused by digital hard- or software innovations, because the society is closely associated with the digital world and adapts itself very fast to innovations – with all its advantages and disadvantages.

### 3 Tremendous Changes and Important Challenges in Social and Work Life

Within the last 15 years there were build up new possibilities and also new requirements for today's people, because of the – mainly technological – progress. This is not only valid for private persons, also the business and working environment changed. An area, which – in general – quickly captures and implements innovations in all its sectors.

#### 3.1 Past Development

In the last decades, technical innovations fostered the acceleration of economy. This is particularly applicable for devices like computers, smartphones, tablets or mainframes, which gave new possibilities in working environment, whereas the main advantages are a decrease of time and money and also labour needed to reach corporate objectives. These innovations did well in bringing positive changes, but also in bringing more complexity and pace as well as necessarily rising safety standards.

The arguments of complexity and pace are easy to understand by looking at a modern working environment, in which people do business – often paperless – with different electronic devices, getting many e-mails a day (in higher positions often hundreds or thousands of e-mails per day), using programs of any kind, bridging any gap in space by just sending data via internet.

This is the small scale of complexity and pace, which can be noticed by looking at a single person's workplace, but it should be considered that the mentioned devices are massively in use and – this is the particular novelty – connected. There are billions of links between all kinds of devices worldwide, working in different networks, enabling a rapid communication and therefore action in modern business world. Also using such devices and opportunities is not quite expensive as it was 15 years ago. In 2014 a complete business equipment, for instance for a start-up company, is available for a few thousands of Euros. Furthermore the internet as a resource is almost free of access costs (excluding cost of internet connection) and also its business opportunities are various available as using the internet gets more popular to private persons as well as companies in all branches.

With such a shift of conventional business methods and workplace design there also comes new requirements for safety regulations as the internet offers a relative anonymity to all its users. Therefore many attempts are made to keep pace with online developments to secure data and rights on the internet and use of technical devices.

By looking at conventional usage in working environment there are great impacts on people who are affected by the mentioned developments. The impacts mainly concern those persons, whose conventional working environment changed through digital progress, which means that these are not young but middle to older age bands. Members of the younger generations benefit from the advantage of growing into the digital age, without exactly knowing another lifestyle and are therefore more familiar with it. This is proven by looking at the proportion of young people owning devices like mobile phones, smartphones or computers compared to the same proportion in older age bands. As recent statistics show, the proportion of people between 18 to 35 years owning a personal computer in their household is 97.1 per cent (in Germany, on 1 January 2013), while this proportion decreases as the people get older. It is 96.9 per cent for people between age 35 and 45, 93.7 per cent for people between 45 and 55, 87.0 per cent for people in the age from 55 to 65, 78.2 per cent from 65 to 70, 64.3 per cent from 70 to 80 and only 38.0 per cent for people over 80 years. This finding is especially valid for mobile computers (laptops or tablet-pcs), the internet access, mobile phones or games consoles. It is also noticeable that the proportion of households owning personal computers, internet access and mobile phones decreases as the household income is lower. (*Federal Statistical Office of Germany* 2014, p. 23 and 25)

Whereas this statistics seems to be of low importance for obvious findings concerning the modern working environment, their interpretation is highly important, particularly to explain developments in work life by today. The people who are very familiar to technical or digital devices in their private life are also more likely to be so in a professional context. Therefore the younger age and middle aged bands are expected to do so, whereas the same finding is valid to households with higher incomes. Because of this situation, today's work life cannot be examined without considering the private

circumstances in our society. This is especially valid, if single persons are examined, because their understanding of the digital world gained in private life will have an impact on their understanding of the digital world in a professional context. Considering the explanation in the first chapter and above, there is a conflict between the socially acknowledged importance of the digital world and the access to it in the older age bands and also for people with lower incomes.

## 3.2 Current Situation

As digital resources get more important in our society traditional, respective conventional ways our economy works will change. This is what has happened the last decades due to digital progress and this is what will happen to an existing digital world, in which progress is accelerated because of past developments.

The digital resources like software, hardware and internet are not equally accessible as the data of the current situation in *Germany* shows. On the other side, these resources are fundamental to a society and also a work life, which displace conventions by digital processes and new conventions in a relatively short period of time. This is highly important, if such displacements are changes affecting the whole society and therefore work life like the digitally caused changes do. Even if the discussion about such resources is not severe today, it will be, when progress is made and digital development increasingly – more than it already does – affects people's life.

As recent statistics show, there is a considerable proportion of people, who do not use the internet or have internet access. The *fig. 1* shows that there were one fifth of the people in 2013 without internet access or even a computer. Furthermore this data cannot represent the whole world's status, because *Germany* is much better developed in its digital evolution than other countries worldwide and its development even is above the average of Europe. (Czajka 2011, p. 711, 713-714 and 717)

These facts encourage social inequality as well as inequality in job chances as conventional processes get displaced by digital solutions without providing the same access to digital resources for all members of society.

In this context it is very important to look at the reasons, which are given by people, who do not use the internet. In 2010 such people were asked to tell their reasons for not having an internet access at home. Among answers like that there is no need for internet or that there are other possibilities to use the internet instead of an access at home, the following answers were answered under the five most mentioned reasons:

- Not enough skills to use the internet;
- Acquisition cost is too high;
- Cost of use is too high;
- Concerns about data security and privacy protection. (Czajka 2011, p. 712)

The problem about the findings of the survey is that the motivation of not using the internet does not lie in a personal motivation of individuals, it is more a lack of resources such as education and money or the only little developed internet security and infrastructure.

### 3.3 Future Development

The economy of many countries worldwide and also the widely linked global economy works competitive with the aim of economic growth, which in return creates stable economies and wealth. But this principle also requires improvements, innovations and an increase in productivity to withstand in a competitive economy. These conditions in turn carve the way for digital development and in particular accelerated digital progress, if the participants of the economy understand and use the potential of the digital world as to implement improvements to increase their market chances.

Besides this development would cause problems, too, which need to be addressed in the right way. For instance an increasing importance of the internet and digital resources will encourage the displacement of conventional processes by digital processes like already happened in the last ten to fifteen years. According to this aspects of data and privacy protection would become more important, but the question is, who is responsible for providing an appropriate security infrastructure as the internet has no borders, which could assign a special country to specific parts of it. Additionally this development would also exclude non-internet users as they do not have an appropriate or are probably not able to get internet access or even access to digital resources at all. In this case it is not clear, who is responsible for providing internet access as such an access probably becomes the only possibility of access to fundamental resources in the future. There is also different quality of internet and digital resources access. If the internet gets necessary to have access to fundamental resources, it has to be questioned whether it is right that people, who own more money should have the better access to basic resources.

The mentioned examples in their concrete explanation seem to be of little importance to the contemporary situation and they are also not ought to describe the concrete future. They are meant to explain that every decision and action, which affects society, cannot only be measured by its obvious effects or seen in (economic) myopia. All changes need to be examined in detail, to ensure that they do not provide a promotion of inequality or social problems – a task many social and federal institutions are responsible for.

If there are no surprisingly developments concerning digital resources, which could outweigh, disrupt or negatively affect the digital evolution, for example a lack of investments in technological infrastructure or a rise in cyber-crime (*UKCES 2014*, p. 40), the (digital) progress made can be anticipated to continue or even to increase in its development intensity in future. But in preparation of such progress and the implied changes in social and work life, the society and in particular participants of the economy should face the important challenges caused by the progress.

## 4 Important Aspects in Future Work Life

After all changes in the past and predictions about future developments described in the previous chapters, it is worth to discuss, in which way our society and especially (future) decision makers and political leaders need to deal with such changes. That means, there are two things important: the changes that exists, which can already be identified as important key factors and the way these aspects are treated in our society and particularly in future work life.

### 4.1 Findings about Future Work Life

A recent study about the future of work in the *United Kingdom* (UK) examined, which trends can be indicated regarding work life until 2030. This study's results show different trends, which are already noticeable in parts today. The study also defines *trend* as “*a development lasting several years that is empirically documented. Trends usually run a steady course, and cyclical changes and fluctuations do not affect them, nor are they subject to changes in course or sharp rises.*”(UKCES 2014, p. 14)

Important trends, which were identified by the study in the matter of digitalisation (regarding the *UK*) are the change of work environments, the convergence of disciplines (for instance informatics and natural sciences) and technologies, the digitalisation of production, the development of information and communication technology and the increased use of big data as well as changed economic perspectives (UKCES 2014, p. 21-25).

All the mentioned trends affect work life in different ways, changing the conditions of future work life. Concerning the changing work environments, the study names *continuous digital training* as a necessary component of future work environments to provide more flexibility in order to withstand the pressure to be more flexible and to adapt to steadily changing business conditions. The *convergence of disciplines and technologies* means, that there will be a stronger cross-linkage between these and therefore a stronger demand for high-skilled workers. This implies that rapidly changing technologies and knowledge will create also rapidly changing innovative products and processes in working environments, which people need to adapt to. These conditions will encourage high-skilled and knowledge-based working as well as the manifestation of our society as knowledge society. An *increased digitalisation of production* will bring new kinds of production systems and factories, which will be increasingly autonomous, because of a better link between product development and production. Also processes of production will become more complex, while cost reduction is possible through new technologies such as *3D printing*. These facts will shift the scope of human's work to non-routine processes, which cannot be realised by machines and digitalisation. But this development will also be responsible for a reduction of jobs in production, particularly for workers in routine processes, while there will be a greater demand for medium- and high-skilled personnel. Moreover the *development and progress concerning information and communication technology* need to be considered. This develop-

ment is closely related to an *increased importance of big data* in the future. Both of the mentioned trends will displace many lower skilled jobs, while new jobs concerning these new and further developed technologies will be created. These new jobs require competences in handling information and communication technology, whereas digital skills like programming, web design, analysing and interpreting big data and also managerial competences will become crucial important to work life in many branches. An increasing diffusion of mobile devices and (faster) mobile internet access will provide (ubiquitous) communication and also instant access to media and information. Besides the technology for communication and information is expected to face a huge growth in capability and also complexity. Aside from the mentioned facts the study goes further, too, and states that digital competences and learning skills as well as adaption skills will become very important for the general population in the future. Another trend describes *changed economic perspectives* and can be summarized or better to say defined as increased complexity of the financial systems and the economy. The reason for this is the constitution of the economic system in developed economies like most of the European economies, which means the need for growth. Because of multifactorial impacts on reaching economic growth, for instance the contribution of technological aspects, growth is more difficult to achieve in future and businesses will be forced to get more complex to be innovative enough to provide steadily growth. (cf. *UKCES 2014*, p. 21-25)

As mentioned at the beginning of this chapter, parts of this developments are already visible today. But although they are trends and visible, they should precisely be recognized by persons, whose organisations could be affected by such developments, for example decision makers in companies, other leading personnel in comparable institutions or politicians, because they can handle such developments easier in a strategic perspective, they also have more time to elaborate different options regarding the right reaction to such trends and developments as they can act preventative to scientific findings about the future in the matter of digitalisation.

## 4.2 Responsibility for Dealing with Findings about Future Work Life

The trend that digitalisation changes work life is reinforcing increasingly as it is noticeable for great parts of population in economies all around the world and the correct and exact consideration of this development will bring advantages to those responsible persons, who recognise changes early and plan their reaction to it carefully. Hence this poses the question, who should be responsible for appropriately dealing with changes in work life.

The mentioned question will be one of great importance as the digital development proceeds and yet the answer to it is very complex, if it is aimed to answer this question for the development in developed economies. Over many decades different institutions and associations were founded to discuss and protect rights and obligations of participants of our economy, especially for employees, for instance trade unions or professional associations, which have a lobby in politics and our economy. These peo-

ple are responsible, but as they are representatives of the people affected by changes through digital development, they should not be the only responsible institutions. Also politicians should be interested in durable working conditions in their countries as this creates wealth and financial stability to states. In this case there should be more clearly stated requirements and regulations on harmful developments issued by those decision makers. But as there is also a trend to less political influence due to faltering public finances (*UKCES 2014*, p. 29; whereas this situation is also valid for other developed economies with comparable actual characteristics, especially throughout Europe), other participants of the economy, especially the companies, which do business and are directly affected from changing working conditions, will have a greater impact on shaping future working conditions. Particularly these institutions should be focused by all institutions involved, because they will have a strengthened position in decision making concerning future working conditions. At least the people affected by changes through digital development are essential, too, as they are the human resources needed to profit from digital development. In this way the public opinion and the social behaviour regarding digitalisation will have massive influence on the development of working conditions.

### 4.3 Digitalisation as a Chance for Companies and our Economy

In a competitive business environment like the global business environment, people lacking elementary knowledge and skills are mostly those being excluded from businesses. In times of digitalisation this is a doubtful way to handle the socially and economically important topic. The economy and also many companies depend on electronic devices, the internet and the networks they create. These resources ensure financial stability and resilient economic conditions. But as there are people excluded from this development, they do not have the opportunity to use these fundamental resources as well as the products and services e-business-companies offer. This is applicable for digital solutions from other institutions, too. A well-known example of digital solutions is *e-government*, which is a huge chance to take serious and promising reforms on public systems, especially on constraint public finances. Many institutions, which offer digital products or services depend on customers and a broad target audience. If many people use the products and services for example companies offer, these companies as well as third-party institutions, for instance states, gain profits from this. Therefore the inclusion of the general population will become more important as the digital development becomes fundamental to our life as well as an increasingly important economic factor. The inclusion and participation of people in digital development could be a possibility to activate great parts of the secret reserve of non-internet users and people, who refuse or do not have the chance to participate in digital progress or even have trouble in dealing with electronic devices and internet. These are entry barriers, which need to be lowered to engage more people to participate in the digital evolution.

One possible idea of dealing with this entry barriers is to make companies or institutions offering digital services and products socially responsible for lowering such entry barriers to encourage an increa-

sing number of people to participate in the digital world and development. Of course, this is difficult to realise, but as there are new requirements for solutions, unusual thinking should be a possibility. As the institutions, which provides digital services are held responsible or just partly responsible for digital education, they do not only discharge an important educational and social task, they also profit from more competent internet users, who have digital competences and are able to use internet services. This solution could lower entry barriers to the digital world, advance business methods, in particular distribution channels, and also fulfil important social responsibilities. Moreover the solution is able to pave the way for necessary reforms in public services.

Furthermore it is important, how to take institutions providing digital services in responsibility and how to implement appropriate provisions. One way could be the acknowledgement of internet and digital skills as part of professional rehabilitation (backed by institutions of national social insurances). Another way could be to establish subsidized learning institutions, which provide courses, learning materials and public internet access. Additionally it is elementary to expand the existing infrastructure necessary to implement these changes – an often criticised issue, e. g. in *Germany*, where the expansion of internet infrastructure in sparsely populated areas is often criticised. *Germany* proceeds with dealing with this criticism as the *Digitale Agenda* (digital agenda), a program with seven fields of action concerning the support of digital progress in *Germany*, was decided by the *German parliament* on 20 August 2014 (*Federal Ministry of Economics and Technology* 2014).

Also very important is the financing of these provisions that could be gained through an internet tax or a similar internet fee, which would be taken for the specific purpose of internet promotion. Another way could be tax deductibility for that companies supporting better internet access as well as the educational processes concerning relevant skills. The second possibility should be favoured as affected institutions could pass tax costs to their customers. In a special responsibility should also be governments of countries, whose public finances could be consolidated and gain advantages from reforms through digital development.

The proposed changes could encourage people to use digital resources and this could support underrepresented groups or age bands, for instance older age bands to get access to new technologies. In this way not only the future challenges of work life could be addressed, also companies providing digital services could gain huge advantages from this. Moreover it would ensure that the evolution of digital resources and in particular the internet to a basic resource and as a part of the minimum subsistence level (in *Germany*) would be accessible for everyone.

There are additional advantages of an internet fee, too. It does not only provide financial backing for solving future challenges like the changes described above imply. Besides the inclusion of the old age band (also the wealthiest age band) would boost the digitalisation as an economic factor. Thereby the young generation could be encouraged to take part as *teaching generation* to older age bands, which

are less familiar with digital resources. Additionally internet companies, often addressed as institutions that are very liberal and take little social responsibility could bear greater parts of social responsibility in order to improve their reputation. But there are disadvantages, too. Such a fee would restrict the freedom of all institutions, which have to pay the fee. It could also persuade these institutions to relocate their businesses to other countries or pass the costs to their customers. Indeed, there are many more consequences and impacts, which need to be considered.

## 5 Summary and Conclusion

As recent statistics reveal the distribution of digital resources and the internet strongly increased in the last ten years and the majority of the population, in this case shown by the example of *Germany*, is in possession of internet access and digital resources like computers and smartphone. But there is also a large percentage of people without access to the mentioned resources, while the resources become increasingly fundamental to daily and work life in our society. In times of digital resources being fundamentals of participation in social and work life the exclusion of people is exactly the wrong way to handle this socially and economically important topic, especially as digitalisation and its possibilities are a significant economic factor and a necessary basis for reforms, e. g. of constraint public finances.

In case of working conditions it can be summarized that on the one hand digitalisation provides huge opportunities to change future work life, but on the other hand appropriate conditions and financing of these conditions need to be implemented to ensure the correct handling of digital development, progress and its effects to future work life. Therefore the most important aims in near future should be to reach equal access to fundamental digital resources and the internet as well as to use the possibilities the digital world offers in its full extend. With decisions like starting a German *digital agenda* governments show that they understand the importance of the digital progress in our society. These insights need to be realized by a larger number of governments as well as political and economical decision makers, especially to organise the handling of digitalisation in a preventive instead of a reactive way and to clarify responsibilities between those decision makers. Additionally there has to be a new quality of cooperation between them and the public and private institutions worldwide to ensure the necessary digital infrastructure and security, because the digital world does not know conventional borders. Particularly science can contribute to this progress by offering a dialogue with decision makers that accompanies the way to all relevant decisions and explains advantages, disadvantages and also opportunities and risks of digital developments ensuring to integrate all needs and positions of appearing stakeholders.

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*Cover image* by *Steve A Johnson*

(Effective 02.08.2014, URL:

<https://www.flickr.com/photos/artbystevejohnson/4607812450/sizes/o/in/photostream/>)

**Fig. 1: Computer- und Internetzugang im ersten Quartal des jeweiligen Jahres von Personen ab 10 Jahren (computer and internet access in the first quarter of each year of persons from 10 years age in per cent)** by *Federal Statistical Office of Germany*, 2014

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