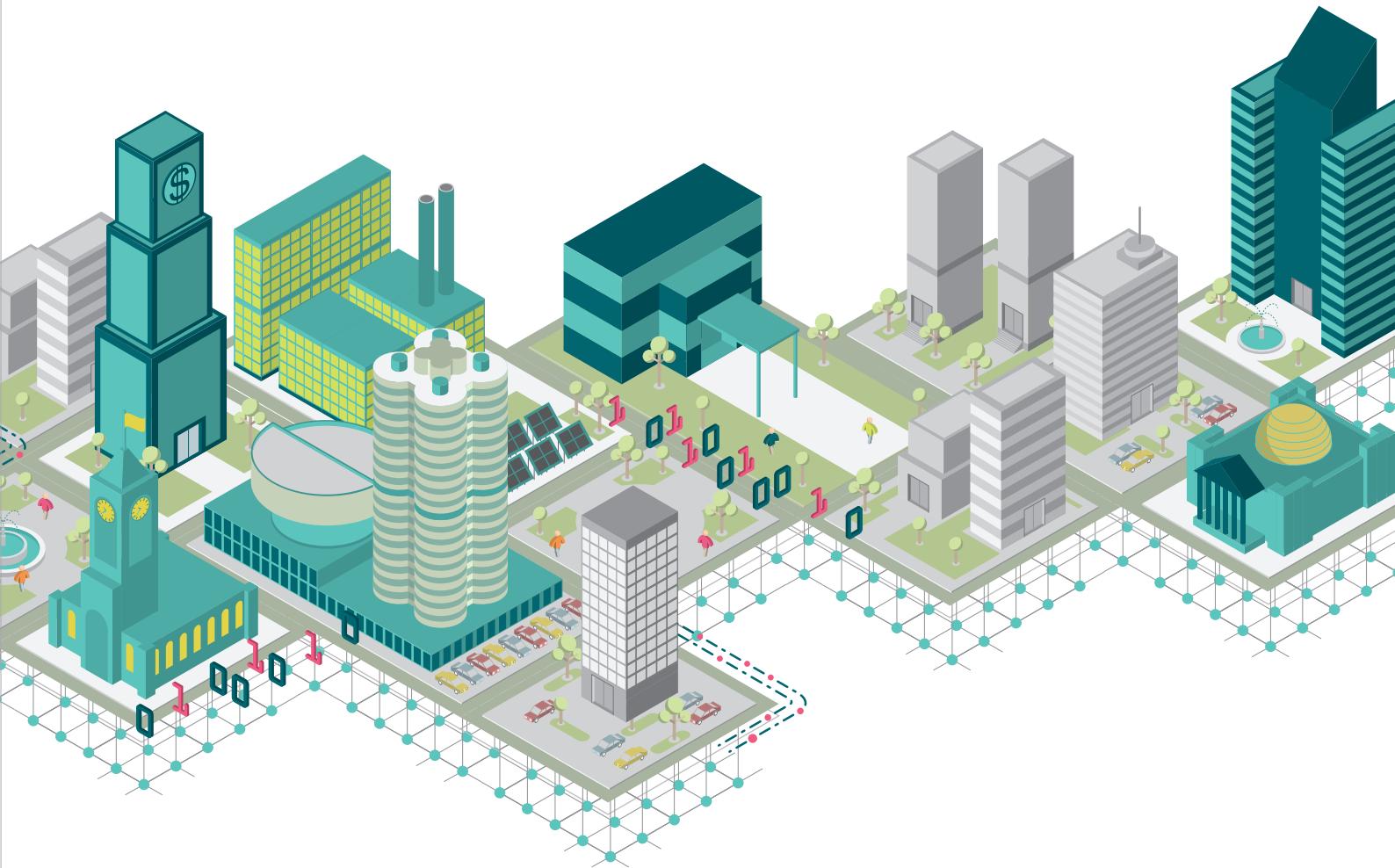
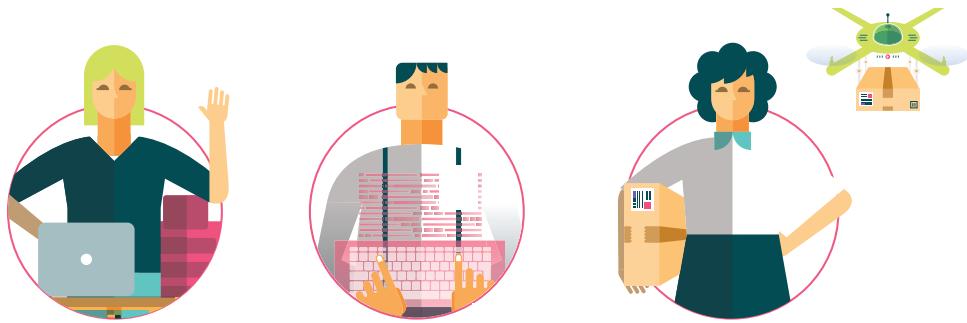


TOWARD THE LABOR MARKET 4.0?

Potential impacts of digitization on labor and employment
in Germany until 2030



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The most important facts in brief

A contentious international debate on the future of employment has been waged for a number of years. According to an often-quoted 2013 study by Oxford University scientists, 47 percent of all jobs in the U.S. labor market are at serious risk to be replaced due to progress in automation. The dissolution of regular employment that is frequently associated with digitization is already well underway in the United States. Already, 53 million Americans, about one third of the entire workforce, work in the so-called freelance economy – and hence often lack the social security which regular employment typically provides.

A growing debate about the impact of digital technology on the labor market is also taking place in Germany. Since Germany is considered the economic engine of the European Union (EU) and the country's high export rates underscore the international competitiveness of German businesses, there is still little need for politics to take action. Compared to other countries in the EU, Germany still has a strong middle class. However, digitization might exert pressure on precisely this segment of the labor market in the medium to long term. This would lead to social dislocations. Businesses, society, and politics should therefore urgently deal with the changes that might take place in the labor market over the next 15 years.

Foresight is a method which allows for precisely this strategic examination of the future. It focuses on the development of scenarios. They permit organizations to minimize risks early on or identify a particularly desirable scenario and to develop measures that promote its taking place. Developing the scenarios requires special knowledge about the most important trends and developments concerning the impact of digital technologies on labor and the labor market as well as the ability to break through dominant thought patterns that simply project past facts and events into the future. To satisfy these requirements, the Foresight Lab "Impacts of digitization on the 2030 labor market" gathered labor market experts and specialists in digital transformation. This interdisciplinary and intersectoral workshop developed the scenarios presented here under the methodological guidance of foresight experts.

At the beginning of the process, the group of experts identified five central factors in several steps. In one form or another, these factors form the basis of all scenarios and make up their most important characteristics. These key factors – digital infrastructure, new employment conditions, digitization and competitiveness, capacity of the state to adapt, and polarization of the labor market – were used to create different rough scenarios, each of which was

coherent in itself. In subsequent steps, these rough scenarios were developed into the distinct scenarios which are presented here. Here is a brief summary of the most important aspects of the scenarios:

1. "Engineering nation with a heart": In this scenario fiber-optic networks cover the entire area of Germany. The companies have successfully accomplished the transformation to Industry 4.0 and thus maintained their international competitiveness. The companies' project workers are for the most part regular employees. The government controls the transformation process ambitiously but with a clear focus on policies that stimulate the economy. The pressure on the labor market increases as a result of the further advances in the mechanization of production, because particularly demand in the middle segment (skilled labor) is declining. Following the reform of the Hartz laws, an unconditional basic income has been introduced.

2. "Silicon countryside with social conflicts": The infrastructure of VDSL and cables is complete in the cities and all rural areas in Germany are equipped with fiber-optic cables. Economic competitiveness is in good shape, as key sectors in the field of Big Data lead the way globally. The predominant mode of working has undergone tremendous change. We now have mostly self-employed people with many customers. So far politics has edged the transformation process along with massive investments, but is now approaching its financial limits. One reason for this is the imminent collapse of the social systems, especially since the Old Economy, which by now has been left behind, has sent its employees of the baby boomer generation into early retirement and increasingly relies on outsourcing labor.

3. "Rhineland Capitalism 4.0": In this scenario, a fiber-optic network has been installed throughout Germany. This was the decisive requirement for creating a technology-friendly mood in the entire country: Germany is now a fully digitized industrial nation. The economy has not merely maintained but even consolidated its excellent international competitiveness. All key industries recognized and seized the opportunities of the "Internet of Things" early on. Many digital innovations originated in Germany. Yet small and medium-sized businesses are still lagging somewhat behind in this development. The majority of people with a job are now self-employed,

and demand for the work they offer is in fact high, too. The legislature has provided important stimulus for growth by providing tax incentives and cutting red tape. The labor market looks stable and is showing a positive trend. There is rudimentary but universal social security.

4. "Digital strongholds and disconnected hinterland": Germany has missed out on developing its fiber-optic network. Even in the major cities, digital data communication continues to take place over copper cables. The competitiveness of the German economy suffers from this deficit, too. Only the big cities have companies that are still rooted in the Old Economy but can keep up with the international competition. Therefore employment conditions have not changed much. Here, the traditional standard employment conditions still predominate. While politics has effectively supported the digitization of businesses in some sectors, by neglecting to provide nationwide structural development aid it failed to also allow the areas outside of the booming big cities to profit from this. Demand in the labor market therefore shows a very negative trend outside of the major cities.

5. "Digital evolution in the federal competition": Some federal states have advanced the development of the fiber-optic network in all conurbations and rural areas by way of subsidy programs, in addition to investments in cable and VDSL by the telecommunication providers. Yet other federal states are lagging behind in the development of the infrastructure. Industry 4.0 is very important for the economy, but the success of the industrial transformation is quite different in the various states. There is competition for the best talents throughout the country. Due to the large demand for highly qualified knowledge workers, they can pick the job they want and therefore largely work on a freelance basis, charging very high fees. Political control for the most part takes place at the level of the federal states, and national politics has lost in importance, also because of growing regulation from Brussels. Demand in the labor market is mainly focused on highly qualified people, while demand for all other members of the working population has declined considerably.

6. "Digital failure": The digital infrastructure has remained at the level of 2016: Germany is a "digital developing country". Consequently, German business has completely lost its international competitiveness. People

who have jobs essentially work in what today is referred to as standard employment conditions. Due to the slump in tax income, politics has become virtually incapable of catching up and expanding the digital infrastructure, which it has failed to develop. Germany has been unable to keep up with the global economy. Thanks to the economic slump, the labor market shows a downward trend in all segments. The salaries are at a low level. The party "The Analogues" has been represented in the Bundestag for a number of years. Referendums against technical advancements and improved networks are successful on a regular basis.

Those in charge of the project at the Bertelsmann Stiftung and the stiftung neue verantwortung, Juliane Landmann and Stefan Heumann, analyzed the six scenarios at the end of the study. The ranking of the scenarios relative to the competitiveness of the economy shows that the factors "digital infrastructure" and "ability of politics to control the development" are closely linked to the successful digitization of German companies, while labor market and the organization of labor develop separately from it. Therefore they must be regarded as particularly open to the influence of politics. The analysis identifies three factors which serve as engines for the speed of development and the way in which the scenarios develop. The development of the digital infrastructure – specifically of the broadband networks on which it depends – creates the basis for the greater application of digital technologies in companies and at the workplace. Yet the digitization of the economy is not determined by the development of the infrastructure alone. It is closely connected with strategic decisions made in the companies, access to the pertinent skilled workers, and the regulatory environment imposed by politics. The third factor – acceptance among the population – underscores that the digital transformation cannot succeed without the support of the public at large.

Besides identifying key factors that impact how soon the scenario would occur, the concluding analysis looks at three strategic areas where politics can take action. They can be derived from developments affecting all scenarios. Here the focus is on potentially converging and conflicting interests between employers and employees.

- **Reorganization of labor:** Four of the six scenarios are based on the assumption that the labor market will become considerably more flexible. This means that companies are going to meet their staff requirements

only for limited project periods – mostly by hiring freelancers and sometimes salaried project staff members. The decreasing number of unlimited employment contracts raises the question of whether employees are also going to profit from the possibilities of the modern organization of labor. In view of the increasingly flexible labor market as a result of the digitization, politics, too, will have to deal with its institutional stability.

- **Pressure on the labor market:** In five scenarios, declining demand for their services is to be expected for at least some people. This will result in rising unemployment and social tension, and put the focus of the debate on the issue of equal opportunities and a social system that fits the labor market. Here politics must act early so as not to jeopardize social harmony in Germany. Moreover, when it comes to the reorganization of the labor market, it will have to become a strong mediator between the parties of collective wage agreements.

▸ **Employee development and training:** A highly dynamic, digitized economy requires development and training of the workforce. In most scenarios, however, it is the employee who is responsible for this. This implies the risk that the permanently unemployed, the elderly, and the workforce in industry sectors where digitization is only of minor importance are left behind with respect to their qualification and become disconnected from the labor market. For this reason politics is called upon to offer government qualification measures in 2030. The question is how to develop and organize these measures in such a way that they are in line with the technological transformation and the great pressure to innovate.

The project

Juliane Landmann, Stefan Heumann

The digital transformation of our economy changes the way we work. This has long since ceased to be about using e-mails or the new options of working at home using Web applications. Nowadays companies organize their employees through in-house social networks, use collaboration platforms on the Internet for tendering and managing projects, and optimize their production, logistics, and sales processes by gathering and analyzing countless data in automated processes.

These changes are already the subject of fierce public debate under the keywords "Big Data," "Industry 4.0," and "Internet of Things." It is still impossible to determine all the possibilities and consequences of the ever greater integration of digital technologies in our work environment and their overall impact on employment and the labor market. One thing is already clear, however: the jobs and the labor market of the future will change radically during the decades to come. But what exactly is this change going to look like? And what will be its impact on our economy and society? These issues move more and more into the center of sociopolitical debates.

With the latest developments in the field of artificial intelligence, software and machines will very soon advance into areas of activity that so far only people were able to perform. These technological developments combine with the phenomenon of connectivity and vast amounts of data that accumulate in the wake of the rapidly advancing digitization. The fact that the new analysis and evaluation technologies can be applied to these vast amounts of data and the ability of software programs to optimize their own algorithms (and thus to learn) opens up previously inconceivable new possibilities of employing machines and software in the typical working day routine – whether in the office or in the factory.

If we look at the micro level of the workplace, in the future work will present people with entirely new challenges and possibilities. The new technologies must not only be controlled. When the human-machine interface is designed in an employee-friendly way, it also contains great potential for facilitating work. When we look at the whole economic picture, on the other hand, the question about the impact of technological changes in the labor market at the macro level arises. Will the gains in productivity and flexibility achieved by these technological developments make entire occupational groups superfluous? Where will new jobs be created in the future? What qualifications will be required for them? How will they be compensated? How will they impact the relationship between company

and employee? Who can shape the transformation using what means? Companies and the workforce are just as interested in the answers to these questions as is politics:

① The integration of digital technologies in company processes and the opportunities for creating new business models which the development of new technologies opens up confront German businesses with serious challenges in their endeavor to ensure their national and international competitiveness in the medium and long term.

② Employees will be affected in very different ways by these developments. Depending on whether there is higher or lower demand for their abilities and skills, their employment and earnings potential in the labor market will improve or decline. The type and conditions of employment will change as well once companies start tapping the technical potential for the reorganization of work procedures.

③ For politics, the technological change in the economy and at the workplace will generate numerous challenges and issues. They range from adjusting the general political framework to new economies, the organization of companies and business models, to the way labor and employment policies deal with the social consequences of these changes.

Therefore there is a large demand for understanding the future impacts of the technological change on economy and labor better. Yet questions about the future impacts are extremely difficult to answer. Quantitative models that identify empirical trends in the past and continue them into the future quickly reach their limits. What makes matters even more difficult is that the technological change is not linear and triggers entirely new developments and trends which cannot be found in any past statistic.

This is why studies of the technological change tend to prefer an approach that is based on how experts see things. Surveys among knowledgeable authorities are a frequent choice of method here. This is also the basis of the often-quoted study by the Oxford scientists Carl B. Frey and Michael A. Osborne (Frey and Osborne 2013, *The Future of Employment*). The authors had experts assess the automation potential of 70 professions in a workshop. On the basis of the resulting analysis pattern they calculated an automation risk for a large number of professions. This risk is expressed numerically (as a percentage) and

is hence considered a particularly valid, scientific result. Essentially, however, it rests on expert estimations.

Our point is not to present a methodological criticism of Frey and Osborne or other studies that deal with the future impacts of technology on labor. Rather, our concern is pointing out the methodological challenge. Yet this is not to prevent anyone from looking at the future. Quite the contrary. The technological transformation changes labor and the labor market so fundamentally that we cannot possibly afford failing to prepare for these changes.

Foresight methods are particularly well suited for this strategic discussion. Foresight is not about predicting the future but about dealing with potential futures. If we understand the futures that may occur, we can ask ourselves how well we are prepared for the future and what options we have for taking action in order to attain a particularly desirable or avoid a particularly negative future.

Given these considerations we decided to conduct the Foresight Lab "Impacts of digitization on the 2030 labor market." It seemed extremely important to us to enrich the current debate by systematically derived scenarios that were as realistic as possible. Our objective is to enable the public at large and the stakeholders to better recognize the challenges which the technological transformation brings. The project is to help sharpen the picture of labor and the labor market of the future for the long term and thus allow for a strategic discussion of the issue. The quality of the scenarios critically depends on the Lab participants. To live up to our ambitious standards, prior to the start of the project we very carefully thought about the expert knowledge that was important for developing these scenarios. We reached the conclusion that aside from expert knowledge on the topic of "Labor and the labor market", expert knowledge about "Digital transformation and business models" would also be required. The upshot was a quite heterogeneous group of experts ranging from scientists, labor market specialists in politics and administration to union representatives and all the way to founders of start-up companies, investors, and employees in large technology corporations (pp. 52, 53).

Under the methodological guidance of foresight specialists, these experts developed the six different scenarios of the labor market and workplaces which also constitute the core of this publication. The productive collaboration of people with widely different viewpoints and types of expertise not only confirmed us in our conviction that there is great need for such intersectoral work processes, but also that this generates important new

insights. The documentation of the scenarios is preceded by a brief introduction to the method of foresight and an overview of its application in the Foresight Lab. After the presentation of the scenarios we perform a first analytical evaluation of the scenarios and identify strategic areas of activity which in our opinion result from them.

We would like to take this opportunity to once again express our most sincere thanks to the participants in the Foresight Lab and the methodology team. We profited greatly from the three thoroughly constructive all-day workshops with their very high professional level and the many workshop meetings in between.

The scenarios described here are based on the expert knowledge, creativity, and commitment of everyone who participated in this process. It goes without saying that the Lab participants are not responsible for the results presented here and their evaluation. The scenarios themselves are the result of complex group processes. The sociopolitical areas of activity which are summarily derived from the scenarios are solely our responsibility.

We hope that this publication stimulates you to think about the issues raised here, and we look forward to receiving your suggestions and feedback.

The Foresight Lab: Prefiguring the change

Johannes Gabriel, Henning Hetzer, Veit Klimpel, Philippe Lorenz

The issue we are examining – the impacts of digitization on the 2030 labor market – requires that we take a look at the future. This “thinking into the future” may be called strategic anticipation or foresight. It is “thinking ahead.” Changes must be both realistically assessed and creatively contemplated. The complexity of developments sets limits to forecasts. Making precise predictions for an extended time period is difficult to impossible. There is uncertainty or doubt concerning many developments, and particularly about their interdependencies. This adds another layer of complexity. We cannot only imagine one future in which digitization shapes labor and the labor market in 2030, but many. Exploring these different “futures” and envisioning them in a way that allows us to describe and analyze them forms the core of “foresight.”

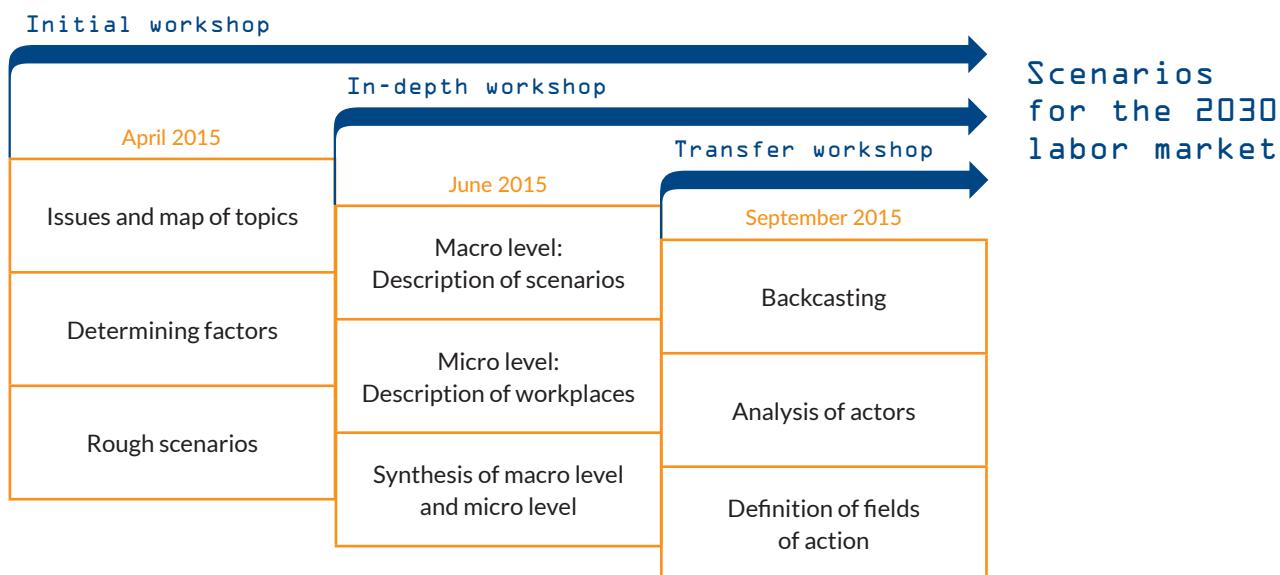
Our project required us to deal with the complexity and uncertainty of the developments and the impacts of digitization on the labor market. The method of foresight demands that complexity be initially admitted and eventually reduced. This is to make uncertainties clearer so that they can be described and assessed. New ideas are generated and possible reactions and actions are explored. It is especially important to break up predominant thought

patterns and raise strategic questions. It is the overarching objective of the Foresight Lab to provide all participating actors better guidance in the subject area to be explored and to gain new viewpoints.

The Foresight Lab applies different methods of strategic foresight and integrates them in a general process in order to generate “knowledge of the future” and to better comprehend the change of the issue at hand. Various foresight methods were applied to questions and issues, and adjusted to the interim results during the process (method mix).

The Foresight Lab used a multi-angle approach from the get-go: experts from science, business, the civil society, the groups of employers and employees as well as politics and administration were involved with the aim of integrating different kinds of expertise and viewpoints, of breaking up familiar assessment patterns, expanding the imagination, and ultimately of jointly coming up with new ideas. The main pillar of the Foresight Lab were three all-day expert workshops which built on each other and were carefully prepared and evaluated afterwards by the project team so that specific “knowledge of the future and guidance” could be generated (see Figure 1).

Figure 1: Schedule of the Foresight Lab “Impacts of digitization on the 2030 labor market”



Initial workshop on questions, issues, and factors

After pivotal questions were identified during the preparation phase (Attachment A), the first workshop (Initial workshop) first inquired about the participants' personally most important or crucial questions concerning the future of digitization as a "question to the oracle," as it were (Attachment B) – both with respect to the labor market (macro level) and the workplace (micro level). Then the participants were asked to name the impacts and changes at the (digital) workplace of the future which in their opinion were most underestimated and most overestimated. Group interaction led to the creation of a "map" which identified important issues and questions and related them to one another. After a group assessment, the most important impact factors were selected which could be used to describe the "digital workplace of the future" – the micro level – by 2030. Afterwards the participants conducted a structured brainstorming session to collect factors which could describe the development at the macro level, the 2030 labor market, under the conditions of digitization. Clustering these diverse suggestions resulted in another map which served to identify and assess the most important impact factors.

Both maps allowed for complexity and creativity while at the same time identifying central factors for a description of the futures of workplaces and labor markets, which was done in greater detail after the initial workshop. The diverse impact factors for the micro and macro levels were assembled in two collections of relevant key factors (Attachment C) which are eminently important but also

highly uncertain. They served as the basis for the development of scenarios (Figure 2).

As a follow-up to the first workshop, the project team formulated in greater detail twelve key factors at the macro level, the labor market of the future, and developed four projections – i.e., different potential developments or conditions in the future (Attachment D) – for each of these factors. In the next step five trendsetting key factors were selected that will impact the labor market the most or that can be used at this point to describe the future labor markets:

- 1 Digital infrastructure
- 2 New employment conditions
- 3 Digitization and competitiveness
- 4 Capacity of the state to adapt
- 5 Polarization of the labor market

The project team then conducted a consistency analysis in order to assess the "consistency" of every single projection of these selected key factors with each projection of the other factors: it tried to find out whether two projections were "compatible" with one another. In other words, an answer was sought to the question of whether a single projection of a key factor may occur along with

Figure 2: Combinations of key factor projections result in a scenario

Factor 1	Projection A	Projection B	Projection C	Projection D
Factor 2	Projection A	Projection B	Projection C	Projection D
Factor 3	Projection A	Projection B	Projection C	Projection D
Factor 4	Projection A	Projection B	Projection C	Projection D
Factor 5	Projection A	Projection B	Projection C	Projection D

a projection of another key factor. The purpose of this assessment was to find out if the potential developments were mutually dependent or even reinforced each other – or if the opposite was true and the projections were mutually exclusive (rating of “5” = mutually greatly conducive to “1” = total inconsistency). If the projection pairs were conceivably independent of one another, the rating was neutral (rating of “3”).

Based on the ratings in the resulting matrix (Attachment E), a software algorithm calculated a multitude of scenarios which contained the many projection combinations of the five selected key factors. Using another software algorithm – the cluster analysis – the number of the calculated scenarios could be reduced by grouping similar scenarios in a cluster. This resulted in six cluster scenarios whose factor projections were consistent in themselves (Attachment F). Several projections per factor could be assigned to one cluster scenario. The percentages indicated how often a projection appeared in a cluster. These calculation results constituted the basic scenarios for the labor market of the future and were the starting point for the further description and qualitative interpretation of these scenarios in the in-depth workshop. The computer-based consistency and cluster analysis with subsequent definition of the scenarios therefore represents a highly formalized foresight method combining expert-based assessment, software-assisted calculation, and group-related interpretation and formulation of the resulting scenarios.

As for the micro level – the workplace of the future – the project team defined in detail nine key factors on the basis of the workshop results and also developed four projections (different potential future developments) for each of these factors (Attachment G). These factors and their projects were then used to build a so-called morphological box which could be used to systematically describe possible future (digital) workplaces as solutions with several dimensions.

In-depth workshop on scenarios

The objective of the in-depth workshop was to further explore the future of the digitization of work, to focus and thus also reduce the complexity that had been established. In a group interaction, the six basic scenarios were jointly

reflected on, discussed in detail, and enriched by narrative elements. Here especially the remaining seven key factors were used that had not been included in the calculation:

- 1 Dynamics of digital technologies
- 2 Companies' capacity for transformation
- 3 Digital professionals
- 4 Lifelong learning
- 5 General insistence on analog technologies
- 6 Economic regulation
- 7 Social security

The goal was to describe the scenarios such that they would appear plausible and consistent, to start contemplating and formulate new aspects, and finally also to identify differences between the scenarios and in comparison to the current situation.

In conclusion, looking at “expectation scenarios” concerning the (digital) labor market of the future provided yet another angle on personal expectation(s) concerning the future (Attachment H). From the morphological box for the micro level – the workplace of the future – several scenarios for future job profiles were generated (Attachment I). The scenarios were constructed following a “narrative morphological analysis” – that is to say, the definition of a path through the morphological box in the sense of consistent combinations of the key factor projections. A total of six descriptions of these paths through the morphological box were generated as scenarios for the “workplaces of the future.” Other potential scenarios or descriptions of workplaces still exist in paths inside the morphological box not yet taken. The scenarios for the macro and micro levels were related to one another by way of the principal question of what workplaces are conceivable in which labor markets.

As a result, the synthesis of both worlds – the macro and micro levels, which at first had been considered separately – had become possible (Attachment J). At the same time it turned out that both scenario worlds were plausible and hence fit one another.

Following the in-depth workshop, the first descriptions of six explorative scenarios for the labor market of the

future were produced which were consistent in themselves and distinct from one another. They allowed for a comprehensible presentation of the overall future German labor market which has been influenced by digitization. The scenarios for the workplace of the future yielded descriptions and visualizations of some “future (digital) job profiles.” The allocation of labor market scenarios and workplace scenarios became more precise.

Transfer workshop on paths and actors

The scenarios on the labor market of the future described future situations. In the transfer workshop, the backcasting method was applied in group interactions to identify paths that might lead to the different scenarios and situations. This also included the preconditions that were the basis for the future situation in the form of a sequence of events. Moreover, some signs were identified which indicated that the development might go in the direction toward a specific scenario. It turned out that such signs, which may also be interpreted as slight signals, can be detected for all scenarios.

To allow us to assess potential changes and challenges, an analysis was initially conducted from the point of view of three major groups of actors (employees, employers, and the public sector) to define their general objectives in the digitization of the work environment. To assess the impacts of the different scenarios, the possibilities and dangers were then discussed that would arise for the different groups of actors in the various scenarios. This revealed differences in the assessment of possibilities and dangers from the viewpoint of different actors, which could then be discussed. Furthermore, some aspects and factors were identified which the respective groups of actors could change in the scenarios or on the road toward them. They show ways in which these groups can impact them and the leeway they have in doing so.

This revealed possibilities for shaping the development. Following the Foresight Lab, these possibilities could be seen as starting points for strategies and potential actions of different actors and stakeholders. Target group-specific recommendations for actions can aid the planning of further activities and the decision-making process. In this way actions which today are taken in the

“digital transformation” can be made future-proof for individual organizations and institutions. One focus is probably going to be on the still largely unknown or insufficiently considered issues concerning the complex of “digitization in the work environment,” which are also important for the agenda of institutions and of politics and must be examined – typically using an approach that includes the different branches and sectors.

In the end both the process and the result provided basic guidance concerning the potential development of digitization in Germany, and hence the country’s labor market – even down to individual jobs – and the way in which this development can be shaped.

The scenarios - including interviews with typical employees

Foresight Lab

Scenario 1: "Engineering nation with a heart"

Profile				
COMPETITIVENESS	DIGITAL INFRASTRUCTURE	POLITICAL CONTROL	DEMAND IN LABOR MARKET	DOMINANT FORM OF EMPLOYMENT
Very strong, with Industry 4.0	Nationwide fiber-optic network in place	Ambitious, but business-friendly politics is clearly dominant	Declining demand – especially in the middle segment, in the area of skilled labor	Permanently employed project workers

few, highly qualified IT experts

Inside a factory as it may be found anywhere in Germany in 2030: someone walking through the brightly lit, shining hallways and warehouses does not encounter any people or hear anyone talking. Instead, there are the sounds of soft beeping, buzzing, and whirring. Yet work is actually being done – by robots and machines. They handle almost all jobs. Only few, highly qualified IT experts – engineers and technicians – still work on the plants that once used to be buzzing with human, manual activity. These experts are in such great demand that they can pick and choose their employers and working conditions as they please, and their income is accordingly high. The situation is radically different for the large rest of the workforce: many

of the workers have lost their job; the professions they once learned are no longer needed in an age of intelligent machines.

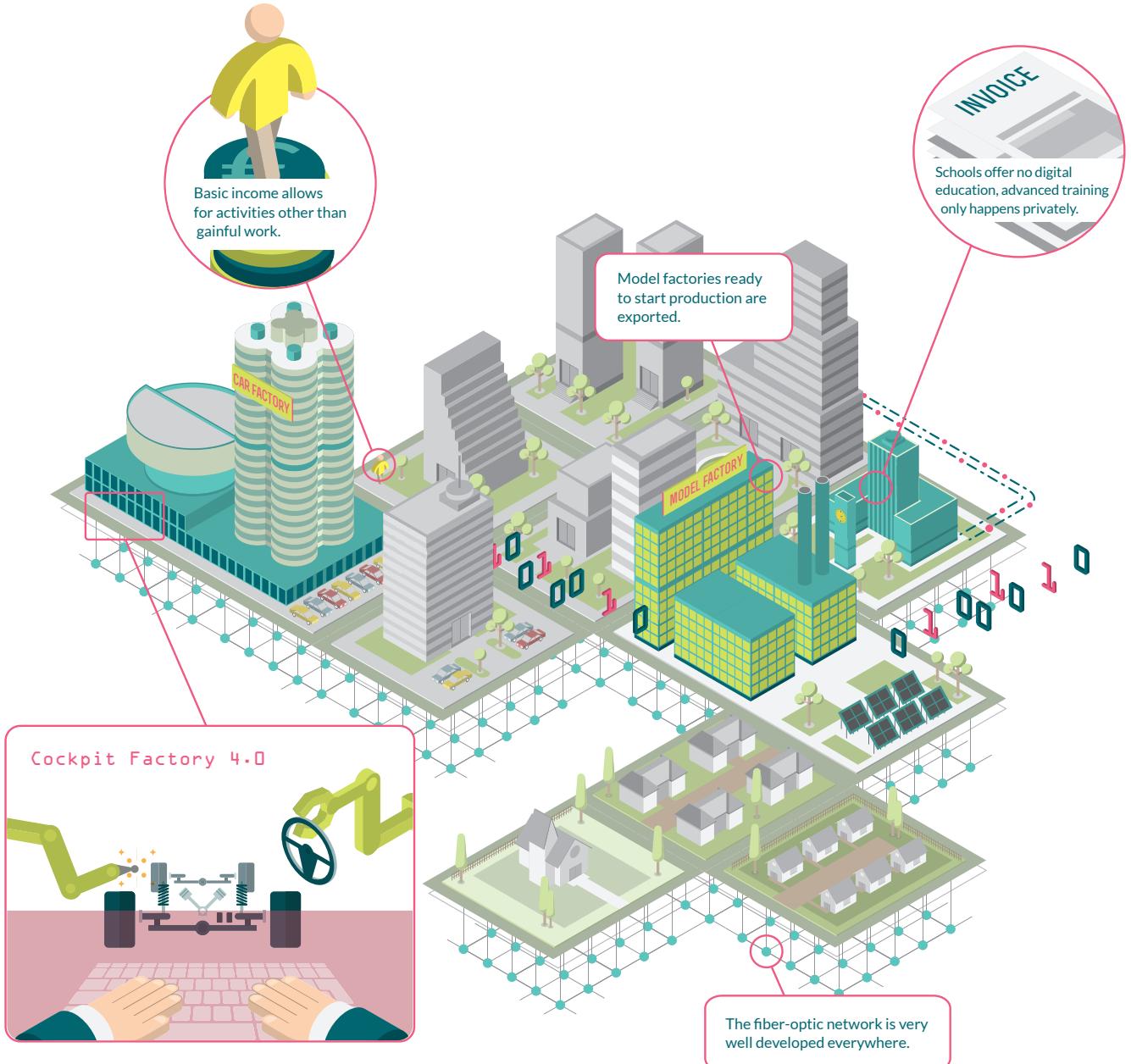
That the strong polarization in the labor market and the great number of people who have been left behind does not lead to major social unrest is due to the government largely offsetting and cushioning social hardships. After a reform of the Hartz laws*, first the sanctions were abolished and a few years later financial support was changed into unconditional basic income. It is to keep people from falling into an abyss and help those who have been disconnected from the economic development.

Particularly the skilled workers from the middle segment have hardly any

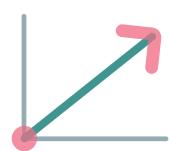
many professions no longer needed

unconditional basic income

Scenario 1: "Engineering nation with a heart"



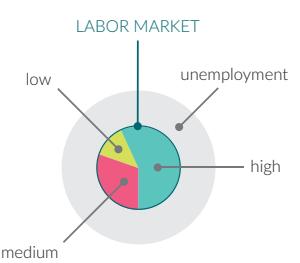
FORM OF WORK



COMPETITIVENESS



POLITICAL CONTROL



LABOR MARKET
AFTER QUALIFICATION

Scenario 1: "Engineering nation with a heart"

**skilled workers in
the middle
segment with
poor prospects**

prospects by now: new jobs in production are nowhere in sight, even the trades offer fewer and fewer jobs from one year to the next – robotics has taken over many tasks here, too. While the situation looks considerably better for the small elite of the sought-after knowledge workers, there is a lack of suitable professionals. Today, "highly qualified" means most of all outstanding professional knowledge. The shift to concentrated, knowledge-intensive work at the fully automated production sites and the lack of working with others has its price: human resource directors complain more and more often about the poor social skills of the oft-praised "knowledge workers." The "high art of German engineering" shines mainly in terms of its technical design, but it comes with a certain degree of social coldness.

For a long time Germany was hardly regarded as a pioneer of digitization; many new digital technologies were slow to find their way into the German economy. In the late 2010s, a change occurred: under the label of "Industry 4.0," Germany took the road of digitization in its own manner, following a course that had been carefully thought through and matured, but ultimately was powerful and globally successful. Consequently, today the digitization of the German economy is a success story that only started later than in other countries.

At an international level, the German economy is competitive precisely in terms of digitization: some companies are in the lead thanks to their old fortés, and many others have seized the new opportunities which the digitization process has offered. The start-up scene has undergone a dynamic development in the major German cities. Thanks to its "silicon cities," Germany has in many ways caught up with other countries in the field of IT. The economic landscape, however, remains under the influence

of the "Old Economy." Large companies, especially engine builders and automobile manufacturers who have already been successful during previous decades, have demonstrated their "capacity for digital transformation" and matured into digital "big players."

Digital products and production methods complement one another in the course of their development, and they are marketed globally. The domestic plants therefore have often been transformed into model factories where new, highly efficient production methods are being developed that are employed globally and also sold to third parties – just like the products. A few years ago the first fully automated engine and automotive factory was opened. Since then it has been considered a symbol of the success of Industry 4.0 and a pioneer of a work environment without workers. Germany is considered the country that best masters the simultaneous digitization of products and their pertinent production. This is true both for companies that have always been considered lead industries and for the country's many "hidden champions."

Private investors and the public sector jointly have made sure that almost the entire country is interconnected by now via modern, fast data lines. This was preceded by great pressure on the part of companies and municipalities. EU subsidies were reallocated and invested in the digital infrastructure. Only a few scattered rural regions are not yet connected to the fiber-optic network. Yet some of the existing technologies, specifically VDSL and cable, have been considerably advanced over the past 15 years and also constitute an important part of the powerful IT infrastructure.

Culturally, the digital delivery of education is widespread – all the way to graduating classes from school or college. Yet there is a lack of suitable teachers: those who would be suffi-

"Old Economy"

**"capacity for digital
transformation"
demonstrated**

model factories sold

fast data lines

education and training as an investment

ciently qualified to train students in the digital special disciplines switch to the private advanced education and training sector. Continuous education and training in the special area of "data, algorithms, and digital issues," which is much in demand, is only open to those whose employers (or customers) pick up the bill. Especially in this field, education is not regarded as a value in itself but seen as a strictly rational investment in the human capital. To be sure, digital tools have entered the education system, and some MOOCs (Massive Open Online Courses) are a smashing success, but digital contents are not an integral part of the syllabi.

Generally technical progress is seen as something positive, because it offers opportunities for some and convenience for others: the workers in industries that have been under pressure make use of the technical opportunities for advanced education and training – there are many different ways to becoming a knowledge worker, but they not easy to

take. Those who are part of the privileged knowledge society are happy about the freedom and the leisure time they have won.

Many of the well trained and sought-after professionals have flexible working arrangements that grant them more or less autonomy in terms of working hours and location. They tend to have one employer, but rotate between different locations and duties. They can do much of their work at home or while traveling, just like the freelancers and company founders, who enjoy solid orders and whose working conditions grant them equal

flexibility and autonomy. Whether they are salaried employees or freelancers, the boundaries between work and private sphere are more or less blurred for most jobholders. In the companies, teams are often connected in the virtual space; that all staff members are at one location has become a rare occurrence. The open-plan office is getting obsolete. The individual's personal freedom is considerably greater than in the past, but so are his or her self-responsibility and the pressure to succeed – because the entrepreneurial risk has shifted away from the organization and toward the employee. Many conventional work arrangements have

entrepreneurial risk has shifted toward the employee

Quote from Maximilian Schneider, i-factory master, in 2030

"Very few of my colleagues take a lunch break. This is obviously an advantage which robots possess: they don't get hungry. I work as an i-factory master for a large automobile manufacturer. I'm one of the last human staff members in car body production. Most activities and procedures are performed by machines in our company. I and my colleagues in the factory cockpit pull all the strings. I mainly function as a problem solver. When there is a glitch somewhere, I test, program, adjust, or calibrate until everything is running smoothly again. I enjoy this, the work is challenging, and there is always something new. Plus, it's good to know that machines can't do everything and that we people sometimes are superior after all. My bosses know that, too, therefore they pay me really well. Also, they invest a lot of time and money in my continuing training. Contrary to many of my friends, I have very regular working days. Apart from a few night shifts here and there, I arrive at 9 in the morning and leave around 6 p.m. This model used to be quite standard, but today it makes me look almost unique."

many different ways to becoming a knowledge worker, but they are not easy to take

working arrangements that grant autonomy in terms of working hours and location

long since ceased to exist. The unions have failed to adjust to the new situation and therefore declined in significance.

In 2030 politics is much more business-friendly than it was just 15 years earlier. The success of such countries as Russia, the U.S., and China has left its mark. Germany was afraid of losing its position as export world champion. Subsequently the state managed to advance the digitization process by putting a few proactive measures in place. Now, however, legislation often lags behind developments in the labor market – "the digital world"

dwindling significance of the unions

politics much more business-friendly

Scenario 1: "Engineering nation with a heart"

has created too many uncertain contexts. The legal system, for example, does hardly justice to digitization – except in labor laws and in the area of data protection; predictive policing or complete digital monitoring do not exist in Germany.

* The Hartz laws, also known as Hartz reforms, is a set of recommendations submitted by a commission on reforms to the German labor market in 2002.

The economic objective of growth has been achieved, the labor market has become highly flexible, and the unconditional basic income seems to fulfill its soberly planned function of maintaining the social peace and quiet.

Lead questions

- › How can politics regain its active role of shaping things for all of society?
- › What interest-driven politics can the unions pursue after losing the battle about the traditional regular working arrangements so they can reposition themselves with respect to the flexible working arrangements that have now become standard?
- › What is the general political framework the German economy needs, which by now no longer exports cars but 4.0 factories?
- › Is there still a clear boundary between the production and the service sectors?
- › What measures can be taken to aid in the reintegration of former skilled workers and employees from the low-pay sector?

Scenario 2: "Silicon countryside with social conflicts"

Profile				
COMPETITIVENESS	DIGITAL INFRASTRUCTURE	POLITICAL CONTROL	DEMAND IN LABOR MARKET	DOMINANT FORM OF EMPLOYMENT
Fairly good, with Big Data analyses	The infrastructure of VDSL and cables is complete in the cities, and rural areas are equipped with fiber-optic cables	So far yes, but politics is running out of breath in 2030	Demand for many simple jobs has almost evaporated, experienced software developers are sought after	Freelancers with many customers

demand for many simple jobs evaporated

In the fall of 2030 the outlook is gloomy: the social security system is close to collapse. Hardly anyone still believes that things are going to turn for the better – the labor market is just too fragmented and impervious. True, many well-paying, high-qualification jobs have been created, especially for “knowledge workers,” but the demand for many simple jobs has almost completely evaporated, and people with low qualifications have no lobby. A particularly serious problem is the fact that those who have been left behind seem to have lost access to the labor market for good – which jeopardizes the nation’s social harmony. The bleak outlook for an ever growing number of people is caused and at the same time exacerbated by a structural problem: only very few companies have managed to develop a competitive business model within the context of digitization.

Especially small and medium-sized businesses have failed to adjust to the development and hardly changed at all. Automobile manufacturers and

engine builders continue to be successful, particularly because they have imported and implemented automation technologies from digital market leaders in the U.S. and Asia. Thanks to massive savings in the human resource segment and simultaneous increases in production efficiency, they now generate considerably greater profit than previously. They have, however, lost their economic significance and outstanding position – also in terms of many jobs; banks and insurance companies have long since overtaken them and become new big players in the New Digital Economy.

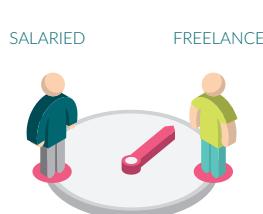
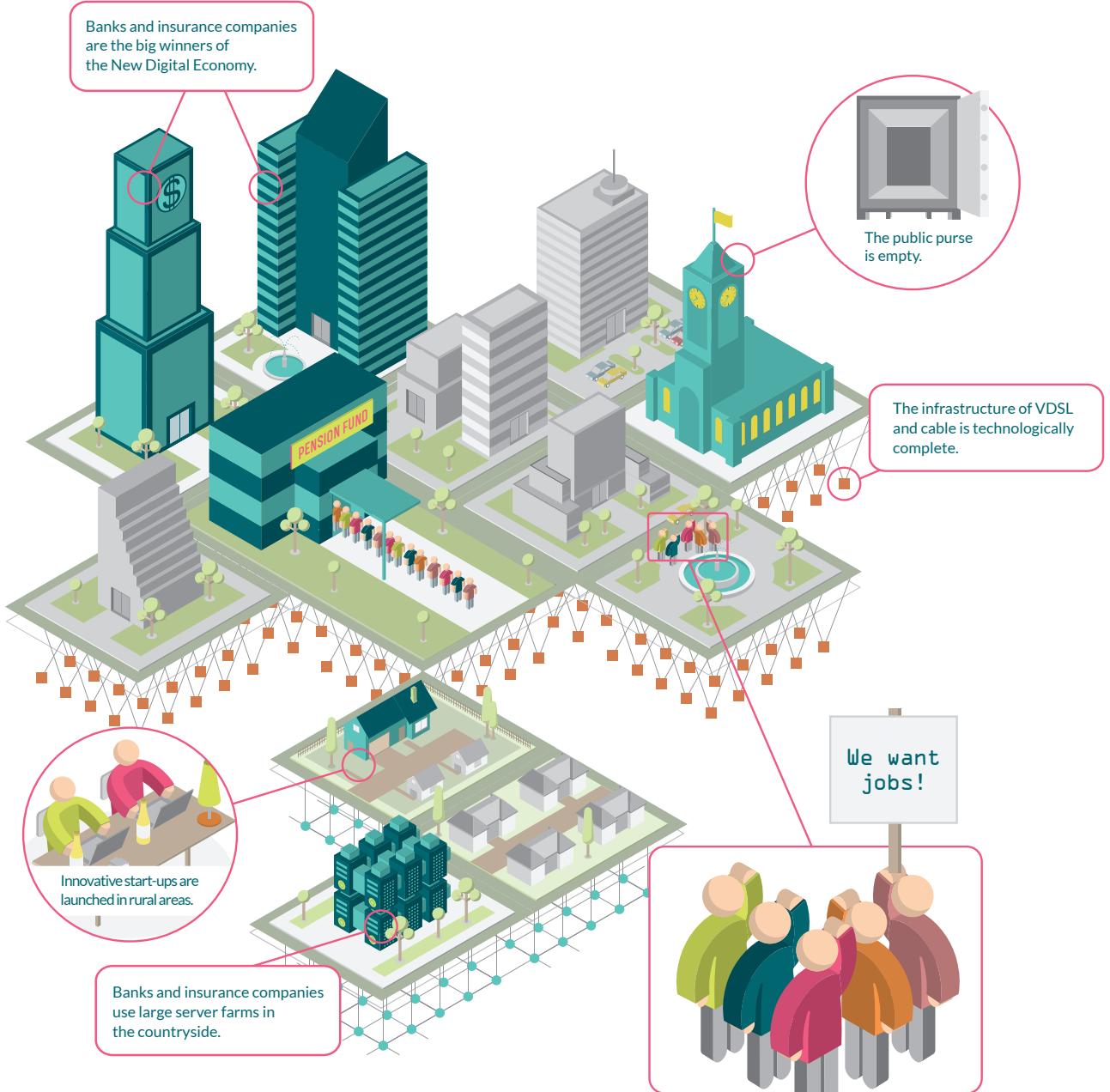
Many companies in the banking and insurance industry had changed their previous business models; based on their mature data analyses, for instance, the insurance companies put their stakes in digital insurance packages. The formerly great public interest in data protection issues has been nonexistent for a few years. A general change in attitude has taken place where the focus shift-

automation technologies from the U.S. and Asia

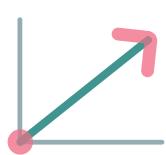
the new big players: banks and insurance companies

interest in data protection issues nonexistent

Scenario 2: "Silicon countryside with social conflicts"



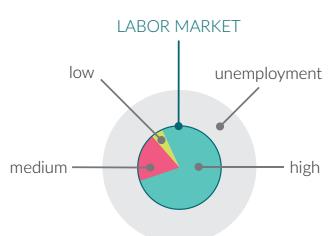
FORM OF WORK



COMPETITIVENESS



POLITICAL CONTROL



LABOR MARKET AFTER QUALIFICATION

**pioneering role
in the field
of Big Data**

**fewer jobs in
these sectors**

**dream employers:
banks and insurance
companies**

**automobile
manufacturers
and engine
builders hire more
freelancers**

ed on the advantages. One of the decisive factors in the success of the banking and insurance industry was the fact that the companies invested in the development of digital technologies early on. This has allowed them to assume a highly specialized pioneering role in the field of Big Data – their key technology – on the international stage. Yet there are even fewer jobs available in these sectors than elsewhere – while revenue per employee is enormous.

People who have the proper qualifications and work in this sector therefore enjoy heavenly working conditions. Especially the elimination of previous monotonous, repetitive tasks is generally welcomed as a clearly positive development. Banks and insurance companies are the dream employers of the country's digital elite. Due to the lack of professionals in this industry, the per diem fees are very high. New working conditions have also become established at automobile manufacturers and engine builders. After both sectors have cut a large percentage of their production staff, sent numerous baby boomers into early retirement (with sometimes very attractive pensions) and thinned out their corporate management functions considerably, they now hire more and more freelancers – as do nearly all business sectors. The majority of their principals also no longer have classic employment contracts with their companies but work on the basis of flexible employment models. Especially

the young are not interested in organized representation.

Experienced software developers with the proper specialization are in especially high demand. They tend to have acquired their knowledge not just in college but also at bespoke advanced training seminars and by constantly enhancing and adjusting their specialized knowledge. While the developers had to pay for this out of their own pocket, this was a worthwhile investment that bore little risk.

Generally speaking, digital advanced training in 2030 is tailored to the needs

**Quote from Sabine
Schulze, business
model architect,
in 2030**

"To this day my parents don't understand what exactly it is that I do. Small wonder: 20 years ago neither my industry sector nor my job title existed. Together with my colleagues I design new business models. The idea is to show companies roads into the future by taking their know-how, their special abilities as the starting point for opening up new business opportunities. It is an extremely creative job where we sometimes rely on software forecasts and data analyses, but the actual work is done in a dialog and by developing ideas. We don't sit together in the same room to do this. One of my colleagues works in Shanghai, another one is traveling around the world. We get together in previously scheduled video conferences. The freedom which clouds offer us in our work is really great. I can hardly imagine how my parents managed to do this back then, sitting in an office day in, day out, from morning till night. It is very important for our employer that we participate in advanced training. All of us constantly attend tutorials and workshops. Basically we hunt for new ideas around the world. After all, technologies and associated business models change at a breakneck pace. Advanced training seminars are always demanding, but we all get paid really well. Fortunately no one polices us, but that is not necessary anyway: the job is too much fun not to do it as well as possible."

of this elite of knowledge workers, while government funding for digital basic or advanced training is lacking. This makes the concept of lifelong learning a private matter which only few privileged individuals can afford. Especially people with low qualifications are left in the lurch. The state has largely withdrawn from the area of digital education and training for financial reasons and because of the complexity of the issue. As a result, various social groups of "analog abandoned individuals" are formed who reject the

**experienced soft-
ware developers
in demand**

**the concept of
lifelong learning
becomes a private
affair**

Scenario 2: "Silicon countryside with social conflicts"

the digital segmentation of the labor market is continued in society

the state has reached its financial limits

progress digital technologies bring. The digital segmentation of the labor market is thus continued in society.

The transformation of the now fragmented and polarized labor market was also prompted by the – not nationwide, but still considerable – development of the digital infrastructure. The state has made large-scale investments over the past 15 years, but reached its limits in the process, and is now under tremendous financial pressure. In conurbations, private providers continue to expand their powerful cable networks, while in some – especially rural – areas fiber-optic "highways" are built, as it were, which are now regarded as the "silicon countryside." Contrary to the actual intention of also using the massive expansion of the digital infrastruc-

ture to support the locally producing small and medium-sized businesses, the beneficiaries – aside from a few small software developing companies – are the computer centers and server farms of the banking and insurance sector.

The state's capacity to adapt used to be quite impressive, especially during the early phase of digitization, by implementing lighthouse projects to improve the infrastructure and cutting red tape to make employment conditions more flexible. Meanwhile it is becoming ever more obvious that the state is overextended when it comes to the digital economy. Economic regulation is also weak, the few government interventions are solely reactive.

computer centers of the banking and insurance sector profit

the state is overextended

The financial sector has a pioneering role in the global competition; the Old Economy is losing its influence. As a consequence, software developers get dream jobs, other workers retire, and many disciplines will become extinct.

Lead questions

- › How can small and medium-sized businesses, including the automobile industry, be supported in their effort to improve their capacity for innovation?
- › How do you create well-paying and secure employment conditions again in the traditional industry sector?
- › How can pension policies be designed proactively in view of the forthcoming great increase in retired people and the fairly poor state of the labor market?
- › In this scenario, too, the unions have lost the battle for regular employment conditions, and must ask themselves: How can you establish a balance of power relative to the company owners on the basis of project-related employment conditions?
- › Is it possible to utilize the existing specialized knowledge of Big Data for generally accepted sustainable economic growth?
- › What about data protection?

Scenario 3: “Rhineland Capitalism 4.0”

Profile				
COMPETITIVENESS	DIGITAL INFRASTRUCTURE	POLITICAL CONTROL	DEMAND IN LABOR MARKET	DOMINANT FORM OF EMPLOYMENT
Excellent, with “Internet of Things” technology	Nationwide fiber-optic network in place	Yes, much is working very well	Stable demand, with upward development	Freelancers with few customers

car notifies the office system

Monday morning, 8 a.m.: The first staff member to arrive at the office on this fall day in 2030 is still 2 miles away. Since a road has been closed, this will take another 15 minutes, estimates the staff member's car and notifies the office system, which is just now raising the temperature in the office to the set point. At the same time the system updates the staff member's appointment calendar: the video conference that was scheduled for 8 a.m. is pushed back 15 minutes, of which all other participants are notified as well. Five minutes later the flexible walls around the staff member's desk move into meeting mode. After another five minutes his computer boots up, as do all other devices that are relevant today. After a brief self-test and several updates, all LEDs light up green: everything is set to go, the workplace is ready.

euphoric view of digitization

Society has become technology-friendly, digitization is seen not only favorably but euphorically welcomed in private and work-related settings: more freedom, more leisure time, more possibilities. True, a small group has formed in the upper strata of society which opts for an alternative lifestyle and considers it chic to be offline.

With this clientele in mind, some luxury hotels even advertise their deliberate disconnectivity. But the analog crowd is only a marginal phenomenon.

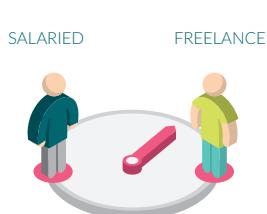
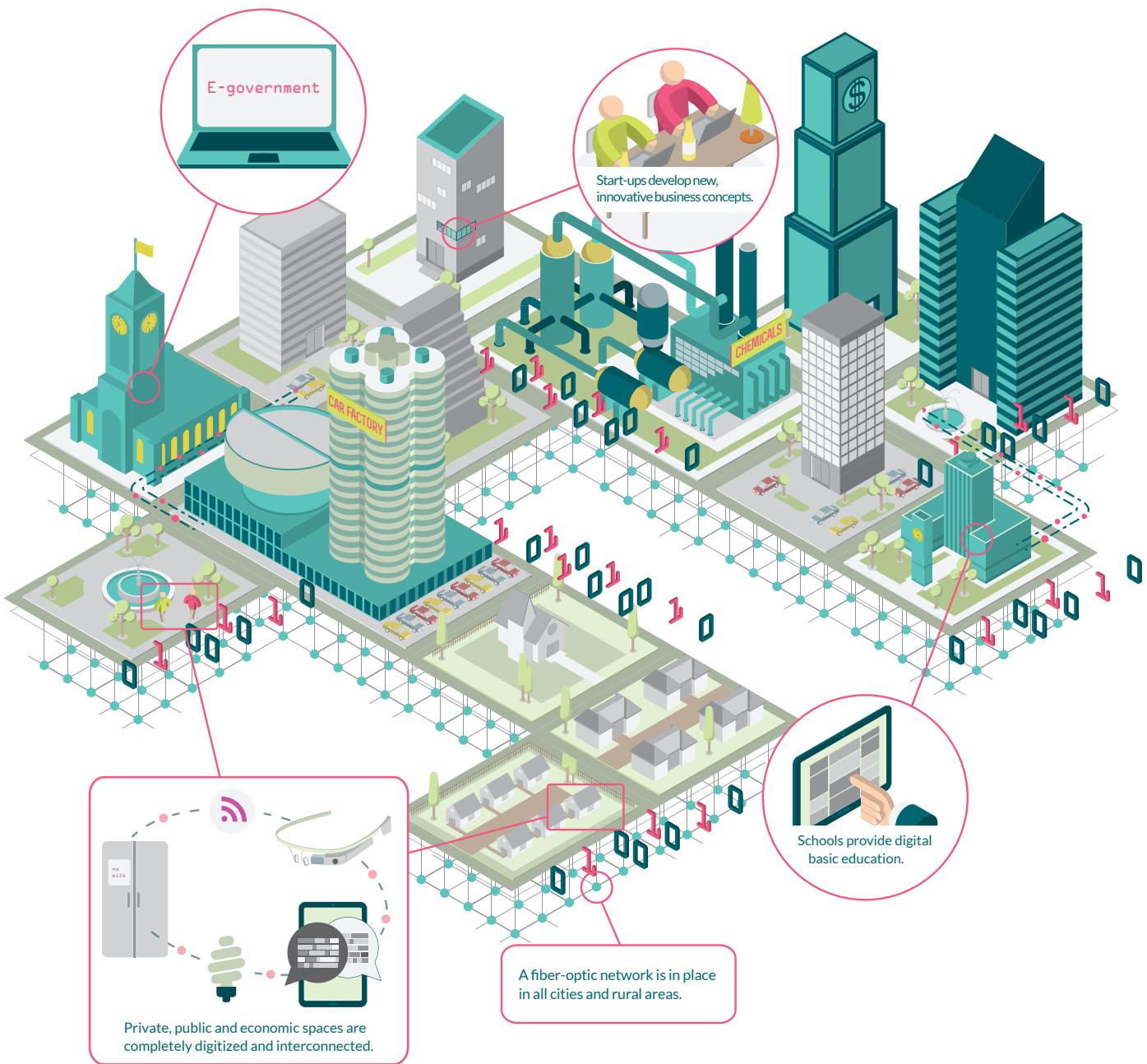
That Germany has metamorphosed into a completely digitized industrial nation is one consequence of the installation of a digital infrastructure, whose speed and stability are state of the art. Having powerful Wi-Fi is now a fundamental right. Thanks to numerous public-private partnerships, tremendous investments have been made in the expansion of the network. Whether in the cities or in rural areas – the total availability of a powerful Internet connection has become a matter of course, by now not only for millions but, in the wake of the increasing connectivity in the “Internet of Things,” even billions of devices.

The state has helped establish a ubiquitous digitized work environment in other areas, too. New business models and business segments have emerged everywhere. Economic regulation has proven to be effective; more and more often the government is able to make necessary, appropriate interventions in good time to provide crucial stimulus for the growth of some sectors that are important for

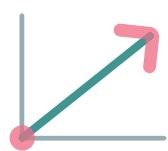
powerful Wi-Fi as a fundamental right

new business models everywhere

Scenario 3: "Rhineland Capitalism 4.0"



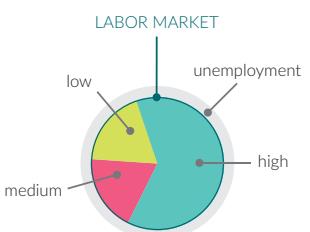
FORM OF WORK



COMPETITIVENESS



POLITICAL CONTROL



LABOR MARKET
AFTER QUALIFICATION

tax incentives and cutting red tape

the national economy. Especially tax incentives and cutting red tape have been successful.

The German economy is in the lead, in part due to its traditional fortés and skills. Similar to Switzerland, many companies have focused on what they are good at. Especially the global demand for products and services can be satisfied by the Old Economy. The old middle class still makes a not insignificant contribution to the economic output, but has remained largely analog and is increasingly losing ground. However, New Economy players have also formed. Thanks to a radical structural transformation, banks, insurance companies and stores, but also the chemical and automobile industries have taken advantage of the new opportunities. As a result they have assumed and often merely consolidated their leading positions in the global market. Only marketing and trade relations are still somewhat problematic. Overall, the digital economy is able on the one hand

to react to trends and use advanced technologies of other countries, but on the other hand also to establish trends of its own accord and develop revolutionary technologies. Digital innovations are once again made in Germany.

Work has become very compartmentalized and is increasingly organized via projects. Often freelancers are hired who, however, typically have only one or a few customers, which allows for continuous, trust-based col-

laboration – “permanent freelancer” has frequently become the dream concept for both agent and principal. The extreme flexibilization of the labor market which has taken place – it is also known by the keyword “Agenda 2020” – has drastically lowered the level of social security. There is only basic security for everyone. The social system with which Germans used to be familiar virtually no longer exists. The labor market has been completely deregulated.

Nearly all industry sectors do their business proper by way of digital

old middle class is losing ground

Quote from Ibrahim Hamzik, crowd manager, in 2030

"My family keeps calling me 'digital slave driver' – they do it jokingly, but there is actually some truth to it. As a crowd manager I receive orders, turn them into small or even tiny work packages, and pass them on to our pool of freelancers, the crowd. Whether a commission can be carried out well and quickly, is ultimately my responsibility. That's why I must pass on the pressure I myself feel to the crowd in a way. Hence the image of my job as that of a slave driver. With every new project, I have to be able to estimate the amount of work required, the size, and the ballpark fee for the different work packages that are needed. Only few elements are done by rote, every order is slightly different. The experience I have in splitting up such an order is also important. Receiving the project, forwarding it, and communication – all that is done via IT. This allows me to monitor the progress the crowd has made, but it also allows my bosses and our customers to monitor me. In a way I straddle the fence: on the one hand I am the contact for our customers, and on the other for the crowd. The company where I am employed expects me to undergo advanced training on my own as my work requires. It does not invest in me and my skills, probably also because my job is in danger of becoming extinct. I personally believe it won't take long until I am replaced by machines, even though many of my colleagues see that differently. Financially at least this won't make much of a difference for me – already I can hardly make a living on my salary."

digital innovations from Germany

working environment organized via projects

know-how. This leads to an extensive need for digital professionals which cannot be filled completely, especially not in the sectors which are still growing. The employment agency's re-training seminars can hardly keep pace, but even individual advance training is often insufficient. While the job prospects are bright for knowledge workers, unemployment, especially among the less educated class, is high.

In response to the lack of profes-

level of social security lowered

bright job prospects for knowledge workers

Scenario 3: "Rhineland Capitalism 4.0"

digital basic education and training ensured

every child receives education fund

sionals, the education system has adjusted to the new requirements. Digital content is now taught with digital means even to pupils. Even though the curricula are still lagging somewhat behind, this ensures the digital basic training for the young and coming generations. The concept of equal opportunities has been redefined: today every child receives a digital education fund at birth which can be refilled by, say, when he or she graduates from school. Yet those who do not seize this opportunity drop out

of the system and have no further claim to digital education and training. It seems as if only a privileged group of people can acquire the advanced and more in-depth skills, as this digital training segment remains a private affair.

The state has adjusted to the needs that have evolved in the wake of the digitization process as well. While there is no strict e-government yet, the development clearly goes in that direction.

well on the road to a strict e-government

Due the first-rate network infrastructure, the Internet of Things has become firmly established, and the highly successful New Economy is accompanied by a very fragmented labor market.

Lead questions

- › Can an economically highly successful society do without a social security system as it was the norm in Europe in 2016?
- › Will the labor market and the value added of the companies be organized via online platforms?
- › If yes, how do German and European legislation cover crowd and cloud platforms with respect to labor and data protection laws?
- › What are the pertinent discourses which society conducts?

Scenario 4:

"Digital strongholds and disconnected hinterland"

Profile				
COMPETITIVENESS	DIGITAL INFRASTRUCTURE	POLITICAL CONTROL	DEMAND IN LABOR MARKET	DOMINANT FORM OF EMPLOYMENT
<i>Not really, only the major cities have economic clout, the economy has "Old Economy" features</i>	<i>Digital data traffic in the big cities via copper cables, hardly any areas equipped with fiber-optic cables</i>	<i>Not very successful, at least as far as national policies are concerned</i>	<i>Poor large-scale digital infrastructure leads to loss of available jobs – job seekers have to move into the cities</i>	<i>Traditional employment conditions and freelancers with few major customers</i>

young generation lured to big cities

booming centers and dying regions

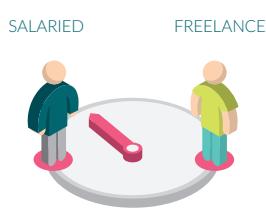
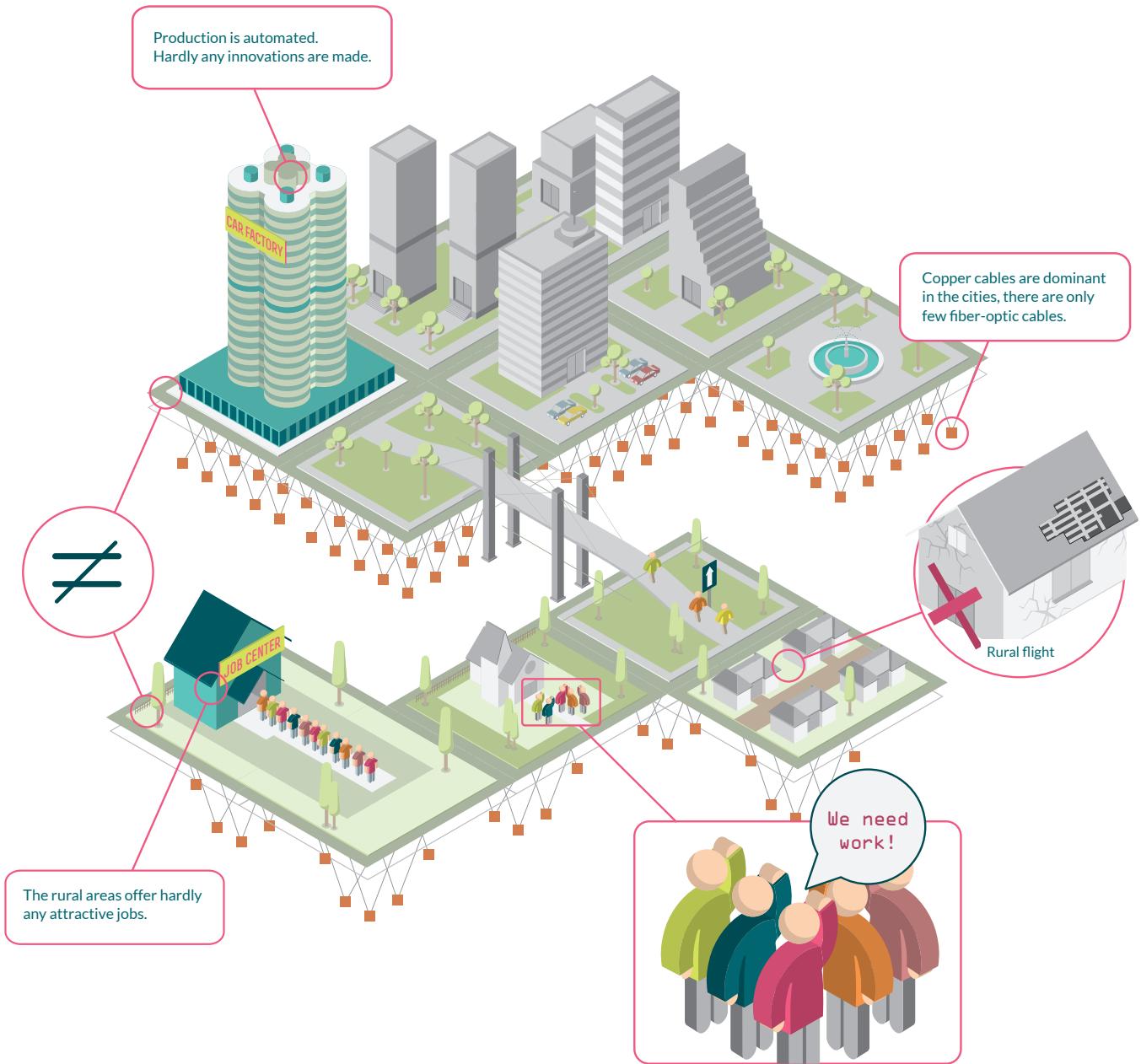
Empty shop windows, faded signs, crumbling facades: the pedestrians have long since vanished from the pedestrian zone in Neustadt (any rural town in Germany), and gone along with them are retail stores, restaurant businesses, and movie theaters. A few years ago a large disco moved into the formerly largest department store in town. The company that operates it is about to go bankrupt, the audience is disappearing. Many members of the young generation have moved away, lured by Germany's big cities and the prospect of a job and a future they offer. While most of them have stayed at home, they lack the money and desire to spend a night at the disco.

Germany is split – into high-performance centers that keep growing year after year and a disconnected hinterland that slowly but surely is becoming deserted. Often there are only a few miles between booming centers and dying regions. Initially the greater metropolitan areas were perceived as lighthouses. State and society were late to recognize how grave the devel-

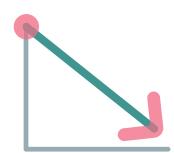
opment of the situation in the hinterland was. The realization has come too late, the gap is already too large: while their healthy economy allows the urban metropolitan regions to invest in maintaining and expanding their infrastructure, the large rest of the country lacks the funds to take successful measures for developing the infrastructure and the economy. Climbing interest rates have had an impact on the households: since attractive loans are no longer available, there have been more and more public-private partnerships. Moreover, investments are only made where success seems likely, which is conducive to the formation of centers.

Parents' level of education has long since ceased to be the sole deciding factor concerning one's own chances. Background and place of residence have become at least as important. In the metropolitan areas, even the youngest pupils are offered computer labs which are paid for by sponsors, while in the more rural regions only marginal digital basic education and

Scenario 4: "Digital strongholds and disconnected hinterland"



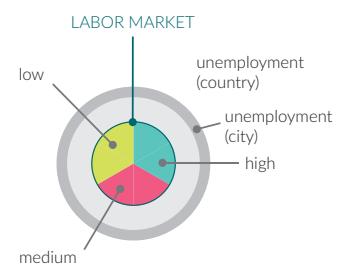
FORM OF WORK



COMPETITIVENESS



POLITICAL CONTROL



digital advanced training: a private affair

training is offered at the schools and colleges. Those who really want to make it must acquire the skills that are relevant for the labor market on their own: digital advanced training has become a private affair which only a privileged and highly motivated group of people can afford. The field is mostly covered by private training providers. Many college and university graduates leave Germany to go to the U.S. or Asia, whereas the German cities are of interest especially to graduates from Eastern Europe.

If only as a consequence of already existing developments among businesses, government regulation has paved the way toward the digital future in several sectors, some of which it could proactively help become completely digitized. Yet due to a lack of structural support, only the metropolitan areas have benefitted from this. According to a landmark decision on the solidarity tax, the scarce public funds are no longer to be spent on trying to create equal living conditions for all. Lighthouse projects are subsidized instead. The rest of the country is left behind.

government regulation promotes only metropolitan areas

If only as a consequence of already existing developments among businesses, government regulation has paved the way toward the digital future in several sectors, some of which it could proactively help become completely digitized. Yet due to a lack of structural support, only the metropolitan areas have benefitted from this. According to a landmark decision on the solidarity tax, the scarce public funds are no longer to be spent on trying to create equal living conditions for all. Lighthouse projects are subsidized instead. The rest of the country is left behind.

Old Economy highly automated and to be found in the cities

Germany is still characterized by the "Old Economy." A large part of production is highly automated and can be found in the cities and their affluent suburbs. Yet German production has lost its status as pioneer. Other industries and sectors have succeeded in adjusting to the digitization process sooner. However, since they are all located in the met-

opolitan areas, funds for them are not directed to the hinterland. The digital strongholds have become solid, economically autonomous players which also compete against one another in the global market. The global competition is largely decided by connectivity, speed and prices, and less by technical innovations in the conventional sense. Many of the digital technologies that are relevant for the German economy are therefore imported from the U.S. and Asia and copied.

Due to the different economic development in the individual regions,

imported and copied: digital technologies

Quote from Anna König, local package deliverer, in 2030

"I am actually a hairdresser, but for a while now I have moonlighted as a local package deliverer. All day long autonomous city cars, and sometimes drones, deliver merchandise to my apartment which my neighbors have ordered on the Internet. I don't need to be home for the delivery, a special window was installed in our apartment which opens and closes automatically. Or the little robot carriers bring the parcels right to my door and push them through the parcel drop box. While my children do their homework at night, I take the packages to the people in our housing complex. They use an app to tell me when they get home and want to receive the packages, then I go to their place. The more they order, the better for me: I get paid per package delivered, on a fee basis. It isn't much extra money that I'm making as a local parcel deliverer, but my salary at the salon was just not enough. That's why I was looking for another job which I could do from home after work and where I could take care of my children at the same time. Plus, I didn't need an additional qualification. You don't need a lot of skills other than using the app and reading nameplates on doors. At Christmastime I'm sometimes swamped when I come home and see the huge mountains of packages that have been delivered during the day. But at least I have no boss who irritates me. On the other hand, when deliveries are late and I get bad evaluations from customers, my pay is reduced. I've noticed that the personal contact with the deliveryperson is important for many people."

digital professionals are in demand almost exclusively in the metropolitan areas. Yet since only a small minority of workers leave their hometowns, unemployment in the hinterland is high while professionals are lacking in the digital strongholds. Moving is also a matter of money, as living expenses in the cities are high. In many sectors, automation has moreover led to job cuts at industrial production plants. Social tensions in Germany are great; the gap between

high unemployment in the hinterland

Scenario 4: "Digital strongholds and disconnected hinterland"

gap between poor and rich, between educated and uneducated widens

the poor and the rich, between the educated and the uneducated, keeps widening, ever more frequently jeopardizing the country's social harmony. Strikes and protests have become the norm, especially in the rural areas.

social system in crisis

The regional upheavals and the size of the unemployment figures have precipitated the social system into a crisis. Those who have fallen through the cracks – and this includes many former freelancers and entrepreneurs – end up getting a basic pension. The number of those who have been left behind in the wake of the digitization process keeps growing. For a long time entire regions have been considered problem-ridden – problem spots have turned into problem areas.

Despite the social developments, digitization is largely regarded favora-

bly by society, even though it has led to a boom only in the metropolitan areas. Those who live there and have a job are for the most part still working in employment conditions that resemble those back in 2016, nine-to-five jobs in offices are still common. A few permanent freelancers have been added to the staff, but otherwise not much has changed.

The state has only partly managed to successfully implement the general digital environment. There are still a number of sectors and branches where digitization is at a standstill. A major problem are the differences in the connectivity status in Germany, the analog spots outside of the metropolitan areas make further adjustments across different political areas impossible.

nine-to-five jobs are still common

big problem: differences in the connectivity status in Germany

Only in the big cities did a digital development take place, the rural hinterland suffers from a terrible job situation and the resulting poor purchasing power of the population.

Lead questions

- › How can the country's regional and social division be overcome?
- › What is the role a nationwide education policy might play in this?
- › In view of the slowing economic development, what can be done to improve the poor condition of the social security systems?
- › Do the unions have to complement their industry sector-focused structure with more regionality?
- › Can the urgently needed federal control plans even be implemented against the big city interests?

Scenario 5:

“Digital evolution in the federal competition”

Profile				
COMPETITIVENESS	DIGITAL INFRASTRUCTURE	POLITICAL CONTROL	DEMAND IN LABOR MARKET	DOMINANT FORM OF EMPLOYMENT
Generally speaking, yes – except that there are big differences between the federal states; Industry 4.0 is very important	Development of fiber-optic network varies greatly between the different federal states	Works, with qualifications – the competition between the federal states undercuts national political endeavors	Demand is mostly for highly qualified professionals	Freelancers with few customers

federal states
pitch their
advantages

A job fair for young graduates in 2030: not only individual companies present themselves here but, in the main hall, the federal states pitch the advantages they offer. The visitors can recognize which states are attractive even at first glance: long lines have formed in front of their information centers while other booths are completely desolate. Accordingly, some federal state representatives have little to do that morning – if someone does ask them a question, it is typically about where the information center of another state can be found.

Digitization has led to a federal competition in Germany, with clear winners and losers. Some regions, which include creative cities but also rural areas, have now turned into highly dynamic and digital lighthouses. These digital clusters attract qualified applicants, many companies and freelancers. Other regions have completely missed the boat and lost many talents. These discrepancies at the level of the federal states and regions are largely a consequence of the federal competi-

tion. While some regions have pursued a successful digital location policy and drawn international investments and know-how, other states and regions have not been able to bring about this structural transformation.

Especially the education system has changed in line with the regional differences. In the booming regions, digital skills are taught early on in school. By contrast, digital basic training is short-changed in the weak regions. This further exacerbates the divide between the regions. The downward spiral of education and training system on the one hand and of the economic development on the other is obviously also reflected in the labor market. The booming regions gain additional benefit from advanced education and training in their strong IT sectors. A large supply of digital professionals meets large demand at the digital centers, while the regions that have been left behind lack equally qualified applicants and jobs for low-qualified people.

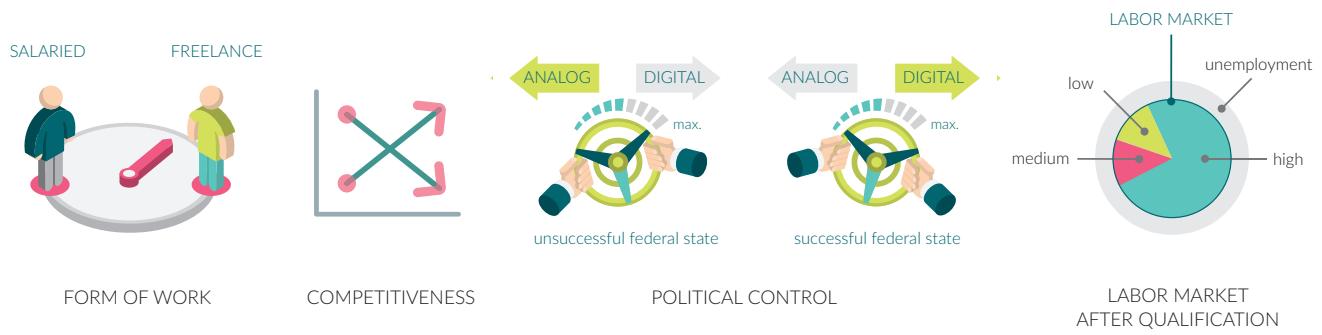
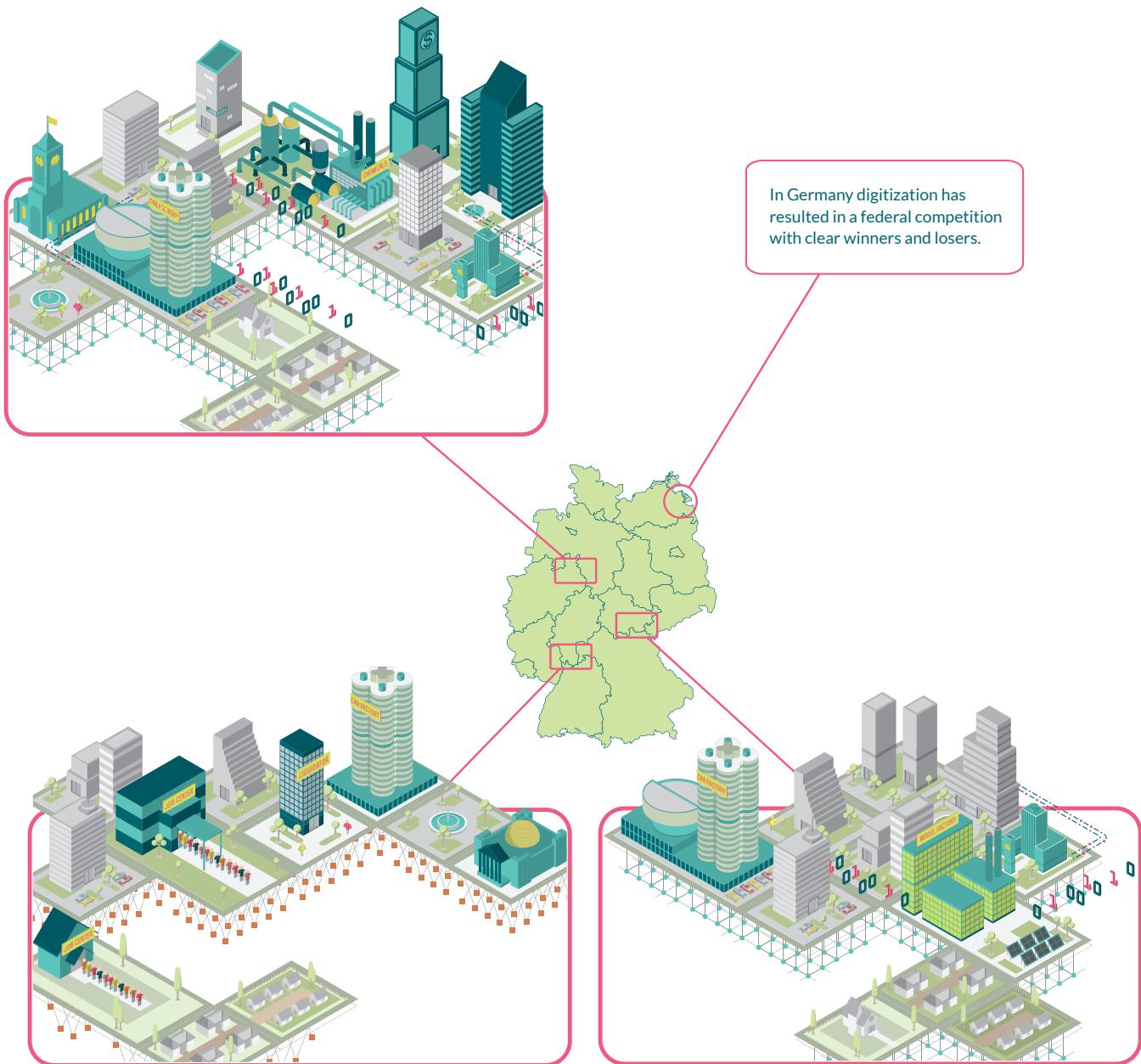
Industry 4.0 has become a success story in Germany, precisely because

attracting talents:
digital clusters

booming regions:
digital skills are
taught early on
in school

Industry 4.0
has become a
success story

Scenario 5: "Digital evolution in the federal competition"



**value added for
classic industrial
products**

it combines two factors: on the one hand the old segment of small and medium-sized businesses, which continue to be flourishing thanks to their analog fortés, such as excellent industrial manufacture and the production of goods. On the other hand, a new, digital economic environment has formed in the various German "silicon cities." To be sure, Germany is not generating any revolutionary technologies, but as a result of their successful integration, implementation, and the value added this brings for classic industrial products, the economy has kept pace and continues to

be competitive at a global level.

Domestic production has changed in the wake of the pronounced trend toward automation. The factories are managed by just a few specialists, which has led to extremely high capital efficiency. Another consequence has been the elimination of jobs at the middle qualification level; demand has declined even for simple jobs, both in the analog and the digital segment.

This has led to major changes in the labor market within a short time. Prospects are better and the pay level is higher than ever for highly qualified professionals and knowledge workers – here too especially in the strong regions. Hardly anyone still works in traditional employment conditions. People prefer to work freelance, which has led to great flexibility on both sides. The companies can respond faster to developments and reduce or expand

**elimination of
jobs at the middle
qualification level**

**working freelance
increasingly popular**

their staff at extremely short notice. This has given the economic landscape in Germany relative agility. In 2030 a company is conceived of as a solid association of freelance staff members who, however, for the most part work for just one customer – so the difference is mainly in their formal ties to the company and less in the organization of labor. Freelancers are also included in collective decision-making. Since earlier company structures have dissolved almost entirely, classic special-interest groups, which were focused on one industry sector or

**no longer any
classic special-
interest groups**

**Quote from
Dr. Maryam Farhad,
online investigator,
in 2030**

"I am a policewoman in the 'Virtual Manipulation Crimes in Financial and Merchandise Markets' unit. We make sure everything is aboveboard in the digital markets. For example, we check if algorithms in high-frequency trading or loan scores have been manipulated. My colleagues and I used to work in different units and then did some training when these jobs were created in the Criminal Investigation department. But training actually never really stops – if you want to have a chance at stopping cyber criminals, you must always be on top of the latest methods and technologies and quickly recognize manipulation attempts. Therefore we communicate our experiences and insights at length with one another, also with those colleagues who work undercover. This is one of the major differences to my previous job. Plus, now I can decide on my own when and where I work. For instance, I often take a long break in the afternoon and play with my children. When they have fallen asleep at night, I sit back down at the computer. At first I had to get used to my boss not being the only one who wanted to know about the progress and results of my work, which I brief him about every morning in a video conference. We are also monitored via our in-house software, much more so than previously. The purpose of this is fighting corruption. After all, we basically deal with insider information all the time that might tempt us. True, being an online investigator doesn't make you rich and rarely famous, but it's a good living with good security – after all, I'm a civil servant."

corporation, are no longer expedient. Nowadays, well-organized freelancers have great negotiating power.

Many freelancers work at locations of their own choosing, often in the country, enjoying a good quality of life and an excellent digital infrastructure – as long as the region is properly equipped, because in this respect, too, there are tremendous differences between the various

Scenario 5: "Digital evolution in the federal competition"

federal states. While some have advanced the installation of a comprehensive fiber-optic network through their own subsidy programs – complementing the investments of the telecommunications providers in cable and VDSL in the conurbations – other federal states have failed to keep up with the development of the infrastructure.

This new employment model, however, has consequences not just for companies: the freelance staff members must provide for their financial security on their own. Therefore much fewer employees make contributions to the social systems while at the same time more and more people depend on them. Consequently, basic financial security is increasingly paid for with taxes. These major changes result in sustained high pressure for reform.

The social divide further widens the regional gap. Companies and talents move into the strong regions while the population in the weak ones continues to decline. In some big cities English has been introduced as second official language so as to keep up in the competition for professionals. Furthermore, the federal states that can afford it are developing their own subsidy and provision models for their population and for those they are trying to attract.

Structural measures of the federal government turn out to be less and less effective. While the strong regions are largely successful with their intelligent, forward-looking regulation, at a federal level the government tends to lag behind, failing in some areas of politics. Regulation at a European level is more significant anyway. The global competitive pressure, the increasing strain on the social systems, and the attempts at moderate regulation which does not slow down the digital developments – all of this often pushes the state into the position of being "driven," and it has difficulty keeping pace.

*basic financial security
increasingly paid for with taxes*

English as second official language

special subsidy and provision models of the federal states

government tends to lag behind at the federal level

The divide between the different regions and the polarization of the labor market have also resulted in dwindling solidarity and a debate about issues of the financial equalization scheme between the federal government and the federal states. The objective of equal living conditions, as stated in Germany's Basic Law, has been abandoned. The profoundly different concerns of the federal states make it ever more difficult to reach agreements at a national level. Regional aspects increasingly supersede partisan considerations. Moreover, regional parties have been founded. Passing national legislation has become ever more difficult.

German society is divided as well: on the one hand, the country has a digital and successful elite, and on the other there are entire generations and groups that have been overtaken by these developments. A movement has sprung up that longs for a return to life in the country, in harmony with nature. But there is also a "pro hi-tech" movement that is drawn to the high-performance centers with a good digital infrastructure.

partisan considerations superseded by regional aspects

harmony with nature

"pro hi-tech" movement

The federal states are in intense competition as locations for digital businesses. While some states have become highly attractive to digital businesses, others have been left behind, and even a growing number of classic industries and small and medium-sized businesses move into the more attractive states.

Lead questions

- › What is the impact of the federal competition on the economic clout of the entire country?
- › Which political areas must be shaped on a national level, and which ones do not?
- › What difference does the fact that an ever larger number of people work on a freelance basis make on the concept of the unions representing workers' interests?
- › What is the impact of the dominant employment model of working as a "permanent freelancer" on the social security of the workforce?
- › What is the impact of the new regular employment model of "permanent freelancers" on the corporate culture and the organization of work?

Scenario 6: "Digital failure"

Profile				
COMPETITIVENESS	DIGITAL INFRASTRUCTURE	POLITICAL CONTROL	DEMAND IN LABOR MARKET	DOMINANT FORM OF EMPLOYMENT
Low	"Copper country" – putting it in a nutshell: hardly any development compared to 2016	The government is more or less inactive	Labor market develops very poorly due to a lack of economic competition	Traditional standard employment conditions

former "hidden champions" turn into "lost champions"

too-slow establishment and development of an efficient digital infrastructure

It has almost become the norm: the evening news announces insolvencies. It is large companies in formerly flourishing industry sectors that now fold one after the other. Many of them have a long history, but a largely analog core business, for which there is no more use in the digital world of 2030. Former "hidden champions" often turn into "lost champions." Such industries as automotive and mechanical engineering have long since lost their position at the top of the global market and have been pushed aside by competitors from other countries. The term "Industry 4.0," which used to express hope, now refers to a story of failure.

This has a number of different reasons, which are mutually dependent. A problem was on the one hand the too-slow establishment and development of an efficient digital infrastructure both in the countryside and in the cities. Since this prevented urgently needed innovations and the creation of new business models, Germany was increasingly forced into a role of strict user of digital technologies.

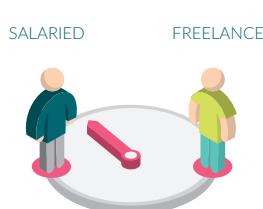
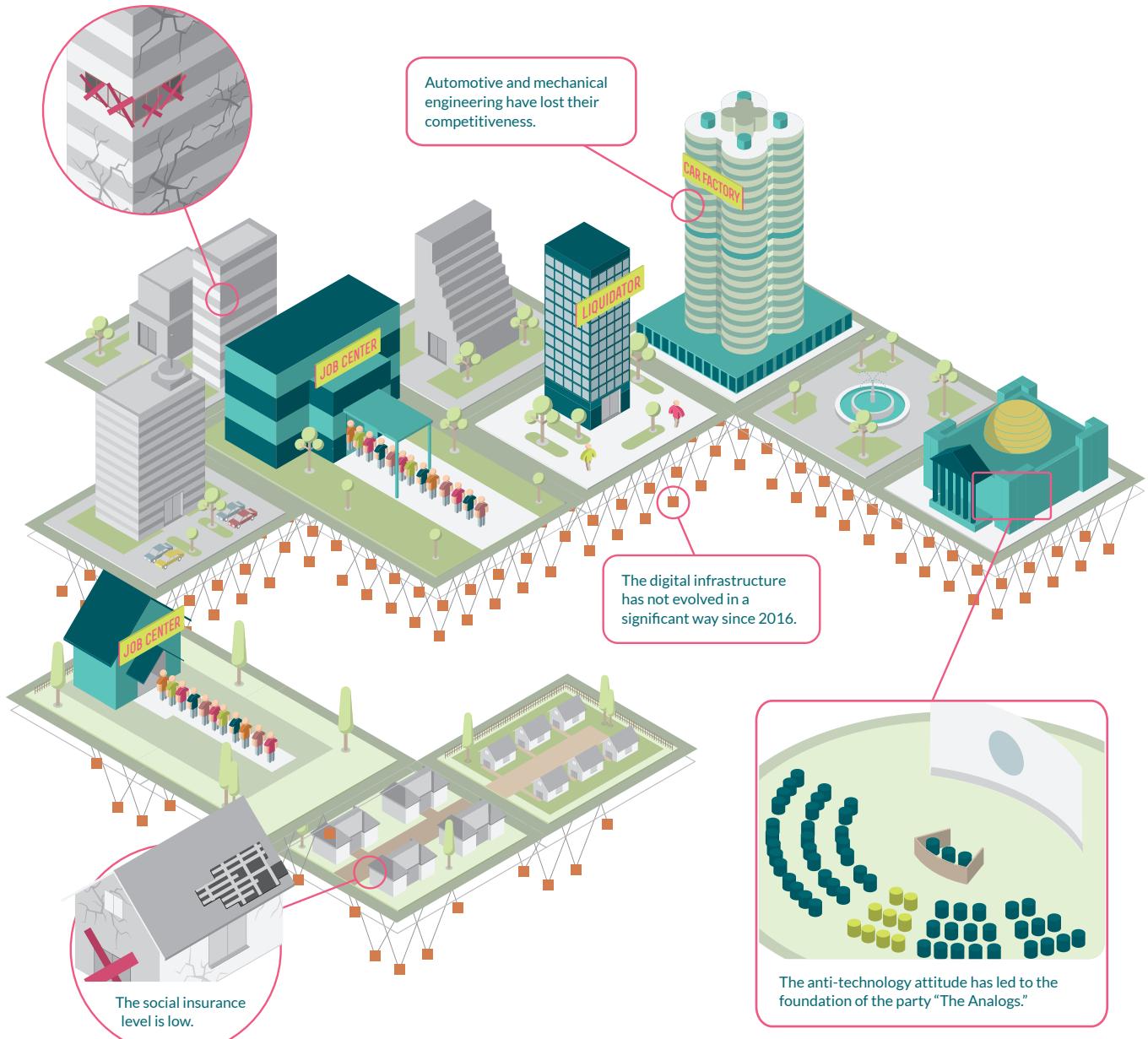
Established German companies, for example in the telecommunications sector, were swallowed up by foreign corporations. The upshot was a drastic decline in significance and revenues of domestic businesses, which in turn resulted in considerable tax losses. Since then urgently needed funds for the modernization of the infrastructure have been lacking even more.

The digital failure has other reasons as well. For example, the government was unable to support the pertinent structures and introduce legislation to promote innovation. There was hardly any area of politics where the state has managed to keep pace with the digitization process. Its regulations come late and often in a comprehensive form which is quickly made obsolete by the technological development and then ends up obstructing innovation. At the EU level, regulation of small segments dominates as well. Asia and America do particularly well thanks to their speed and flexibility.

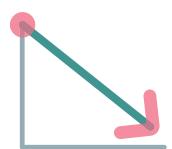
Failed digital policy has left the potential of digital technologies for the economy and society largely

legislation that promotes innovation quickly becomes obsolete

Scenario B: "Digital failure"



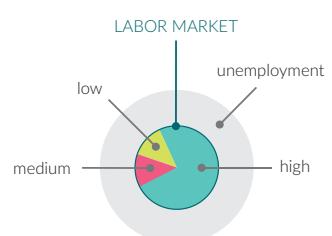
FORM OF WORK



COMPETITIVENESS



POLITICAL CONTROL



LABOR MARKET
AFTER QUALIFICATION

Scenario b: "Digital failure"

great insistence on analog technologies	unexploited. For a long time there was great insistence on analog technologies within society which almost amounted to cultural noncompliance. These tendencies were exacerbated by the demographic development – especially the older generation proved to be increasingly skeptical about or even opposed to technology. An intensive and sustained debate about data protection – also on an international scale – has reinforced the negative attitude of the population and led to the introduction of rigorous guidelines in Germany. For a few years the party "The Analogs" has been represented in the Bundestag, and referendums against further technical developments and improved networks are successful on a regular basis.	Speaking, major parts of the population are opposed to further immigration, which also eliminates the possibility of a debate about qualified professionals from foreign countries.	existence-threatening skills shortage
in the Bundestag: "The Analogs"		Skills shortage in turn has reinforced the development in which only few companies have succeeded in making the leap into the digital age. Many rested too long on the laurels of the relatively successful 2010s, until they were so far behind the pioneers of digitization that they could no longer catch up and the situation suddenly became existence-threatening.	
digital basic training	Schools have not received digital equipment, but digital basic training was introduced. Even so, most of the students grew up to become consumers, not designers of digital technologies: using smartphones – yes, programming apps – no.	The employment conditions have fundamentally hardly changed: regular employees can still be found, as can staff members in flexible project	employment conditions have barely changed
potential of numerous young, motivated migrants in the education system not developed	<p>Quote from Vladimir Bakerov, accountant 4.0, in 2030</p> <p><i>"Compared to the way it used to be, a lot has changed in our company. One of the advantages for me: I no longer have to go to work – work comes to me. My desk is at my home and I make my own work schedule. This is because my employer has come up with a new business model: I work for a car manufacturer whose market would have become too small in the long run, which is why my department, Accounting, was opened for outside orders. Since then we have not only handled our in-house bookkeeping but also do that for a few start-ups. This is possible because many young IT companies tend to prefer hiring other companies for bookkeeping to hiring their own employees for this job. I mainly deal with individual and special accounting cases for which programming software wouldn't be worthwhile. My boss organizes the distribution of the work packages among myself and my colleagues. The system notifies her about the state of the projects we are working on; so if we were too slow, it would be noticed. The company lets us participate in online workshops on the latest changes in tax legislation on a regular basis. You've got to keep an eye on them, because we deal with a great many individual and special cases. Work can be stressful at times, but at least I make decent money. And I can look at my garden from my desk, that's obviously also great."</i></p>	organizations. The ratio of freelancers has remained far behind expectations.	salaries at a low level

generated for people in the creative field, for developers and specialists, partly because the companies that use them no longer exist. In this segment, too, there is a downward spiral: as incomes decline, tax revenues drop as well, and as a consequence so do government investments. There are virtually no countermeasures for this development.

***social system
enters a
serious crisis***

Due to the high unemployment rate and the smaller number of contributors, Germany's social system has also entered a serious crisis. Almost all

benefits have been cut, but the principle of funding through contributions has still been preserved. The instability of the social system is currently still somewhat kept in balance by a relatively affluent, ageing society whose strong economic performance has led to corresponding wealth, which mitigates the social and societal impacts of the structural crisis. Yet the national debt is already skyrocketing so that social benefits can be kept at least at a minimum.

Germany has lost the global competition for most attractive industrial location. The labor market still has many salaried employees who pay mandatory social insurance contributions, but demand is by now strictly focusing on jobs that require little education and training.

Lead questions

- › How can the digital infrastructure be developed in view of poor economic strength and the associated lack of resources?
- › Where is the basic anti-technology attitude among the population going to lead?
- › Does this perhaps even contain potential for economic growth that is somewhat removed from the mainstream?
- › How does the increasingly precarious funding of the legal security systems impact the relationship between the generations?

Drivers and spheres of action: Results from the Foresight Lab

Juliane Landmann, Stefan Heumann

The six scenarios presented here grant us a look at how jobs and the labor market might develop in the future. They are to be regarded as sections from a “future space of potentiality,” as it were. Compared to a linear, even extrapolation of developments, this method gives greater consideration to particularly drastic developments – in this case, advances in digitization and connectivity. This systematic methodology allows for developing clearly distinct future options. These are moreover distributed relatively evenly among a spectrum of possible futures.

Each scenario contains information about the way a specific key factor has developed. These key factors – and the ways in which they have developed – constitute the matrix for different scenarios. There are a total of five of these factors: digital infrastructure, economic competitiveness, dominant form of employment, political ability to adapt or control, and development of demand in the labor market (p. 13).

Within the complex of “digital infrastructure,” there are two basic alternatives: it is either equally well developed throughout the country or only in certain regions. Furthermore, it is relevant whether supply takes place via low-performance copper cables or high-performance fiber-optic cables. Similar to the classification of the digital infrastructure, for the factor “economic competitiveness” we have the alternatives low or declining and nationwide or only regional. “Forms of employment” remain either conventional or become flexible, which may be combined either with firmly belonging to one employer or the status of a genuine freelancer. The strategic preview of the “ability of politics to control” is basically about the question of whether the legislature will be able to assist the country’s transformation process toward the digital age in and across various political areas. And the “development of demand in the labor market,” another key factor, can be positive or negative, which in turn will be accompanied by an increase or decrease in the average income.

Since the labor market depends on economic developments, it makes sense to classify the scenarios under precisely this aspect. We did this for the six scenarios in Figure 3. The first column states the general economic competitiveness of the different scenarios. The scenarios with the most positive assessment are shown at the top.

Sorting the scenarios by their respective economic strength clearly reveals that there is a linear relationship between the country’s competitiveness on the one hand and its development of the digital infrastructure and the

government’s ability to take society into the digital age on the other. The scenarios with the best assessments are those that have successfully developed a nationwide fiber-optic network. Political control increases in proportion with the economic strength. Yet as far as the detailed descriptions of the scenarios are concerned, they are primarily assessments of the government’s economic policies.

When it comes to the labor market, matters are quite different. Neither the form of employment nor the demand in the labor market develops in line with the economic competitiveness. Therefore labor demand may either rise or fall. It is possible that the entrepreneurial risk shifts to the self-employed, but it is also conceivable that it is salaried employees who are organized in projects that constitute the dominant form of employment.

This kind of phenomenon is a strong indication of a mechanism that divides the various facets of the scenarios into developments that explain matters or that must be explained. Applied to the present issue, this would mean that the digital infrastructure as well as politics impact the way in which economic competitiveness is going to develop in view of the digital transformation. These types of development can also be called “drivers.” The form of employment and demand in the labor market, however, clearly do not function as drivers in the six scenarios. The group of Foresight Lab experts rated the development of these two key factors as uncertain and hence as dependent and controllable.

When analyzing the six scenarios with respect to the political spheres of action they entail, we must distinguish between two interdependencies: one, areas of politics which have a crucial impact on the development toward the scenarios, and two, political spheres of action which require answers within a scenario.

Milestones into the digital age

As explained above, the scenarios have drivers with a critical impact on the speed of the digital transformation. After all, as long as there is no adequate broadband infrastructure, neither the connectivity of businesses nor the development of new digital forms of employment will make any vital progress. In addition to the driver

Figure 3: Scenarios listed by economic strength

Economic competitiveness		Digital infrastructure	Political control	Development of demand in the labor market	Primary form of employment
Scenario 1 "Engineering nation with a heart"	Yes	Nationwide fiber-optic network	Excellent	Decreasing	Salaried project workers
Scenario 3 "Rhineland Capitalism 4.0"	Yes	Nationwide fiber-optic network	Yes	Stable to positive	Self-employed workers
Scenario 5 "Digital evolution in the federal competition"	Generally speaking, yes	Copper cable or fiber-optic network has reached its technical limits	Works	Decreasing or increasing depending on the federal state	Self-employed workers
Scenario 2 "Silicon countryside with social conflicts"	Generally speaking, yes	Copper cable or fiber-optic network has reached its technical limits	Works so far	Decreasing or increasing depending on the level of qualification	Self-employed workers
Scenario 4 "Digital strongholds and disconnected hinterland"	Generally speaking, no	Little improvement since 2016	Generally speaking, no	Decreasing or increasing depending on city or country	Traditional standard employment conditions and self-employed workers
Scenario 6 "Digital failure"	No	No development since 2016	No	Decreasing	Traditional standard employment conditions

"digital infrastructure," which we have already mentioned, two other drivers, "digitization of the economy" and "social acceptance of digitization," can be identified which crucially determine the development of the scenarios.

Digital infrastructure

Whether you take Industry 4.0, the Internet of Things, or the use of new digital platforms via the cloud – without a powerful broadband infrastructure, companies will be limited in their ability to use digital technologies. The development of this infrastructure is to a significant degree determined by investments on the part of the telecommunications industry. From an economic point of view, however, these investments are worthwhile only in densely populated areas. Moreover, there is still only limited demand for high-performance fiber-optic connections even in offices and factories, as we are only at the beginning of the development of broadband-intensive applications. Yet if high-performance fiber-optic connec-

tions are not widespread, companies have little incentive to develop these applications. For this reason a few countries, such as South Korea, push the extensive development of fiber-optic cables by way of public investments. Without a suitable regulatory framework and subsidy programs, the development of the broadband networks in the countryside will only make slow progress. In this case large parts of Germany would lack the requirements for a digitization of the economy and labor, as has been described for some scenarios.

Digitization of the economy

The extent to which new digital business models and digital technologies have been developed and integrated in a company depends not merely on the digital infrastructure. Management must also take the appropriate strategic decisions, and the necessary skills must be available. The fact is that especially in the small and medium-sized businesses, progress in the development of digitization is

currently sluggish. The regulatory framework provided by politics will have a big impact on whether and how much companies will invest in digital business fields and technologies. Whether we take data protection, platforms, or copyright: with respect to the regulatory framework for the digital economy, the crucial issues will be negotiated in Brussels. With tax, labor law, and education policies, however, the design of central issues of digital economic policy primarily remains in the remit of the respective countries.

Acceptance among the population

While Germans use smartphones and frequent Internet shops, they are also highly skeptical of new technologies. Yet digitization will only advance at a rapid pace if it is accepted widely. After all, it is the citizens who make digital business models a success through the choices they make, their purchase and leisure behavior. The general public greatly impacts the integration of digital technologies in companies and at the workplace in its roles as entrepreneurs, investors, and employees. If the promises of digitization with respect to new, attractive jobs, user-friendlier services, and better access to education and government offerings are not kept, this will give rise to the danger of digital technologies being met with more rejection than acceptance among large parts of society. It is difficult to imagine how a speedy digital transformation of the economy can be accomplished under these conditions.

Spheres of action in the labor markets of the future

The factors mentioned above drive the digitization of the economy, leading it toward the scenarios outlined by the group of experts. More general developments, in turn, can be derived from these scenarios. These developments are the basis for the three political spheres of action we identified in our assessment of the scenarios. Yet needless to say, the different spheres of action are extremely important not just for parliament and government, but also for workers' representatives and companies. For this reason the description of the spheres of action includes an analysis of the convergences as well as conflicts of interests between employees and employers, from which the need for political action can be derived.

The reorganization of labor

In three scenarios, the economic growth that is the result of digitization also entails self-employment as the most frequent form of employment in 2030. Here companies satisfy their labor demand, which may range from highly qualified IT specialists to low-qualification service staff and temps, from a large pool of self-employed people. In the fourth scenario showing economic growth, salaried project workers make up the largest percentage of the 2030 labor market. In this scenario, companies no longer organize themselves primarily via functional-hierarchic structures. Rather, employees are assigned to projects of different size and duration.

Even if the relationship between worker and company is quite different in the two versions (salaried project worker in the company vs. self-employed freelancer), one characteristic unites the two forms of employment: everyday work is flexible/adaptable in both cases. Companies take advantage of the possibility to organize the work to be done via digital platforms (cloud working). Individual work steps, small jobs, or entire projects can be performed via these platforms as needed. The comprehensive connectedness and the possibility of joining in at any time allows freelancers and salaried project workers to work whenever and wherever needed or desired. This leads to the establishment of new forms of working with others within companies and beyond company borders.

Even today it is standard in some industry sectors to organize labor across borders of time and place. This trend will increase by 2030. Work will be distributed by the employer in a parallel as well as linear way: parallel working on a job defined by the employer or principal is known by the name of "crowd working," where the job to be done is handled by a previously not exactly determined number of people simultaneously. This way of working is customary, both within and beyond the borders of the company. By contrast, the linear variety is project work – which is already quite familiar nowadays – where responsibility is transferred to individual members of a clearly defined team.

In the 2030 labor market, workers will endeavor to take advantage of the technical possibilities for achieving greater compatibility of personal life and work. Moreover, it is in the workers' interest to decide on their own how their job should be done. With respect to the technological transformation, what is most important for the employer are greater productivity and modern business models. In terms of the scenarios, companies will try to achieve both mainly by outsourcing labor and gaining access to innovative ideas.

Figure 4 provides an overview of the most important interests of workers and companies concerning the

Figure 4: Distribution of interests concerning aspects of the modern organization of labor

	Workers	Companies
COMPATIBILITY OF WORK AND PERSONAL LIFE	Positive – women's growing tendency to have a job is the central driver of this interest.	Ambivalent – the interest is dependent on the labor supply: when there is a skills shortage, for instance, strategies for acquiring staff are guided by employee interests.
SELF-DETERMINED WORK	Positive – especially knowledge workers want to decide autonomously on how they do their job.	Ambivalent – see above, depending on the type of labor, control may be more ineffective.
OUTSOURCING OF LABOR	Ambivalent – with respect to the above-mentioned interests, this may be viewed positively, but the conditions for outsourced employment tend to be worse than for salaried employees.	Positive – there are savings in wage costs when the demand for goods produced or services offered is volatile.
ENSURING THE CAPACITY TO INNOVATE	Ambivalent – jobs can be secured, but established structures may also be broken up.	Positive – innovative ideas are crucial: access is ensured either through salaried employment or a crowdsourcing strategy.

organization of work. They may help explain the future predominance of salaried project workers and freelancers. In an attempt to determine where the interests of employees and employers diverge, the table tries to correlate the interests of the two groups. The final determination of the measures politics must take will focus on these divergences.

The aspects shown on the left are not clearly distinct from one another – the transitions are blurred. Many consider the compatibility of personal life and work to be part of an autonomous working life where the employer or customer grants a high degree of flexibility and freedom in doing the job at hand. The transition between self-determined work and outsourcing is also not clearly defined in actual practice.

Outsourcing is often justified by the argument that it gives job holders more freedom as to when and at what terms they want to work. This may be true for highly qualified workers for whom there is great demand and who can choose and do those jobs that they are interested in. For many self-employed people, however, the terms are worse than for salaried employees. In the low-pay sector, which requires few qualifications, workers tend to be so dependent on jobs that there is hardly any self-determination. In this case the advantages of outsourcing – such as greater

flexibility, lower fixed costs, and possibly lower wages – are shifted to the companies. Things are similar with crowdsourcing, which in 2030 will probably be conceived of as access to innovation but at the same time also constitutes a model for outsourcing.

Even though the transitions are blurred in actual practice, Figure 4 gives a good overview of the most important aspects of future forms of the organization of employment conditions and the associated interests of employees and employers. A glance at the complex and sometimes contradictory interests of companies and workers can give politics an indication of the problems which the parties to wage agreements/social partners have to contend with in 2030 and where parliament and the government might be called upon to step in. It must be kept in mind that in the scenarios with a strong tendency toward self-employment, the unions will themselves experience pressure and be forced to find answers to how the representation of workers can be adjusted to new forms of employment, such as self-employed platform work.

Furthermore, a significant number of self-employed workers may also constitute a major challenge to the way the social security systems work and to worker protection legislation. In addition to the question of how these changes might be successfully dealt with by adjusting existing

structures, alternative models of social security must also be contemplated. Therefore basic social care is a factor in the scenarios with a strong tendency toward self-employment.

Apart from this undisputed responsibility of the state for labor law-related and sociopolitical issues, the groups of the self-employed and salaried project workers, which we encounter particularly often in the economically successful scenarios, direct the focus on the following additional aspects concerning the reorganization of labor and employment, which politics should keep in mind:

- ① Can workers' representatives realize the opportunities which are driven by digital technology and new forms of organization for all job holders?
- ② What are the means by which the companies will try to ensure their capacity for innovation: acquiring a good image as attractive employer or as a specialist in crowd-working processes?
- ③ What are the criteria which an employee-friendly crowdsourcing platform would have to meet?

The labor market is coming under pressure in many respects

Workers feel pressure as soon as labor demand declines. In this connection our strategic preview of the 2030 labor market points out three potential differences that, interestingly enough, may also be encountered in the economically successful scenarios:

- There might be a general shortage of gainful employment.
- The reduced labor demand concerns only specific groups in the labor market while at the same time many other jobs are springing up.
- A strong concentration of a rapidly growing economy in clusters leads to pronounced regional imbalances.

A general shortage of gainful employment essentially results from the assumption that the connectivity of machines and the use of intelligent software replace human labor in companies. If at the same time not enough new jobs are created for workers who have lost their jobs, long-term, structural unemployment will be a real threat in this scenario.

The second possibility, where only certain professions or activities experience pressure, is also closely tied to the development of demand. As we have explained in particular for the scenarios "Engineering nation with a heart" and "Silicon countryside with social conflicts," initially it is vocational training and college or university studies in specific fields that determine one's access to the labor market. One's chances at employment can be maintained by undergoing continuing and advanced training. Their half-life, in turn, is becoming ever shorter due to the speed of technological change. In view of the great ability of machines to perform routine jobs, it will for the most part be manual and cognitive routine tasks, such as operating analog equipment or proofreading, for which demand will be gradually declining in the labor market of the future.

Contrary to people with secure jobs, who are often referred to as knowledge workers in the scenarios, it is especially people whose job consists to a large degree of routine activities for whom continuing and advanced training is compulsory.

Our scenarios moreover point out another factor which in combination with a general decline in the volume of work and a change in the demand for training will exacerbate the pertinent upheavals in the 2030 labor market.

At least two of the six scenarios predict a future with great regional differences. Depending on which scenario we look at, we can make out major discrepancies between the federal states or between urban and rural areas. In both cases there are model regions with centers of digital business that are evolving magnificently.

Cities and federal states promote these local ecosystems through research subsidies, the qualification of professionals, support for the founders of start-up companies, the formation of networks of the various agents of this development, and investments in a high-performance broadband infrastructure. However, the brilliance of these lighthouses, which are scattered throughout the country, is insufficient to illuminate the entire country. There are not just the booming model regions, there are also large regions which the digital transformation has passed by.

The scenario "Digital strongholds and disconnected hinterland" revealed major differences between economically successful urban and disconnected rural areas. Here cities have become centers of digital business where scientists, founders of start-up companies, investors, professionals, and established enterprises work very close to each other and cross-fertilize one another.

On the other hand, it is also conceivable that some federal states in the federal competition evolve into booming regions for the digital economy while other regions cannot keep pace. This potential future is exemplified in the sce-

Figure 5: Distribution of interests concerning upheavals in the labor market

	Workers	Companies
GENERAL SHORTAGE OF GAINFUL WORK	Negative – the fewer jobs there are, the worse the general negotiating position in the labor market.	Ambivalent – when labor demand increases, salaries often decline, but in a predominantly domestic sales market this may lead to reduced consumption.
... VARIES FROM REGION TO REGION	Negative – high labor demand exists only in a few booming regions, which requires greater mobility on the part of the workers in the economically stagnating regions.	Ambivalent – while companies in booming regions are growing, locations that have been left behind are becoming more and more unattractive, forcing companies to move.
DEMAND FOR WORK REMAINS STABLE OR GROWS: JOBS ARE ELIMINATED, BUT MANY NEW ONES ARE CREATED	Ambivalent – while there are many jobs, the effort required for adjusting to the changed labor demand, e.g. through advanced training, becomes greater.	Positive – as long as the people with the right skills are available in the labor market, the companies can grow in the market.
GROWING DIVISION OF THE LABOR MARKET	Negative – the labor market has more losers than winners, typical middle-class jobs are becoming extinct.	Ambivalent – less well-paying jobs might reduce domestic demand.
... VARIES FROM REGION TO REGION	Negative – the regional inequality of opportunities exacerbates the above-mentioned situation.	Ambivalent – companies in structurally weak regions with a regional orientation regarding the sale of their products or services are potential losers.

nario "Digital evolution in the federal competition." Here the political measures which are available at a municipal and state level range from subsidizing the development of the broadband network, to supporting the creation of clusters, and all the way to education and training initiatives for a successful regional economic policy – measures that lead to drastically different developments in the individual regions.

Figure 5 shows the viewpoints of workers and companies regarding the upheavals in the labor market in the different scenarios. The extent of these potential upheavals in the labor market of the future is shown in the left-hand column. The aspects of "general shortage of gainful work" and the development in the labor market (stable / positive labor demand and growing division of the labor market) are followed by a row which focuses on the regional differences.

Since this, too, contains potential for conflict between the major agents in the 2030 labor market, Figure 5 takes

another look at the situation, this time from the viewpoints of employees and employers. The subsequent discussion examines where the political agents – parliament and the government – might be called upon in the future in connection with this issue.

If we look at the interests of the two active parties that are directly involved in the labor market, we notice that compared to the previous sphere of action the interests are much less unambiguous and that the outlook is basically also less positive.

For workers, a decline in the labor demand and a polarization of the labor market has the greatest immediate, negative impact. Apart from a minority of workers with skills that are in high demand, the majority of workers are faced with cuts in income or even unemployment. A few companies may benefit from low labor costs, but in terms of the overall economy, these scenarios also contain the danger of declining demand. It is highly likely that politics will be forced to act regarding the 2030 labor market and that

it will have to come up with social and economic policies that counteract the shrinking and divided labor market. If parliament and the government do not want these developments to take them by surprise, they already should be looking for possible answers today.

The scenarios clearly point out this pressure on politics to act and turn the focus much more on the problem of providing social security than is typically done in the current debate. If the labor market no longer guarantees income and social security for the majority of the population in 2030, this will create an imbalance in all of society for which answers have to be found that also must be carried by all of society.

In view of this, the experts of the Foresight Lab reactivated almost forgotten, basic security concepts which have been considered unrealistic so far. In the scenario that was economically most successful, "Engineering nation with a heart," the concept of an unconditional basic income is even a rationally considered tool for social appeasement. Yet in this context the trimmed-down version of this solution, the "life opportunities budget"^{*} that is optimized such that it allows people to autonomously determine how to make their living, can certainly be reasonably expected to become part of a serious political debate.

The greatest pressure to take action concerning the upheavals in the labor market which we have discussed is on politics. In nearly all types of upheavals, employees as well as employers fail to take a clear stance, or the position – at least on the part of the employees – is very often a negative one. This constellation suggests that unions and workers' representatives either do not tackle the issue to begin with or that reaching a consensus is simply too difficult for them. But since these issues do require a solution, they will increasingly determine the political debate and force the parties to take a fundamental position.

With respect to the dimensions of potential developments of the labor market in 2030 which are listed in Figure 5, politics is confronted with two kinds of challenge. One concerns the shaping of the labor market itself.

Here two overarching questions can be formulated for which politics should prepare an answer:

- 1 How do you adjust the social security system to the new conditions?
- 2 What are the political answers which the divided labor market needs?
- 3 Since – as explained above – the labor market is at the very center of the issue of distribution within all of society, there are moreover challenges which confront the entire

political establishment with questions regarding their own ability to take action and their credibility.

4 Here, two concrete questions can be formulated as well concerning a pointed look at the consequences of digitization:

5 Considering the regional discrepancies, is it even possible to impose responsibilities which are applicable nationwide?

6 Does the division in the labor market entail a loss of trust in performance-based, fair participation?

* The life opportunities budget is a fictitious amount of money to which all citizens of full age are entitled once in their lifetime. Its purpose is to grant them a regeneration phase, a time for education, or a period that allows them to better reconcile life's various demands.

Rethinking training

When it comes to the challenges of the digitization of the economy for the labor market, people tend to automatically refer to the concept of lifelong learning. That this reflex is also much to the point regarding the 2030 labor market, is corroborated by the constant new technical requirements in connection with the organization of labor as well as the changes in labor demand, which are also a result of the technological transformation.

Our scenarios clearly reveal that the issue of training is a difficult complex of tasks for politics that can be handled in different ways.

Here we focus on continuing training in the course of the working life. Ever faster innovation cycles in the digital economy result in an ever shorter half-life of knowledge. Driven by digitization, this trend is going to further intensify over the next 15 years: workers will have to undergo continuing and advanced training throughout their working life in order to keep pace with technological progress.

In most scenarios, the responsibility for keeping abreast of developments primarily lies with the worker and secondarily with the company. In the scenario "Silicon countryside with social conflicts," training during one's working life is explicitly described as an investment in one's prospects for gainful employment. In "Engineering nation with a heart" it is a kind of entrepreneurial risk. While it is borne by the individual worker, the scenario also emphasized his or her

employer's commitment – for instance in the description of the workstation of the i-factory master, which was used as an example of this scenario.

In the scenario "Digital strongholds and disconnected hinterland," people who are employed in the digital economy profit from the training they receive in their work and their professional networks. Things are similar in the scenario "Digital evolution in the federal competition," where continuing and advanced training generally only takes place in the economically successful digital clusters. In connection with the new profession of online investigator, which was used as a typical example of this scenario, the importance of exchanging information in professional networks was pointed out as well. This exchange teaches workers about the latest developments and trends in the digital economy. It is a form of training that does not require any formal procedures which are put in place by the company.

In addition to this unanimous assignment of the primary responsibility to the workers, the significance of lifelong learning is also underscored by clearly identifying the losers in the 2030 scenarios, who all share the distinguishing feature of having been left behind in terms of their qualification. These are for the most part elderly employees and staff members in industry sectors where digitization has not played an important role so far. As digital outsiders, as it were, both groups have difficulty even recognizing the skills required in the digital economy, let alone acquiring

them. For the same reason long-term unemployed individuals and people with low qualifications who usually still perform manual work are in danger of being disconnected.

Figure 6 gives an overview of the training options in the 2030 scenarios during people's working life. As in the previous sections, they are scrutinized from the angle of the workers' as well as the companies' interests. In accordance with the focus of this publication on the impacts of digitization on the labor market, this examination will also be directed at the advanced training of technological skills.

The overview in Figure 6 shows that many workers will be left behind if the main responsibility for their training lies with them. The same, however, also applies to the situation where this responsibility rests with the company.

The concept of self-determined, lifelong learning works mainly for knowledge workers in the digital clusters. That advanced training is part of their work in interdisciplinary project groups goes without saying. They are used to constantly having to familiarize themselves with new software and other digital work tools. After all, they have their professional networks where they get help in acquiring new skills. For companies this is the most attractive option – but only if (as presupposed in the respective scenarios) employees actually do acquire the skills needed in their respective companies. Things become more expensive for businesses, but are also easier to plan, when the responsibility for digital skills lies with them. Contrary to the self-responsible training option, it is telling that here it

Figure 6: Distribution of interests of those responsible for training

Workers	Companies
WORKERS ARE RESPONSIBLE OF THEIR QUALIFICATION	<i>Negative – workers must use their own resources; moreover, workers outside of the digital business are often incapable of choosing the proper advanced training.</i>
COMPANIES ARE RESPONSIBLE FOR THEIR EMPLOYEES' TRAINING	<i>Ambivalent – workers in successful digital companies profit from advanced training programs, and employees outside of the digital economy have to pay for and organize the acquisition of the digital skills that keep them abreast of developments.</i>

Conclusion

is once again only workers in the digitized economy who benefit from this alternative, but this time primarily the salaried employees.

To make sure the disadvantaged workers can still keep up or catch up, government-paid advanced training programs will be needed in 2030. They will be confronted with the challenge of being flexible enough to keep pace with the technological changes while satisfying the needs of employees and employers. Companies will support greater government involvement as long as the measures taken satisfy their needs. The employees are therefore going to welcome more equal opportunities for those who have allegedly been left behind in the digital development.

Parliament and the government will have to accept this challenge. The big question is how these training programs are going to lead to the desired improved employment prospects. Generally speaking, those who are in charge of this at the political level will have to decide how market-oriented this broad-based training effort should be. On one end of the spectrum there would be a government agency for advanced training which develops and conducts the training on its own. Yet it would also be conceivable to give employees, freelancers, and job seekers a sort of "training voucher" which would allow them to look for those providers in the market which in their opinion are most apt to meet their needs. This, however, would require that the providers are certified in advance in order to ensure the quality of the training. Many alternative models are feasible between these two extremes.

Regardless of which approach is decided upon, it will be crucial to keep the model open. The need for training should be determined in an ongoing dialog with workers and companies and be satisfied as up-to-date as possible.

In conclusion, we can identify the following central questions as to how politics must deal with advanced and continuing education and training in the digital age:

- ① What is the institutional framework we need for broad-based advanced training under the conditions of rapid technological change?
- ② How do we make sure the advanced training offers are need-based and adjusted accordingly?
- ③ How can we best contribute the expert knowledge of companies, employees, and highly skilled professionals to the development of advanced training offers?

The digital transformation changes jobs and the labor market. This thesis was the starting point for our look at the 2030 labor market in the Foresight Lab. The upshot was six labor market scenarios with fitting jobs of the future. The scenarios do not predict the future. Rather, they should be regarded as sections of the future space of potentiality.

All stakeholders should examine these possible futures from a strategic point of view. After all, the strategic foresight conveys two significant insights. One, the future can be shaped – companies, workers, and politics have an impact on which scenario we are going to end up in in 2030. Two, it is possible to prepare for the future – central issues and spheres of action can be identified within all the different scenarios. We should start to deal with them right now. If we do that, future developments will not catch us unprepared and we can respond to any negative implications with counterstrategies early on.

The readers of this publication can draw their own conclusions from the scenarios based on their own background and interests. In our analysis and evaluation we focused on issues of actions which politics must take. Politics in particular is faced with the challenge of accompanying the digitization of the economy in such a way that the 2030 labor market allows for a society that offers equal opportunities. Our evaluation identifies two approaches which constitute the core of the social market economy.

On the one hand, politics must keep an eye on economic strength. After all, only a strong economy can offer good job opportunities. In this regard it is worthwhile to carefully examine the drivers which according to the present study lead toward the scenarios. On the other hand, the economy should be social. To this end, parliament and the government must deal with the strategic spheres of actions which have been identified with respect to forms of organization, development of employment, and advanced training.

We hope the Foresight Lab and the results presented here contribute to the discussion of the strategically important issues of the future.

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Appendix - Methodical details on the Foresight Lab

APPENDIX A: Preliminary questions on the scope of the digitization process

How will digitization change the work environment?

Since digitization is too comprehensive a notion, we will break down the question into the following technological developments: crowdworking, platform capitalism (sharing economy), Big Data, artificial intelligence and automation, 3D printing, and digitization-related technological developments that are not in our radar yet – what do these technological developments mean? What will the workplace of the future look like?

How will digitization change the companies?

Which skills will be upgraded and which ones downgraded, demand for which ones will increase or decline, how will collaboration change in the companies (hierarchies, attachments, outsourcing, new power constellations), where will productivity gains be particularly great?

How will digitization change the labor market?

What macro level trends can be derived from changes at the micro level? Where will new spheres of activity be generated and what will they look like? Which spheres of activity will experience pressure and be devalued or no longer needed? What do the macro trends mean in terms of employment and social policy?

What will digitization mean for different agents and stakeholders?

What are the opportunities and risks going to be for companies, workers, unions, administration, government, social policy, etc.?

APPENDIX B: Labor market and workplace in 2030 - an overall assessment

What question regarding the future of digitization would you put to an omniscient oracle?

Question to the oracle

Reason / background

Author:

What will be the most overestimated impact on/change at the (digital) workplace by 2030?

Subject / term

Reason / explanation / remarks

Author:

What will be the most underestimated impact on/change at the (digital) workplace by 2030?

Subject / term

Reason / explanation / remarks

Author:

What will be ANALOG at the workplace even in 2030?

Subject / term

Reason / explanation / remarks

Author:

APPENDIX C: Key factors - Labor market and workplace in 2030

Collection of key factors at the macro level (labor market) after the first workshop:

The lead question for this work step was:

Which factors are going to influence the future development of the 2030 labor market under the conditions of digitization?

In this context factors are to be understood as aspects which develop in different ways by 2030.

1. Digital infrastructure
2. Dynamics of digital technologies
3. Companies' capacity for transformation
4. Digital professionals
5. Lifelong learning
6. General insistence on analog technologies
7. New employment conditions
8. Economic regulation
9. Digitization and competitiveness
10. Social security
11. Capacity of the state to adapt
12. Polarization of the labor market
13. Intellectual property
14. Corporate culture
15. Human-machine interface
16. Culture of innovation
17. Services

Collection of key factors at the micro level (workplace) after the first workshop:

Our methodology experts distilled a total of 22 key factors from the focal points of the maps of topics which were developed together with the participants:

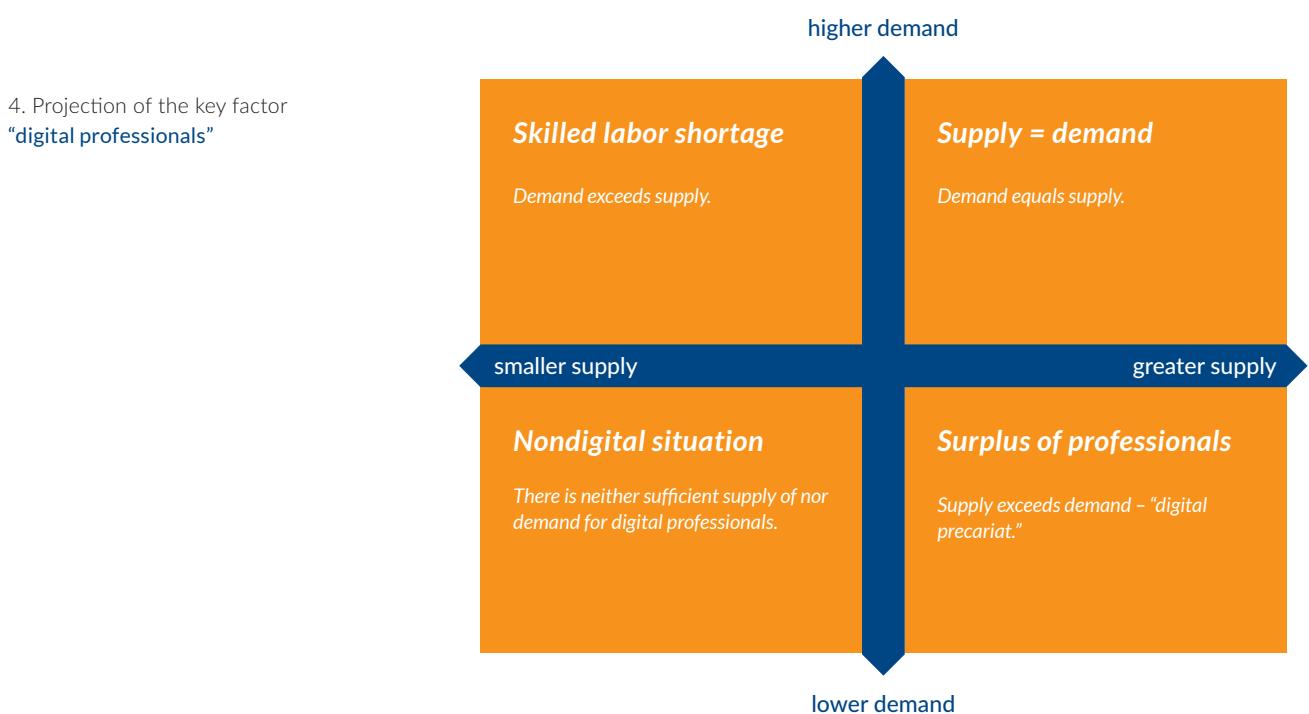
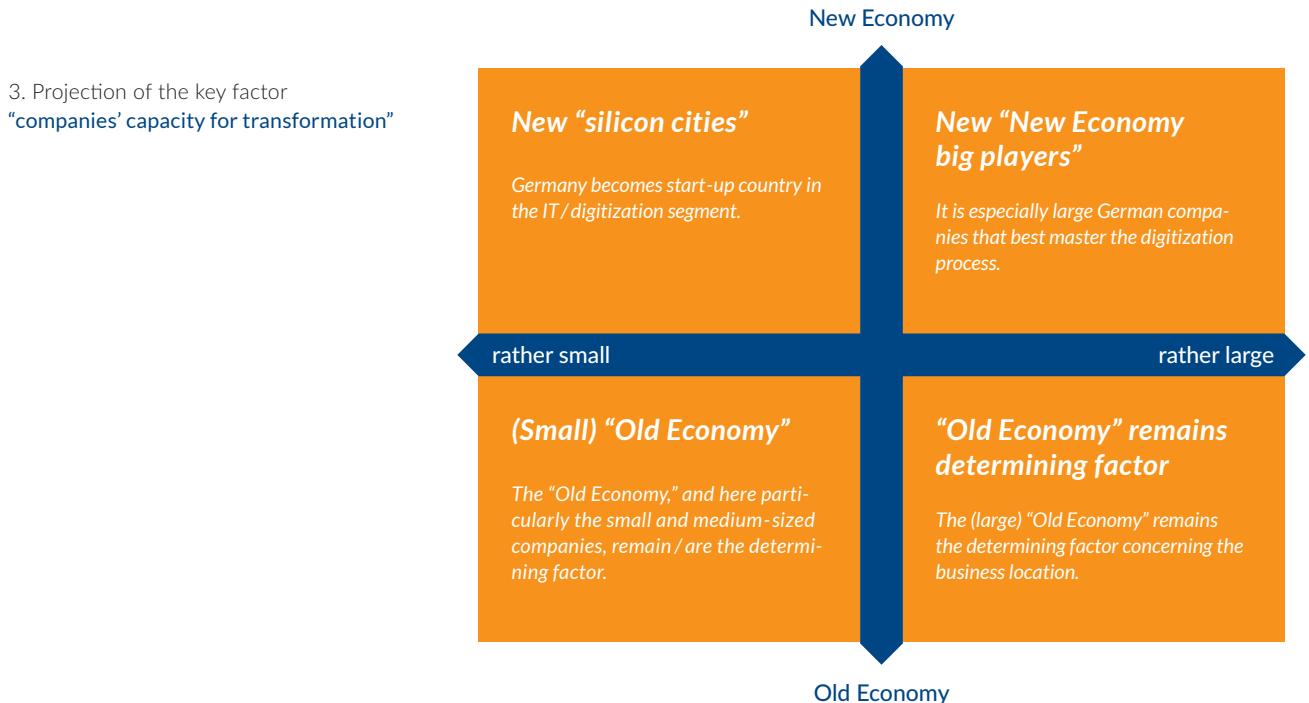
1. Speed, breadth, and depth of the digitization of the workplace
2. Speed of the digital transformation / pressure on the transformation (nationally and globally)
3. Change of the organization (new forms of organization / production in the physical and virtual space), degree of hierarchy / limits of organization
4. Development of efficiency – automation vs. downsizing in the areas of actual (Industry 4.0) and knowledge work
5. Acceptance of technology (by society and by individuals), also acceptance of innovation / of the changes
6. Technology design – support vs. (extreme) control
7. Change of value creation / adaption of business models
8. Individual organization of work (P2P vs. hierarchy)
9. Personal data environment / collection (data protection vs. power / control)
10. Organizational work culture – management / motivation / attachment to the company, co-determination in an entrepreneurial sense (concerning objectives and ways to achieve them)
11. Individual work culture (trust, social interaction)
12. Development of skills up to individuals (education, knowledge concerning digitization)
13. Development of skills up to organization (P2P integration, crowd, etc.)
14. Adaptation of work processes and / or business models vs. "blind copy"
15. Government regulation (less vs. more)
16. Human-machine relationship (complementary vs. substitutional)
17. Involvement of machines in decision-making (data quality / transparency / inevitability)
18. Social security at the digital workplace
19. Availability of interfaces (APIs)
20. Platforms / conditions of cloud working?
21. Responsibility for continuing training with employer or employee?
22. Compensation for flexible work

APPENDIX D: 2030 labor market - dimensions of the key factors

During the transition phase between the initial workshop on April 28, 2015 and the in-depth workshop on June 24, the project team developed so-called key factor projections for twelve out of the 17 key factors for the labor market. By combining features of several key factors, the previously 17 key labor market factors were cut down to twelve. Each of the twelve key factors was now expanded upon in four different so-called factor projections. These factor projections describe possible, different future projections of the same key factor.



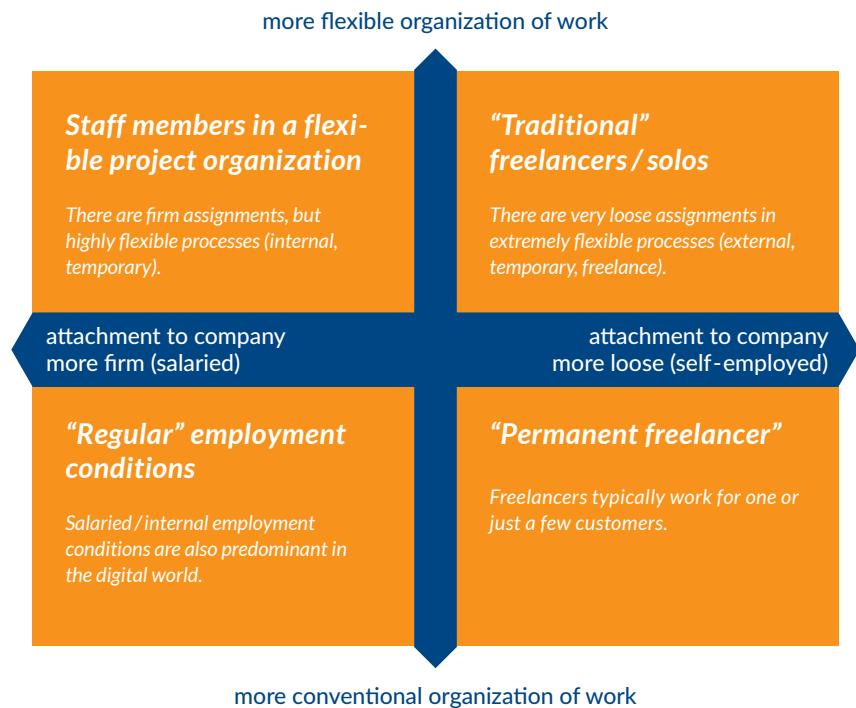
APPENDIX D: 2030 labor market - dimensions of the key factors



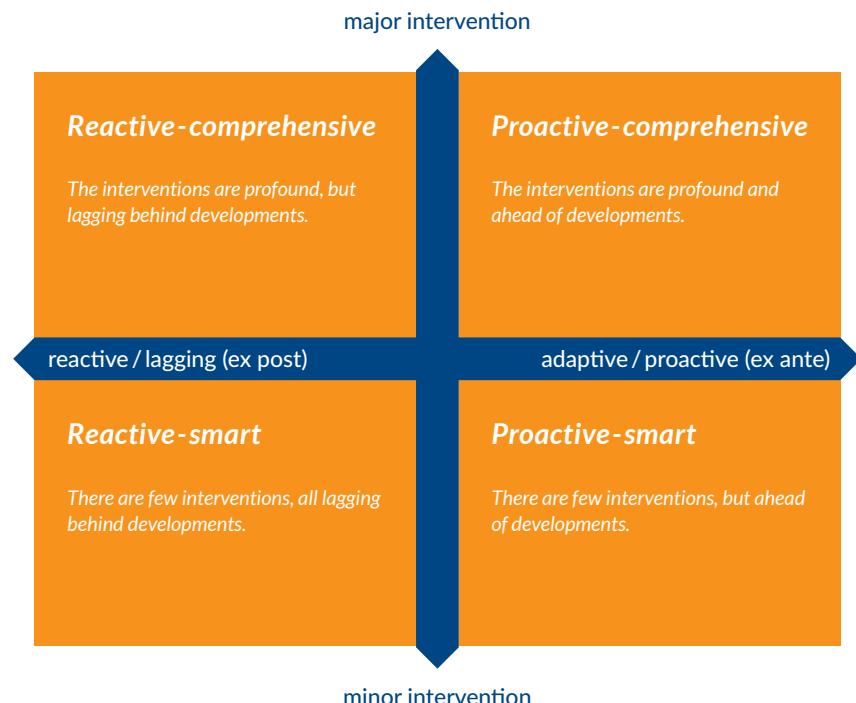


APPENDIX D: 2030 labor market - dimensions of the key factors

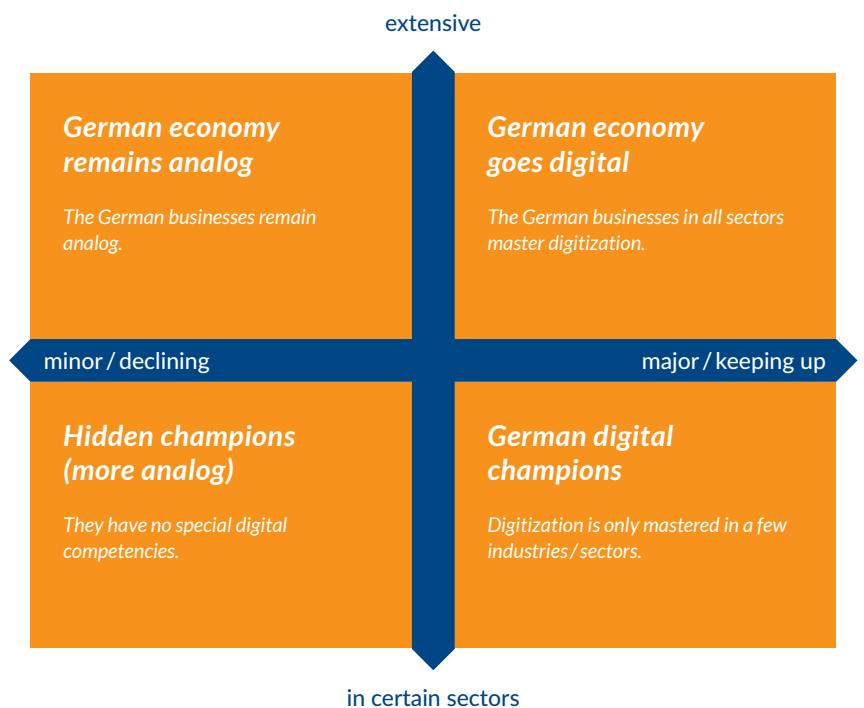
7. Projection of the key factor
“new employment conditions”



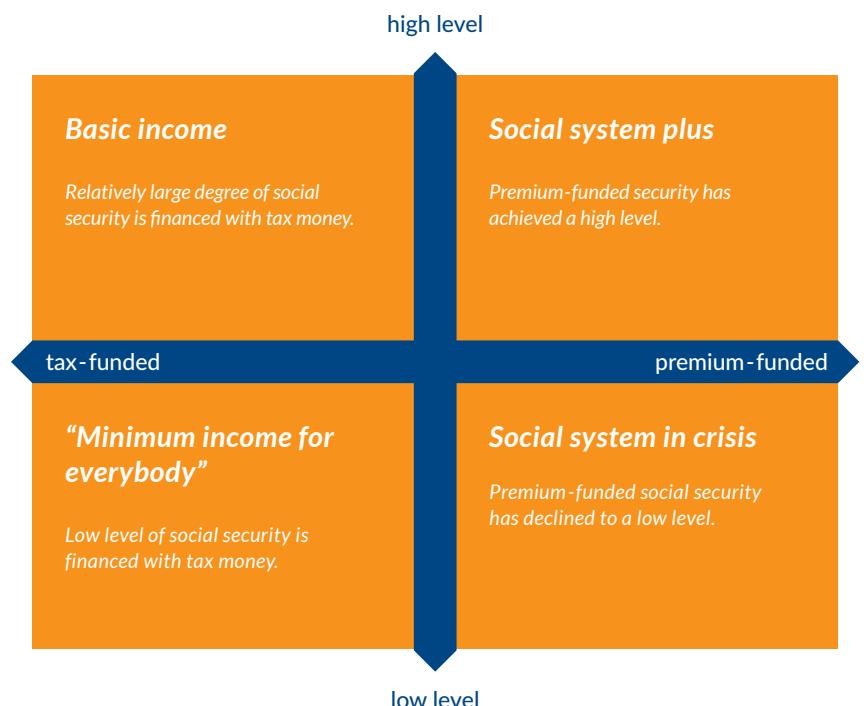
8. Projection of the key factor
“economic regulation”



9. Projection of the key factor
“digitization and competitiveness”

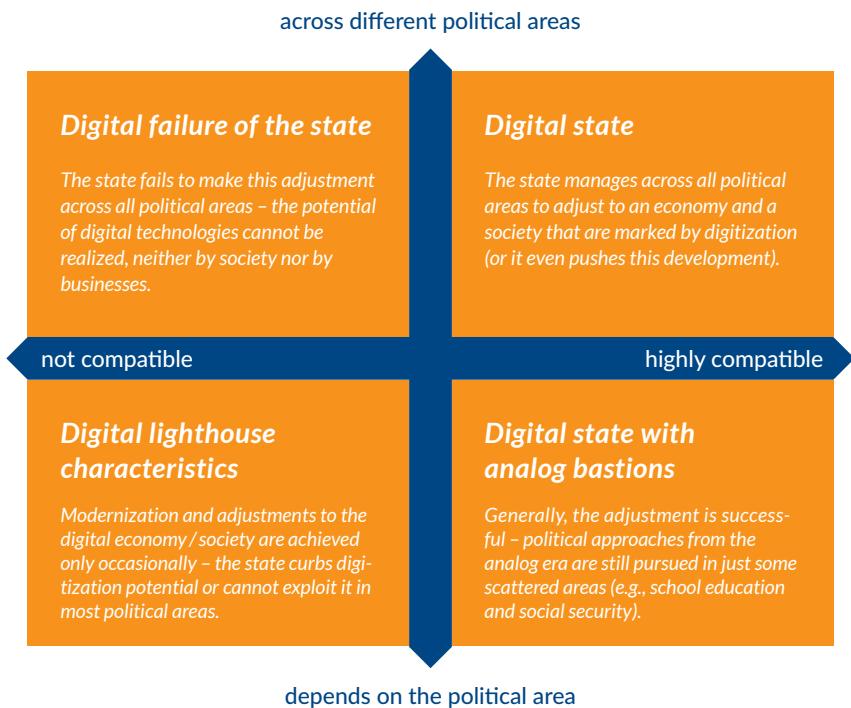


10. Projection of the key factor
“social security”

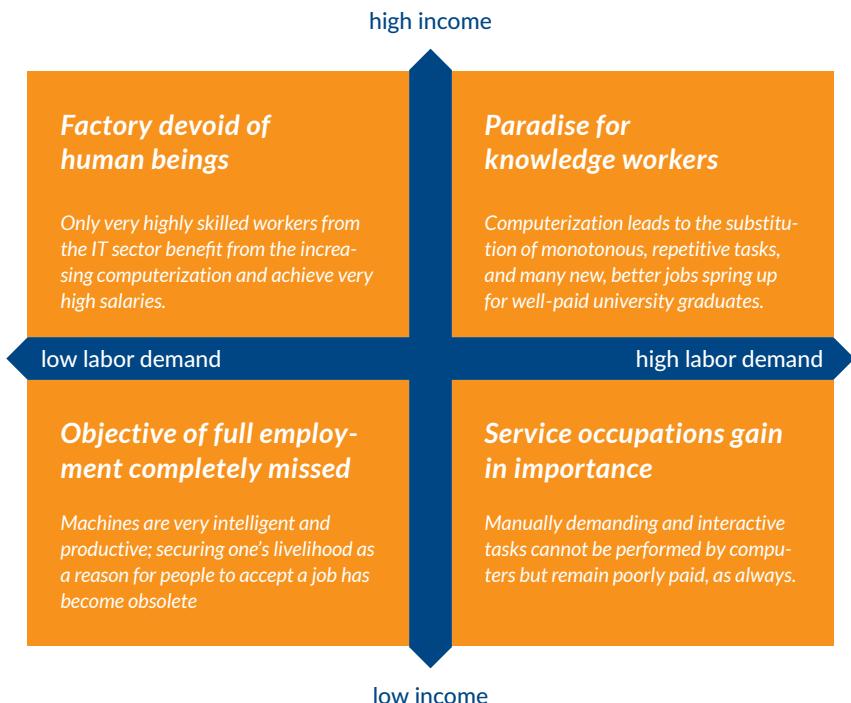


APPENDIX D: 2030 labor market - dimensions of the key factors

11. Projection of the key factor
“capacity of the state to adapt”



12. Projection of the key factor
“polarization of the labor market”



APPENDIX E: Consistency matrix

Scenarios

Question: How can future projection A (row) be compatible with future projection B (column)?

Assessment standard (consistency value)

- 1 = total inconsistency
- 2 = partial inconsistency
- 3 = neutral or mutually independent
- 4 = mutually conducive
- 5 = mutually greatly conducive

		"Copper country"	"Fiber-optic country"	Only "cable cities," hardly any "fiber-optic villages"	"Cable cities PLUS," the rest "fiber-optic villages"	Staff members in a flexible project organization	"Traditional" freelancers / solos	"Regular" employment conditions	Permanent freelancer"	Economy remains analog	Economy goes digital	Hidden champions (more analog)	German digital champions	Digital failure of the state	Digital lighthouse characteristics	Digital state with analog bastions	Knowledge workers	"Nerd caste"	"Knowledge day laborers"	"Nerd precariat"	
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	"Copper country"	1																			
	"Fiber-optic country"	2	1																		
	Only "cable cities," hardly any "fiber-optic villages"	3	2	1																	
	"Cable cities PLUS," the rest "fiber-optic villages"	4	3	2	1																
2	Staff members in a flexible project organization	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	"Traditional" freelancers / solos	2	3	4	5	2	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
	"Regular" employment conditions	3	4	5	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
	Permanent freelancer"	4	5	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
3	Economy remains analog	1	2	3	4	5	3	3	3	2	2	2	4	4	5	1	4	2			
	Economy goes digital	2	3	4	5	1	5	2	4	5	5	2	2	2	5	1	2	5	1	2	3
	Hidden champions (more analog)	3	4	5	2	3	3	2	2	4	4	4	4	2	4	2	4	3	4	1	2
	German digital champions	4	5	2	5	1	5	5	2	2	5	5	2	2	5	1	2	5	1	2	3
4	Digital failure of the state	1	2	3	4	5	1	3	2	2	2	2	4	4	5	1	4	2			
	Digital state	2	3	4	5	1	5	3	4	5	5	2	2	2	5	1	2	5	1	2	3
	Digital lighthouse characteristics	3	4	5	2	3	2	4	4	5	5	2	2	4	4	2	4	2	3	4	1
	Digital state with analog bastions	4	5	2	4	3	2	2	4	4	4	4	2	4	2	4	2	4	3	4	1
5	Knowledge workers	1	2	3	4	5	1	2	4	4	4	1	2	1	5	2	4	1	5	4	4
	"Nerd caste"	2	3	4	5	2	5	2	4	3	3	3	3	2	5	2	4	1	5	4	4
	"Knowledge day laborers"	3	4	5	2	3	1	5	2	4	3	3	3	1	5	2	4	1	5	3	4
	"Nerd precariat"	4	5	2	4	2	4	2	4	4	4	2	4	2	4	2	4	2	4	2	4

Exemplary consistency analysis
by a project team member

Appendix - Methodical details on the Foresight Lab

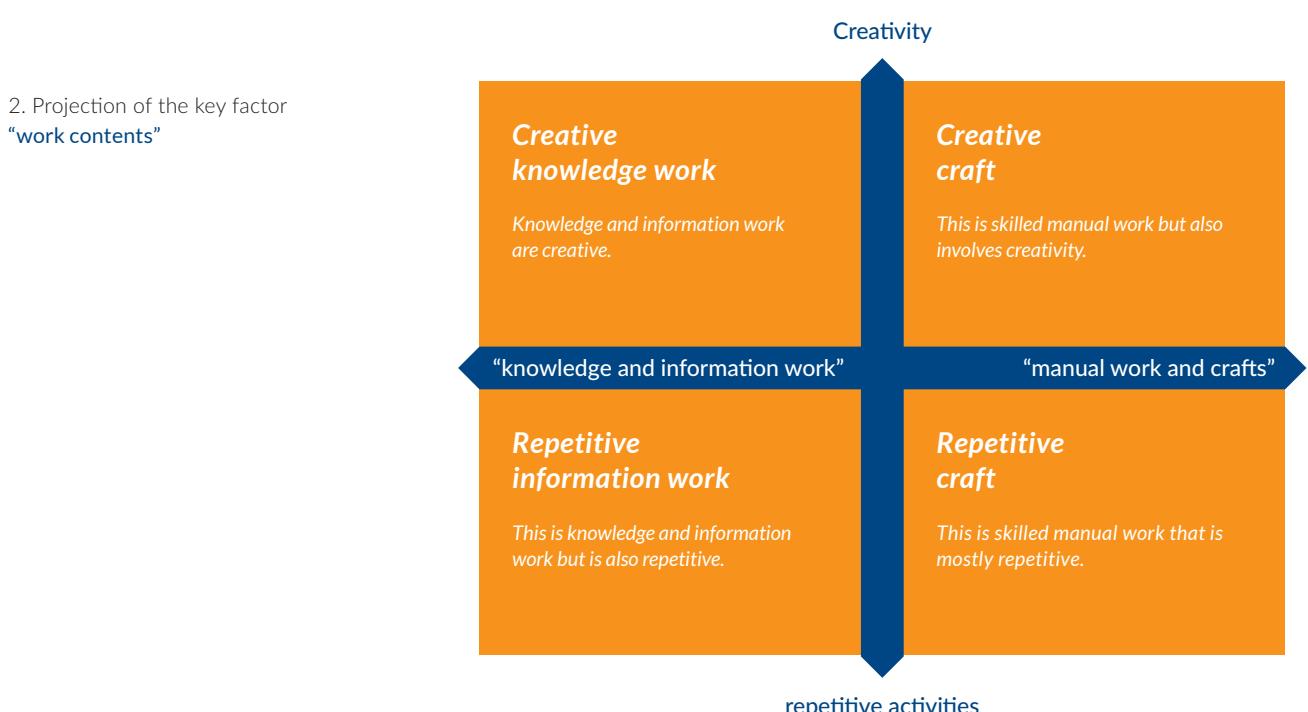
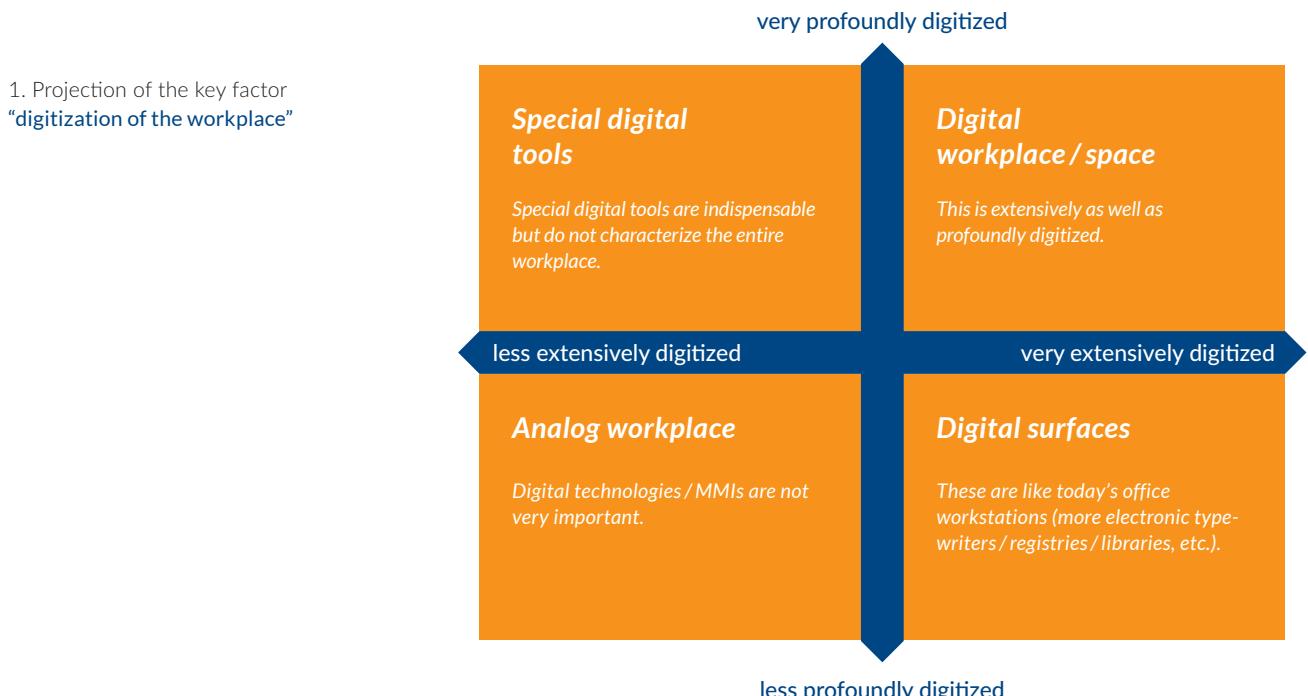
APPENDIX F: Scenarios with consistent key factor projections

When looking at the chart, please note that the values 0–100 were assigned by the project team. They describe the degree of consistency between the pairs of factors, with 100 signifying the greatest possible consistency between the respective factor pairs.

Overall presentation of the “consistency calculation”		Engineering nation with a heart	Silicon countryside with social conflicts	Rhineland Capitalism 4.0	Digital strongholds and disconnected hinterland	Digital evolution in the federal competition	Digital failure
Digital infrastructure	“Copper country”	0	0	0	0	0	100
	“Fiber-optic country”	80	40	100	0	0	0
	Only “cable cities,” hardly any “fiber-optic villages”	10	0	0	60	0	0
	“Cable cities PLUS,” the rest “fiber-optic villages”	10	60	0	40	100	0
New employment conditions	Staff members in a flexible project organization	60	30	25	0	0	40
	“Traditional” freelancers /solos	40	40	25	0	0	0
	“Regular” employment conditions	0	10	0	50	0	60
	“Permanent freelancer”	0	20	50	50	100	0
Digitization and competitiveness	Economy remains analog	0	0	0	40	0	60
	Economy goes digital	60	40	100	0	30	0
	Hidden champions (more analog)	30	0	0	20	30	40
	German digital champions	10	60	0	40	40	0
Capacity of the state to adapt	Digital failure of the state	0	0	0	20	10	80
	Digital state	75	50	100	0	40	0
	Digital lighthouse characteristics	25	20	0	10	20	20
	Digital state with analog bastions	0	30	0	70	30	0
Polarization of the labor market	Factory devoid of human beings	80	30	0	10	60	0
	Paradise for knowledge workers	20	50	25	10	40	0
	Objective of full employment completely missed	0	20	50	60	0	0
	Service occupations gain in importance	0	0	25	20	0	100

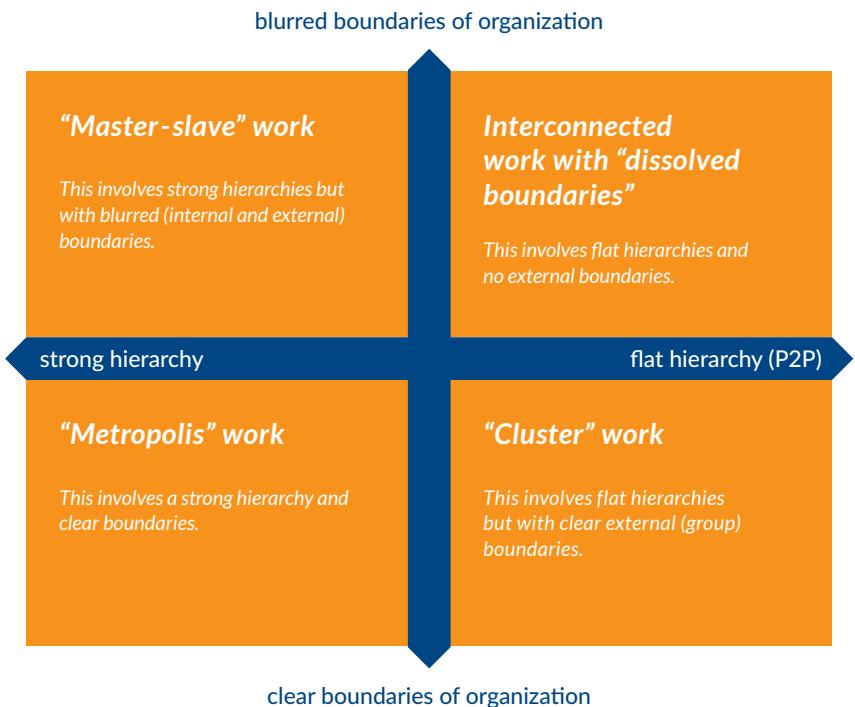
APPENDIX G: 2030 workplace - dimensions of the key factors

As for the description of the labor market, the project team established so-called key factor projections for nine of the altogether 22 workplace key factors during the transition phase between the initial workshop and the in-depth workshop. Here, too, characteristics were combined, which reduced the previously 22 workplace key factors to nine key factors. Once again each of the nine key factors was expanded by four different, so-called factor projections. These factor projections describe possible, different future projections of the same key factor.

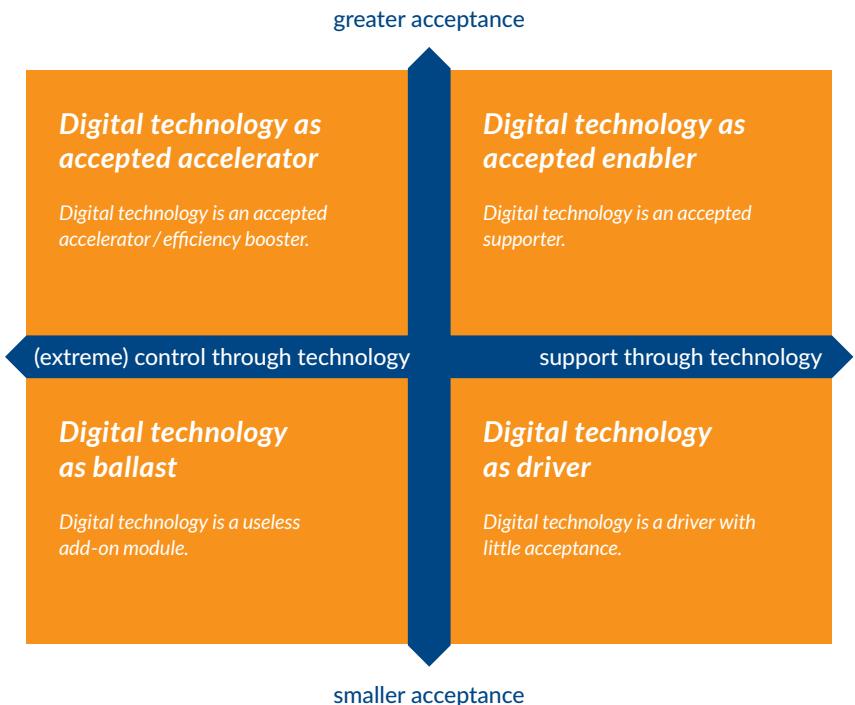


APPENDIX G: 2030 workplace - dimensions of the key factors

3. Projection of the key factor
“organization of work”



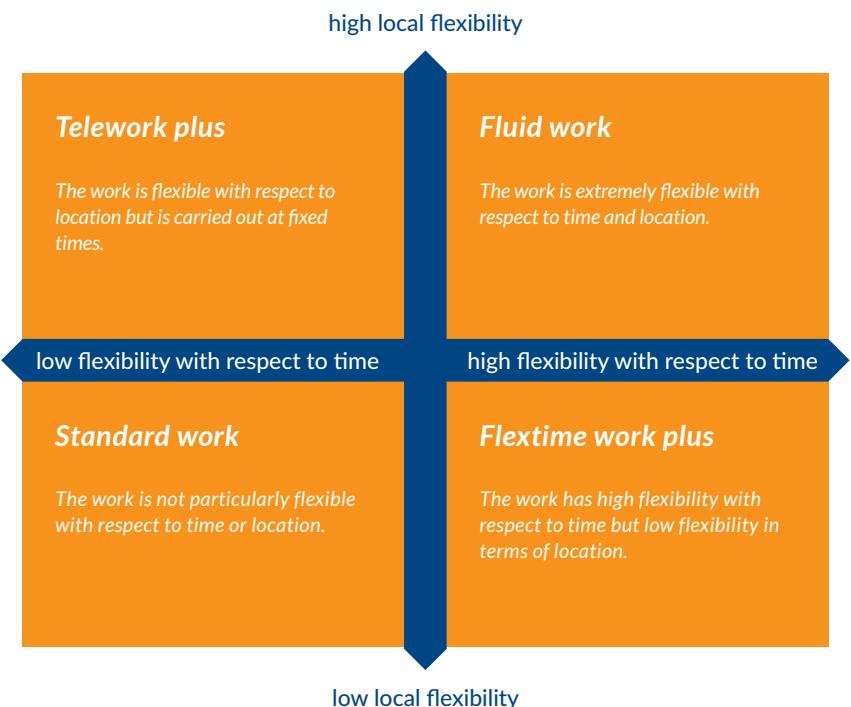
4. Projection of the key factor
“technology design”



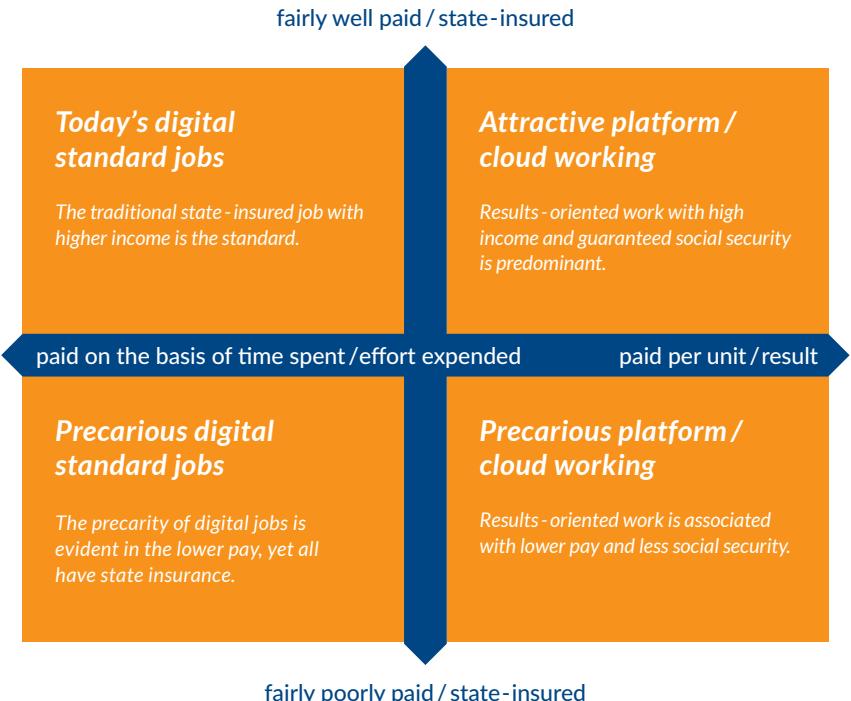


APPENDIX G: 2030 workplace - dimensions of the key factors

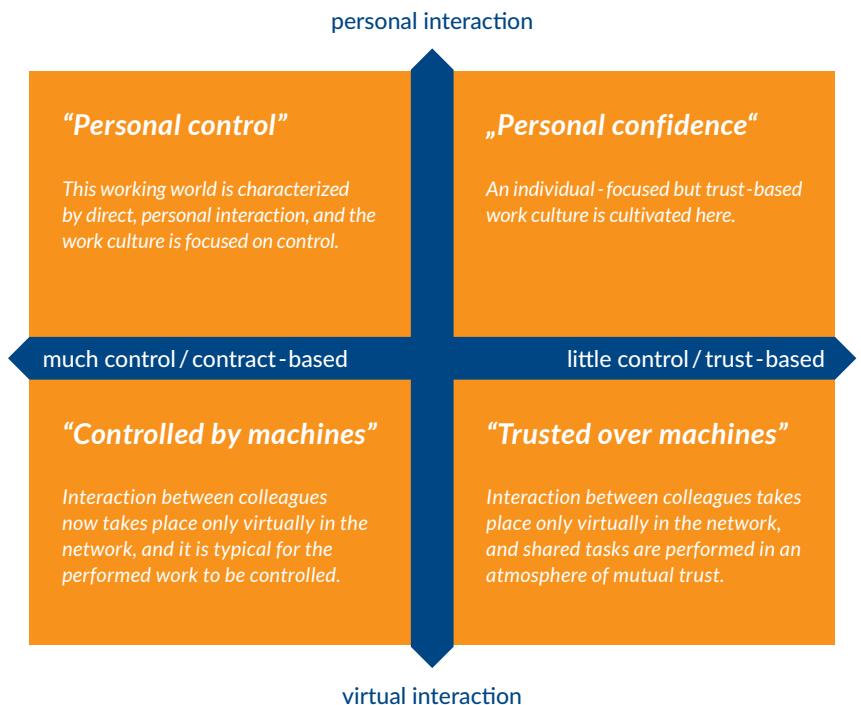
7. Projection of the key factor
"flexibility of work"



8. Projection of the key factor
"income / social security"



9. Projection of the key factor
“work culture”



Appendix - Methodical details on the Foresight Lab

APPENDIX H: Personal expectation scenarios

Our participants were asked to note their expectations regarding the digitization process in the labor market of the future using the assignment sheet below.

The lead questions were: *How would you characterize the labor market of the future (under the influence of digitization)? What do you expect? What qualities do you think this labor market will possess?*

The participants were asked to describe their expectations on the basis of the current state of the labor market:
"Compared to today, as a consequence of digitization, the labor market in Germany will tend to be ..."

Macro level: digitization and labor market

Scenario according to personal expectations
and outlook

Lead questions

How would you characterize the labor market of the future (under the influence of digitization)?
What do you expect? What qualities do you think this labor market will possess?

Answer

"Compared to today, as a consequence of digitization, the labor market in Germany will tend to be ..."

		today		
more liberal	x	x	x	more regulated
more global	x	x		more local
more dynamic	x	x		more static
more transparent	x	x		more untransparent
more competitive	x	x		more balancing
more polarized	x	x		more homogeneous
more unfair	x	x		more fair
more shaped by employers	x	x		more shaped by employees
more unsocial	x	x		more social
more open	x	x		more closed

Comments:

Name:

Assignment sheet on determining
the personal expectation scenarios

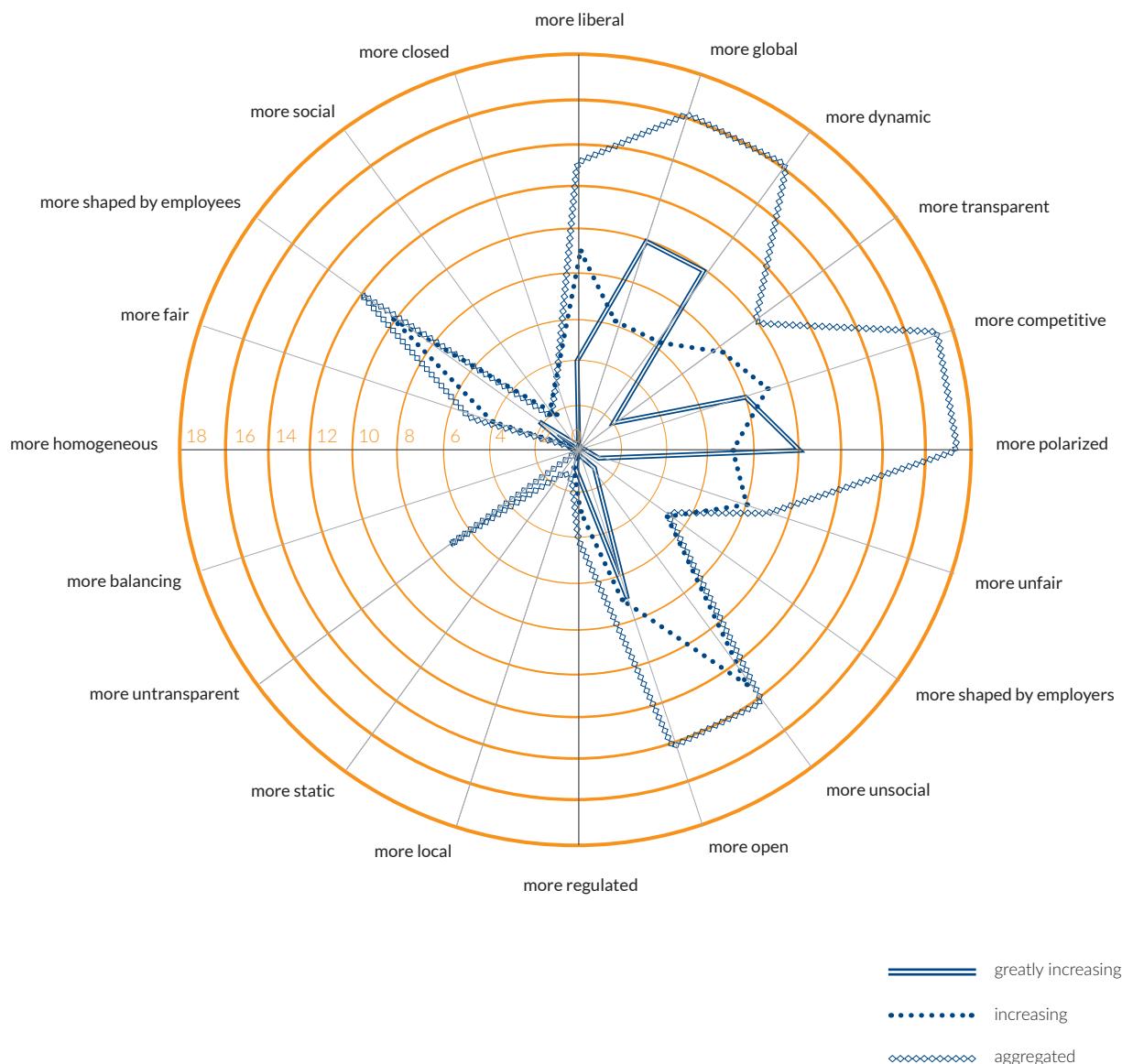


Chart showing the total personal expectation scenarios of the participant experts

APPENDIX I: Morphological box: Construction of the workplace scenarios

In the second workshop, the participants conducted a narrative morphological analysis to construct the workplace scenarios.

Micro level: Digitization and labor market

Name/designation of the job

Key factors	Descriptions			
1. Digitization of the workplace	special digital tools	digital workplace / space	analog workplace	digital surfaces
2. Work contents	creative knowledge work	creative craft	repetitive information work	repetitive craft
3. Organization of work	"master-slave" work	interconnected work with "dissolved boundaries"	"metropolis" work	"cluster" work
4. Technology design (DT = digital technology)	DT as accepted accelerator	DT as accepted enabler	DT as ballast	DT as driver
5. Value creation	new companies in old businesses	new companies in new businesses	old companies in old businesses	new businesses in old companies
6. Development of skills	self-learning professionals	company learning	training as needed	standard courses
7. Flexibility of work	telework plus	fluid work	standard work	flextime work plus
8. Income/social security	today's digital standard jobs	attractive platform/cloud working	precarious digital standard jobs	precarious platform / cloud working
9. Work culture	personal control	personal confidence	controlled by machines	trusted over machines

Exemplary paths through the morphological box

APPENDIX J: Specific job descriptions within the different labor market scenarios

So far the labor market and the workplace of the future have been considered separately from one another. In a last step, our participants therefore joined the two levels. To this end the descriptions of the workplaces were assigned to the different labor market scenarios. This led to plausible scenarios which describe six comprehensive but alternative futures of the German labor market in 2030 and constitute the final result of the second workshop:

"Engineering nation with a heart"

- i-factory master
- local package deliverer
- business model architect

"Digital strongholds and disconnected hinterland"

- local package deliverer
- i-factory master
- crowd manager
- online investigator

"Silicon countryside with social conflicts"

- business model architect
- accounting 4.0 – shared-service accountant

"Digital evolution in the federal competition"

- online investigator
- local package deliverer

"Rhineland Capitalism 4.0"

- crowd manager
- accounting 4.0 – shared-service accountant
- local package deliverer
- business model architect
- i-factory master
- online investigator

"Digital failure"

- accounting 4.0 – shared-service accountant
- i-factory master

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