Berlin Arbeit

Senate Department
for Labour, Integration
and Women's Issues

be Berlin

Work 4.0 – made in Berlin

Conference

Berlin, 14 December 2015

Conference Documentation

EUROPÄISCHE UNION
Europäische Strukturfonds
Investition in Ihre Zukunft

Strukturfonds in Berlin

* GABRIELE SCHLIPF 2015

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Conference Documentation
Work 4.0 – made in Berlin

14. December 2015, VKU Forum, Invalidenstr. 91, 10115 Berlin

Moderation: Mitri Sirin, Moderator und Journalist

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11.15 – 11.45	**Talk "Opportunities in a Digitalised World of Work"** Mayor and Senator for Labour, Integration and Women's Issues Dilek Kolat discusses with: › Ari Huczkowski, COO and Chief Innovation Evangelist, Espoo Innovation Garden, Helsinki; Finland › Dr Reza Moussavian, Head of Shareground, Deutsche Telekom AG, Cologne › Prof Dr Torsten Oltmanns, Partner Roland Berger Research and Communications,Berlin › Walter Riester, retired Federal Minister, Berlin
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11.45 – 12.15 ***Lunch and further time for exchange and networking***

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Background information and aims

On 14 December 2015, the Berlin Senate Department for Labour, Integration and Women's Issues hosted the "Work 4.0 – made in Berlin" Conference. Work 4.0[1] denotes a working environment that is becoming increasingly networked, digitalised and flexible with every passing day. As an innovative metropolis, Berlin was the ideal location to further the discussion concerning how this should be shaped in the future.

With the support of the senator, various expert workshops were held in the run-up to the conference covering the following topics: Service 4.0, Qualification 4.0, the role of start-ups, industry and research. The results of these workshops were fed into the conference. The aim of this well-attended conference – which attracted around 200 participants from both home and abroad – was to further the debate around Work 4.0 that had been initiated by the green paper from the Federal Ministry of Labour and Social Affairs. Another objective was to focus on the distinctive features of and challenges faced by major cities as shapers of the future world of work.

The conference brought together key political figures, experts, academics, social partners, companies and practitioners not only as a means of actively promoting mutual dialogue regarding these matters but also with a view to identifying some tentative courses of action and urgent priorities for Work 4.0 that could be fleshed out further in the course of 2016.

The changes that are likely to result from Work 4.0 played a major role at the conference, particularly those that will be shaped by social partners and politicians. For instance, discussions were held under the heading "Qualification 4.0" to consider the new requirements of the future and what Work 4.0 will mean for the poorly qualified and the long-term unemployed. Basic digital skills will have to be embedded in initial training programmes as well as continuing training modules as part of lifelong learning – an area that Berlin is particularly keen to address. During these discussions, it became clear that Work 4.0 currently throws up more questions than it answers, but also that the "live testing ground" of Berlin – with its mixture of a dynamic start-up scene, traditional industry and a well-developed service sector – provides optimum conditions for developing exemplary solutions. However, a person-centred approach is essential here because unless the needs of people are taken into account and unless people are fully on board, the benefits of technological innovations will only be achievable to a limited degree. For this reason and also because public discussions around Industry 4.0 tend to focus mainly on technological aspects, a further aim of the conference was to spark greater debate of issues such as fair pay/working conditions and work-life balance with a view to tackling these head on, i.e. actively shaping them.

[1] "Work 4.0" is an allusion to the four stages of industrialisation and refers to the impact that automation and digitalisation will have on the future world of work. However, in contrast to the "Industry 4.0" concept, it places the (working) human being right at the centre.
The role that people play in work processes is changing due to the networking of real and virtual objects and processes, and because of the interactions between different machines. Work 4.0 is a way of describing how greater digitalisation and flexibility in the area of work will not only change how labour is organised but also the associated working conditions and qualifications required.
(Here, we are talking about trends that will pose new challenges for policy making – although it is not yet clear what the future world of work will look like in detail.)

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During the plenary sessions and the talk, various tendencies were highlighted in relation to digital development: in the future, people's tasks are more likely to be a matter of supervising/monitoring than actually carrying out the work themselves; digital inclusion and open innovation are the catchwords for the ongoing shaping of the digital revolution. Education is becoming a lifelong process and, in the future, qualifications will have to be afforded the same importance as investments. Work processes are another area that is set to undergo reorganisation in the digital world and so the nature of employee participation in management decisions will have to be completely rethought. In addition, Economy 4.0 is transforming the labour market: digitalisation and automation are creating a fragmented world of work, employees are becoming entrepreneurs (e-lancers). This means that the social systems will also have to be adapted.

Work 4.0 was discussed in greater depth at four parallel workshops, each of which had its own special focus. As part of this, the spotlight was also placed on the specific circumstances of Berlin.

At workshop 1, "Technology and Employment: Automation, Digitalisation and Robotics", experts discussed the opportunities and risks associated with the use of robots and assistance systems. Making products is only one aspect of this. The area of service robotics was felt to be an opportunity for Berlin, but the need for further discussions around acceptance was also emphasised. Research into further applications was also felt to be necessary. Another topic covered was the platforms for the various services that are constantly growing in number. In this area, it was agreed that there is a need for discussions around transparency, quality and data security as well as employment relationships and working conditions. Emphasis was placed on the fact that although technical systems may take over routine tasks in the future, human labour will still be required, especially in situations where people are able to supplement the technical solutions and where human skills have a vital role to play. This is particularly true of personalised services, which are growing in importance.

At workshop 2, which was called "Impact on professional and private life: individual work-life balance and worker rights under flexible working conditions", it was suggested that Berlin might serve as a testing ground for new forms of work. The key priorities here are to define what "good work" will look like in the future and – as the shaping and development processes continue – to get all stakeholders fully on board, from the people beavering away at their laptops at the Sankt Oberholz café with its coworking spaces and entrepreneurial buzz right through to the checkout assistant at Lidl. Among the areas for action identified were the issue of control over working time – new kinds of flexibility can only be introduced in exchange for new forms of security – and the integration of labour market and structural policy. The participants felt that it was a matter of training up the works councils and getting them ready to help shape Work 4.0 at a practical level. They decided that this would involve looking at existing international models, such as the corporate training fund in Sweden or the buffer models found at Finnish companies, and applying the experience gained from these to ongoing development work.

Workshop 3 dealt with "Urban aspects of Work 4.0: cities as testing grounds for innovation? The example of Berlin". Primarily, this discussion focused on the particular challenges faced by large cities, particularly Berlin. It resulted in five core statements. Firstly, Berlin offers a highly distinctive ecosystem. In other words, the city has a special mix of young people, universities, urban culture, start-ups, industry and services; together, these provide a fruitful environment for development efforts as we continue to head towards Work 4.0. Secondly, digitalisation is essential in every sector – including administration. So that Berlin is able to maintain this thriving ecosystem and can also make it accessible to other (potential) employees, the third factor is the need for targeted initial and continuing training for local workers. It also became clear that digitalisation is not only reshaping the landscape in terms of the composition of the workforce but is also redefining the cityscape itself (soon to become apparent from the recently planned Zalando

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campus, for example). The fifth point, which is perhaps the most important one of all, is the assertion that – in principle – Berlin offers very good initial conditions for start-ups, although they must specialise so that smaller corners of the market are also catered for. Just like the start-ups, the cities (Berlin included) themselves must specialise by focusing on specific parts of the start-up community. In this way, they will be able to keep pace with global competition for highly sought-after specialists.

The key question to emerge from Workshop 4 "Qualification 4.0: New challenges and possibilities in initial and continuing vocational education and training" was how initial and continuing vocational education and training, qualifications and the education system itself could be adapted in line with the new requirements. Cross-company places of learning would have to be established, along with e-learning spaces at schools, universities and companies. It would also be a question of developing new digital forms of education and educational formats or enhancing existing ones. Various differentiated digital learning offerings were mentioned during the discussion and these included distance learning courses, MOOCs (Massive Open Online Courses), boot camps, (educational) apps and mentoring. These were said to represent a form of learning that is personalised, fun, guided by algorithms and portfolio-centred. Not only would there be a change in the methods of the dual system of vocational education and training (which combines study with a work-based apprenticeship) but also in those used by continuing vocational education and training schemes. New occupational profiles would arise and existing ones would change or be replaced. The exact nature of future leaving qualifications was also discussed, i.e. whether they should be more method-based or more competency-based. Whatever their final form, it was felt that a basic digital education would definitely have to be included. Another important issue for ongoing development work is inclusion. The process of getting educationally alienated groups involved in digitalisation as well as the more advantaged groups is a very important task. Berlin, in particular, intends to tackle this through pilot projects.

In summary, the conference brought together various thematic threads, which were enriched through the numerous discussions that had been held with stakeholders in advance. As a result, the conference served as a successful information-sharing platform. The wide conversation that has now begun and the available expertise must now be used as a springboard for asking the right questions as we continue our efforts around Work 4.0 and as we embark on shaping what it will look like. The idea is that Berlin will provide impetus and, at the same time, its special role within the process will crystallise.

Welcome and presentation of the "Work 4.0 – made in Berlin" process

Dilek Kolat – Senator for Labour, Integration and Women's Issues – introducing the attendees to the processes of change associated with digitalisation

In her welcome speech, *Dilek Kolat, Mayor and Senator for Labour, Integration and Women's Issues in Berlin,* highlighted the fact that digitalisation, automation and robotics are radically changing working life. Job requirements, forms of work and work conditions are already changing rapidly. There are hardly any jobs that aren't affected. She explained that these processes of change will be shaped from Berlin. The Senator referred to the 10-point agenda ("Berlin auf dem Weg zur digitalen Hauptstadt" = "Berlin en route to becoming the digital capital") by Governing Mayor Michael Müller as a major aid for shaping digitalisation. She pointed out that the opportunities and challenges that go hand in hand with technical innovations will affect all areas of the economy – not only industry. Even the services sector, which accounts for 85 % of jobs in Berlin and so is extremely significant for the city, will be increasingly affected by digitalisation. Berlin has a special role to play within this context: there is no need to set up artificial laboratories to research the future of work because Berlin is already a live testing ground thanks to its sheer diversity, from industry to a variety of service sectors to handicrafts. Consequently, it is well positioned to be at the vanguard of forthcoming developments.

She stated that an extensive conversation would have to take place before political policy could be used to shape the future of work (a future that is already well on the way in many areas). And she also explained that the aim of this conference was not just to exchange information and ideas but also to identify specific areas for action which can be worked on further. The senator emphasised the importance of setting one's sights on the opportunities and how important it is to place people at the heart of all the considerations. This is because technical innovations only have a future if they accompany social innovation and if people are fully on board.

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In her presentation, she mentioned three major areas where Berlin wants to be at the vanguard by running pilot projects. In order for qualifications to be shaped from Berlin, modular offerings will have to be designed for the dual training system and continuing vocational education and training programmes for employees. To help ensure that the digitalisation process is properly backed up academically, a chair for "Arbeitsforschung 4.0" ("Work Research 4.0") is to be established. With her third point, the senator affirmed that the live testing ground of Berlin offered the best possible conditions for bringing together working people and innovation. She said that it would be difficult to think of anywhere else where you could find a dynamic start-up scene, a vibrant research landscape, well established industrial companies and a strong services sector all located in such close proximity to one another. The important thing is to learn from one another. With this in mind, she outlined how it would be necessary to create meeting spaces for stakeholders from the academic and economic worlds as well as the people who will ultimately be working with the technical innovations.

Ms Kolat explained that the Senate Department had already opened up the conversation before the conference, a conversation that first began back in spring 2015 when the "Work 4.0" green paper was published by the Federal Ministry of Labour. A number of workshops and individual discussions with experts provided an opportunity to swap information and ideas about various key topics. For example, a discussion focusing on services was held to consider how productivity gains could be harnessed to improve working conditions. The special feature of service sector jobs is that the person is the main focus.

In terms of qualifications, consideration was given to how the leeway afforded by training regulations could be systematically utilised as a means of integrating digital competencies and how continuing vocational education and training offerings for employees would have to change. It is important to consider vocational teachers, trainers, and job seekers from the outset. According to the senator, there is one thing that cannot be allowed to happen: the emergence of a digital divide between those who have mastered digital technologies and those who are already at a disadvantage.

In order for priorities to be set from Berlin in relation to these aspects (and the others addressed in the course of the conference) she explained that specific areas for action would have to be defined. And also that it is important to adopt an interdisciplinary approach when addressing issues associated with the working world of tomorrow instead of having all the stakeholders working on partial solutions on their own. The aim here is to turn Berlin into a smart city of "good work" – or as Michael Müller put it: Berlin is "smart, but sexy."

Ms Kolat concluded by thanking the attendees, wishing everyone an insightful conference and deep and stimulating dialogue, and inviting all the participants to work together on this future-oriented topic in the future.

Using the opportunities presented by digitalisation – developing Berlin as the "city of work"

Björn Böhning, Head of the Senate Chancellery, explaining Berlin's ambition to be the leading smart city

In his role as *Head of the Senate Chancellery, Björn Böhning* was at the conference filling in for the Governing Mayor of Berlin, Michael Müller. He began his presentation by stressing that there was a duty to shape how the world of work was being transformed by digitalisation. He explained that it was not just corporate cultures that were being transformed but also the areas of initial and further training. The basic principle that should be followed when shaping "Work 4.0" was that of "good work". The Head of the Senate Chancellery then went on to say that businesses would have to create real value and that work would have to be shaped so that people could make a living from it. After all, one element of "good work" is dignity – and this would have to be preserved in the future.

He said that Berlin was the "city of work" and that it was also a growing city. Investments in the sciences and culture had starting paying off in Berlin several years ago and this was reflected in the vibrant start-up scene, for example. Not only that, but high-tech was also set to become a key locational advantage. Nevertheless, this could not be left to run on automatic pilot but called for a high level of commitment. He asserted that it was Berlin's ambition to be the leading smart city and to find intelligent solutions. What people wanted were solutions that would help them in their daily lives. In addition, the buzzword "smart city" would have to be made tangible in their everyday lives. He also emphasised that the jobs created by digitalisation would have to be created in Berlin.

He explained that this was why 30 new IT professorships were to be established – one of which would focus on "Work 4.0" – as part of the 10-point agenda set out by the Governing Mayor of Berlin, Michael Müller, and the President of Technische Universität Berlin, Professor Christian Thomsen. Moreover, a visiting fellow programme was being planned so that excellence in digitalisation could be increased within the city. In addition, the 10-point agenda included plans to make Berlin the first European city to serve as a testing ground for the new 5G mobile technology by setting up test zones there. He said that this – coupled with the idea of having a CityLab where creative types and users of digital technologies could meet – was an important step in helping Berlin to set the pace of the digital revolution. Mr Böhning also cited the area of qualifications as another key factor for making sure that the

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city kept up with digitalisation. He said that digital skills would also have to be developed within the public sector – the largest employer of all.

In his view, it was important to shape the changes by creating general conditions at a political level that could then be implemented concretely within businesses. However, it was essential not to neglect the possible risks. As examples, Mr Böhning cited issues around control over working time and greater flexibility. For instance, care would have to be taken to prevent virtual work demanding that people be available anywhere and at any time. He stressed that laws conducive to a humane world of work would not just drop out of the sky. Rather, improvements would have to be introduced gradually with a view to humanising the world of work – including, and in particular, at small and medium-sized enterprises and start-ups. There were already 60,000 people working at start-up companies and these young businesses would have to be properly overseen. He added that young companies – specifically – were failing to deal with issues such as training or works councils right from the start. Conversations would have to be held with academics and social partners to raise awareness and develop the necessary understanding of these issues, because – ultimately – these young businesses are the ones that will decide the future of work.

Digitalisation and automation are not just affecting traditional companies, but also Berlin's vibrant start-up scene, which already employs 60 thousand people. He thanked the senator for taking the initiative to organise the conference with the aim of creating more job opportunities and "good work".

Talk "Opportunities in a digitalised world of work"

Ms Kolat in action during the talk

Dilek Kolat, Mayor and Senator for Labour, Integration and Women's Issues in Berlin, spoke to company representatives and experts to discuss the opportunities available in a digitalised world of work.

Frau Kolat talking to Dr Reza Moussavian: Consumers are becoming "prosumers"

Dr Reza Moussavian, Head of Shareground at Deutsche Telekom, surveyed 70 experts from around the world about the working world of tomorrow as part of his study on "Work 4.0: Megatrends in digital working of the future". In his remarks, he described how people would go from actually carrying out the work themselves to supervising/monitoring operations and controlling production processes. In response to Ms Kolat's question about what this would mean for Germany's dual education system (which combines study with a work-based apprenticeship), he replied that basic digital skills would have to be integrated into each and every training course. He also identified digital inclusion as a key trend: for example, it might be possible to separate the work done by people from the production site so that their presence was no longer actually required at the factory. In this way, people with restricted mobility would become more attractive to the labour market, for instance, and fresh employment potential would be created for new groups. According to Dr Moussavian, machines do not discriminate when it comes to choosing employees.

He also mentioned how the role of consumers is changing as they become "prosumers", i.e. get involved and actively participate in development processes. Virtually half of all innovations are attributable to this kind of open innovation that relies on contributions from consumers. Ms Kolat rounded this off by commenting that meeting spaces will be required for this to work.

Dilek Kolat interviewing Walter Riester: New forms of participation must be found when it comes to shaping the world of work

The interview with *Walter Riester, retired federal minister,* revealed that an intensive discussion was already raging 30 years ago concerning what qualifications were required. Even back then, it was felt that qualifications were lagging behind investment. As far as Riester was concerned, some of the main issues were: how can continuous education be ensured and how can – for example – collective bargaining agreements respond to changing requirements in the area of qualifications. He said that these challenges had now become much more urgent: qualifications would have to become an ongoing task and be afforded the same importance as investments.

Another trend that Mr Riester identified was the growing tendency towards lean production processes, which involve reorganising work processes. He said that small to medium-sized enterprises, in particular, were under intense competitive pressure in this respect, because countries such as Japan were achieving higher levels of added value than Germany in areas like electronics. By contrast, Germany would have to focus on qualifications. More and more, machines are now communicating with products. Humans are needed to control these processes and must have special qualifications to equip them for this.

One of the core tasks of politicians will be to adapt the social systems to the changes in the labour market brought about by Industry 4.0. Aside from this, Mr Riester cited employee participation in management decisions as another key issue. For instance, the business world had long been against changes to the regulations governing industrial relations. He stressed that it was not just a question of introducing more participation – as demanded by the trade unions – but of introducing new forms of participation in view of how the world of work was also undergoing fundamental changes. In this regard, new ways of participating would have to be found by all working together.

Ms Kolat asks Ari Huczkowski about his experiences with "Work 4.0" in Finland.

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Ari Huczkowski, COO and Chief Innovation Evangelist at Espoo Innovation Garden, a Finnish innovation centre, brings a European perspective and reports about the Finnish debate about "Work 4.0." One trend that can be observed in Finland is a fragmentation of the labour market. Ever more employees are becoming entrepreneurs, working for various clients as "e-lancers" or becoming employers themselves. In Finland, so-called "buffer companies" exist which provide social security during the transition between employment and self-employment.

In addition, he reported, education as a lifelong process is central to the Finnish discussions. For example, studying is a highly digitalised process, and it is possible to learn from the best through e-learning platforms. This creates competition for good education, which forms the basis for innovation.

Frau Kolat talking to Professor Torsten Oltmanns: Management is phasing itself out

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Professor Torsten Oltmanns, partner at Roland Berger Ltd. and leader of Practice Group Executive Communications, was asked what everything said so far would mean for Germany's dual education system (which combines study with a work-based apprenticeship). In response, he said that it was becoming increasingly important to learn how to adapt to changing general conditions. This was something that was not happening in the case of many existing courses of study. Therefore, the dual education system would also have to be expanded to include digital skills and would have to be updated continually.

According to Professor Oltmanns, management is phasing itself out at good companies. This is resulting in leaderless companies because processes are capable of organising themselves. As a result, what we need is qualifications that can be adapted. The trend is towards having fewer employees and buying expertise in from outside.

Summary of the talk

The thread running through the talk chaired by Senator Kolat was that people's roles and tasks are going to change. The main opportunities lie in the areas of digital inclusion and open innovation. In the future, people's tasks are more likely to be a matter of supervising/monitoring than actively carrying out the work themselves. In particular, it will be necessary to reshape social security and the nature of employee participation in management decisions. One of the key challenges identified during the talk was the need to update knowledge and qualifications continuously due to the reorganisation of work processes.

Outlook concerning the future of work in cities – considerations from the Work 4.0 green paper

Thorben Albrecht, Permanent State Secretary at the Federal Ministry of Labour and Social Affairs: In Berlin, there are already lots of signs of digital developments happening

In his presentation, *Thorben Albrecht, permanent State Secretary at the Federal Ministry of Labour and Social Affairs (BMAS),* made it crystal clear that the digital revolution is no longer something that is on the distant horizon, but is happening now. He explained how the business world had once had a sense of being one step ahead and was able to re(act) autonomously. Now, though, lots of new developments were all happening at once: digitalisation, automation, crowdsourcing and clickworking are changing how people work and live at lightning speed. Not only are new markets being created, but also new working conditions.

State Secretary Albrecht said that Berlin was a key "driver" of Work 4.0 and that the digital revolution was already a reality in the city: a new start-up is born in Berlin every 20 hours, with one in eight people now working in this area. Both Microsoft and Deutsche Telekom have singled out Berlin as the location for their innovation centres.

Mr Albrecht stated that the debate around the increased use of technology is revealing associated risks as well as opportunities and that technology is a source of hope as well as fear. Within this context, Mr Albrecht also considered the question of whether digitalisation would result in more or fewer jobs. According to some studies in the USA, digitalisation poses a threat to half of all jobs. By contrast, work by the Institute for Employment Research (IAB)[2] indicates that although the tasks involved in the vast majority of occupations will change, the jobs themselves will remain.

He asserted that the revolution would also create potential benefits for employees. For example, life could be made easier for them by automating dangerous tasks. In addition, it would be possible to create age-appropriate working conditions for an ageing population and opportunities for inclusion. However, Mr Albrecht was also keen to stress that the digital revolution is not on automatic pilot. Rather, it must be actively shaped and geared towards the concept of "good work". Therefore, the general conditions will have to brought into the centre of discussions because digital

[2] Dengler, Katharina; Matthes, Britta (2015): In kaum einem Beruf ist der Mensch vollständig ersetzbar. (There is virtually no job where people are fully dispensable.) IAB Kurzbericht Nr. 24 (IAB summary report no. 24), Institut für Arbeitsmarkt- und Berufsforschung, Nuremberg.

work must also be "good" digital work. He explained that this was why the issue of general labour conditions was also considered a key factor by the Ministry. After all, flexible working time models, extensive worker protection and stable working conditions will continue to be an important part of social security in the working world of tomorrow. The conversation around "Work 4.0" that had been kick-started by the Federal Ministry of Labour and Social Affairs would highlight the different perspectives of experts so that these could be incorporated into its work. He then went on to say that there is no room for one-size-fits-all solutions in a working world that is becoming increasingly differentiated.

He highlighted qualifications as another area that is going to grow in significance. The State Secretary made a strong case for ensuring that qualifications receive even more funding and support from government bodies. As an example, he said that the Federal Employment Agency could play an important part in shaping the future world of work as the federal agency with responsibility for employment and qualifications. This would be particularly important in light of how flexible forms of employment are going to impose new requirements on social security arrangements. At the same time, it would be a question of gearing the ongoing development of further training programmes towards the future because the digital transformation of structures is another reason why qualifications for employees and job seekers are set to become even more important. However, professional development offerings and advice should also be made available to people while they are actually in work.

Furthermore, it would be necessary to devise innovative models because of increased flexibility and the blurring of boundaries between home and work. In order to successfully shape the digital revolution in all its diversity, the priority would therefore be to respond differently across different sectors and professions. He stressed that flexibility is not just a matter for employees but also for employers. Businesses need flexibility and employees need freedom; therefore, compromises will have to be negotiated. He pointed out that (compared to other countries) Germany has some catching up to do in this respect – for example, only a third of companies actually allow their employees to work from home. According to Thorben Albrecht one thing that makes Berlin stand out is the high percentage of working women. He said that they were helping shape the digital revolution while at the same time calling for equal opportunities and a good work/life balance, responsibility for which lay with the companies. However, he claimed that platform business models – in particular – often evaded their responsibilities as an employer. In this sense, the rights that are designed to protect employees must not be allowed to fall by the wayside. Similarly, greater security must be provided for new forms of work and new kinds of employment relationship. As an example, he cited the sole traders who work on their own as self-employed persons, e.g. graphic designers. This is particularly applicable to Berlin, which has twice as many sole traders as the national average.

According to Mr Albrecht, general regulatory conditions and protective rights that affect both employees and employers alike will still be required in the future. To ensure success in this area, established businesses, start-ups, social partners and politicians would all have to talk to each other and show a mutual willingness to shape events. In addition, the existing structures and security systems would have to be examined to see if they were still up to date and whether they could be applied to new employment relationships. All in all, the conversation would ultimately be a pan-European one. Mr Albrecht concluded by saying that Berlin was a good place to observe the dawning revolution because there were already lots of signs of digital developments happening there.

Moderated talk "The challenges of Work 4.0 in metropolitan regions"

Panel members sharing their views at the talk about the challenges of Work 4.0 in metropolitan regions

The aim of this chaired talk was to shed light on the challenges of the digitalised world of work at various levels (society, academia, business and politics) and by looking at them from different sides and angles. The panel was chaired by Mitri Sirin.

Dilek Kolat, Mayor and Senator for Labour, Integration and Women's Issues in Berlin, began the talk by emphasising how pleased she was to see new jobs being created in Berlin as a result of digitalisation. She went on to say that she would be even happier if jobs with good working conditions could be created because people must always be kept firmly at the centre. She stated that many people could no longer imagine doing a day's work without recourse to digital technology because digitalisation has already become a reality in the working lives of lots of employees. However, she also pointed out that the increased use of technology is also a source of fear for companies and employees because they are unsure of the impact. She explained that although the technological revolution had made Berlin more flexible, mobile and diverse it had also made it more complex. This has resulted in opportunities as well as risks: New working time and employment models have enabled employees to work more flexibly but have – at the same time – made many people worry about whether they might lose their jobs. As a result, it is necessary to hold an open dialogue with company managers and employees within the company and to offer them a chance to develop their skills through qualifications. With a view to promoting "good work", Berlin successfully ran the "Warum Minijob? Mach mehr draus!" ("What's the point of a low-paid part-time job? Get more out of it!") campaign, which was sponsored by her department. She said that similar campaigns would be required to facilitate convergence between digitalisation of the workplace and "good work". As an example, she cited the problem of Internet-based platform business models, which despite creating new jobs do not necessarily offer ideal employment conditions. As a result, attention would have to be paid to drawing up a set of criteria that everyone could agree on, one of these being that everyone should be able to make a living from their work. This is the only way for Berlin to become the capital of "good work".

The Senator for Labour explaining her vision for Berlin

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To enable research into the impact that digital innovations will have on work, people, qualifications, society and politics, she disclosed that a new professorship for work research was to be created at Technische Universität Berlin in cooperation with the Federal Ministry of Labour and Social Affairs. Within this context, the senator drew attention to the expert workshops that had taken place in advance of the conference. She explained that these had revealed the importance of collaboration between academics and practitioners.

In order to respond to the challenges of Work 4.0, close cooperation between employers and employees would also be required. She highlighted how working conditions were already being jointly shaped at some companies by ensuring transparency and providing employees with opportunities to have their say. Rather than merely reacting to work and employment-related changes after they have occurred, everyone should be working together to shape them proactively. She clarified that this was the reason why Berlin aimed to develop a qualifications model that would meet the challenges of digitalisation head on.

The senator said that she regards Work 4.0 as an opportunity to get more people into employment – even people with less favourable life chances can benefit from digitalisation if, for example, new routes into learning are opened up by making learning fun instead of relying on traditional "talk and chalk" methods. Ms Kolat explained that in order for this to be achieved we would have to actively shape developments and get people fully on board. She claimed that Berlin could become a source of good practice models and ground-breaking messages.

Professor Sahin Albayrak compares Berlin to San Francisco

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Professor Sahin Albayrak from Technische Universität Berlin, holder of the professorship in Agent Technologies in Business Applications and Telecommunication (AOT) and founder and head of the Distributed Artificial Intelligence Laboratory at TU Berlin (DAI-Labor), regards Berlin as one of the leading digitalised cities, comparing it to San Francisco. He said that Berlin was way ahead of many major international cities when it came to state-of-the-art technology, partly thanks to the solid conditions it offered for study and training in technical disciplines. For instance, Germany is a pioneer in the area of assistance systems and since 2005 research funding and the nation's universities have been heavily focused on this field. However, Germany is also a leader in the areas of health, services and energy. With this in mind, Professor Albayrak addressed the issue of human-technology networks, such as those found in "smart homes". Within this context, people are using their smartphones, tablets or iPads to control their household appliances, electricity consumption and heating. In addition, the batteries of their electric cars are being charged when the cost of the electricity drops to the cheapest rate thanks to renewable energies. He explained how these developments were enabling high levels of energy efficiency and giving people more control over their time because technology was working in the background to facilitate a healthy, autonomous and energy-efficient lifestyle. As a result, smart assistants are improving everyday life by making complex processes more convenient, more reliable and more enjoyable. At the same time, the aim is to ensure that these processes are transparent for and can be controlled by users.

As an example of how to integrate business and academia, he cited Innovationszentrum Connected Living e.V., an innovation network with more than 50 members that he was responsible for starting and of which he is the president. Another area that he said was worth highlighting concerned how the nature of collaboration between humans and technology has changed. It used to be the case that a technology was developed first and only then tried out on humans. Nowadays, humans are factored into the thinking right from the start. To get society ready for the future, it would not be enough simply to serve up the latest technical innovations.

When the discussion moderator enquired whether the new professorship in "Work 4.0" would be in competition with his own research, Professor Albayrak answered with a resounding no. On the contrary, he said that he welcomed the decision because academic efforts must rely on an interdisciplinary approach if they are to be productive and succeed.

State Secretary Thorben Albrecht urging us to start talking now about what we want our work to be like in future

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Thorben Albrecht, permanent State Secretary at the Federal Ministry of Labour and Social Affairs, stressed how important it was for companies to get the workforce fully on board and to conduct the debate around Work 4.0 in an honest manner. The State Secretary remarked that employee rights would have to play just as central a role as before. He explained that platform business models focused primarily on customer needs and that in this area, in particular, we were witnessing the end of conventional forms of business. He stressed that this made it all the more important to ensure that social security arrangements were in place for the jobs associated with these platforms as well.

As regards the issue of participation by social partners and employees, he urged businesses to work with staff and their representatives so that they could actively shape the changes together – identifying this as an area for active trade unions and works councils with the will to get involved. He said that lots of companies were already sensing the change in the air and tackling it head on. The more digitalised companies become, the greater the importance of personnel development. Communication and social skills are becoming just as important as proficiency in IT. At many companies and also among employees, the issue of how to balance work and family life is a key concern. Many companies are starting to think in this direction by supporting staff in their dual role as both family members and employees. In addition, modern information and communication channels offer greater autonomy when deciding where and when to work, in turn, making it easier to "juggle" family life and work. However, it is important to remember that you cannot work properly from home and look after children at the same time. With the blurring of the boundaries between your job and private life, there is a risk that "any time and any place" can quickly turn into "always and everywhere" – this is the flip side of the new flexibility. With regard to this, employers and employees will have to work out new compromises concerning flexibility that are based on smart thinking.

The opportunities and challenges are in the hands of the stakeholders. State Secretary Albrecht concluded by saying that if we wanted to make sure that the work of the future could be classed as "good", we would have to start talking now about what we wanted our future work to look like and what opportunities might be open to companies, employees, social partners and politicians in terms of shaping this.

Stephan Schwarz describing the new requirements for skilled crafts and trades

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Stephan Schwarz, President of the Berlin Chamber of Crafts, was asked by the chair to explain how skilled crafts and trades were facing up to the changes being wrought by digitalisation. Schwarz replied that skilled crafts and trades were – of course – also being affected by digital transformation and that this was dramatically changing the nature of trained occupations and occupational profiles, such as the job of mechatronics technician, jobs in the area of building energy efficiency improvements and many more besides. He said that even 90% of chimney sweeps were now using digital measuring instruments instead of relying on the old "drop a ball down the chimney" trick. He suggested that the existing crossover between IT start-ups and skilled trades and between digital nerds and master craftsmen would have to be stepped up. And he also claimed that digitalisation would allow the needs of young people to be better accommodated and make it possible to create more attractive jobs. In addition, he stated that conventional organisational forms were coming to an end, with crowdsourcing also having become part of the skilled trades sector. He explained that the Chamber of Crafts was factoring this into its qualifications and that, in future, it would concentrate even more heavily on overseeing innovation processes – in the same way that it is already taking account of changes to traditional skilled trades.

In addition, he pointed out that changes in customer needs would also have to be considered. He said that this was already happening in some areas. For instance, in the past customers had to be at home at a particular time so that the relevant data could be recorded by specialists. Now customers are able to record it themselves and send it to the company in the form of a digital photo.

Moreover, existing professional development offerings would have to be adapted as regards traditional skilled trades. Despite the fact that these offerings were already mainly technical in nature, it was becoming increasingly necessary to focus on "soft" factors as well. Schwarz said that up until now there had been a lack of awareness concerning new business models (such as platforms) and disruptive innovations. Small businesses in the skilled trade sector, in particular, faced fierce competition and would have to be supported as they grappled with the issues of digitalisation. Once again, the onus would be on the lawmakers to create the appropriate general conditions. It would also be important not to let customer needs become a justification for precarious forms of work.

Markus Ochsner explaining how the human resources culture at his company has changed

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Markus Ochsner, Member of the Managing Board and Labour Director at ABB AG, stressed that only companies that manage to implement flexible and networked processes will be able to adapt to innovative new markets. As an example, he made reference to the range of services and service products that ABB AG offers for the industrial sector. He explained, firstly, that these are helping to boost the efficiency of customers and their systems. Secondly, life cycle management (comprehensive technical support, training, repair and remote monitoring services) can also be seen as a response to the changes that are taking place within industrial companies. In turn, this is calling for new qualifications on the part of employees.

When people talk about Work 4.0 and its impact on the workforce, they often make the mistake of labelling things too hastily as either "good" and "correct" or "bad" and "incorrect". This is off-putting to many people. To an extent, the specific impact of digitalisation is not yet a tangible reality for employees, but some of the challenges actually became apparent long ago and they accepted them. There are challenges for specialists, in particular, and so they must be intensively mentored and supported by Human Resources Management. In order for the company to remain competitive, everyone must play their part in embracing the technical revolution. In future, the systems, equipment and instruments used within industry will assume a second identity online. This will be extremely useful for businesses and their service offering because it will allow testing and optimisation to take place in a virtual environment. As a result, the digital factory and virtual commissioning will become accessible across the board.

What matters to customers – top-notch performance and service – also matters to staff. Targeted support for day-to-day work and tailored development opportunities are just as important as work-life balance. This can only work if there is trust on both sides – on the part of managers and employees alike. Managers, in particular, need to get to grips with Industry 4.0 and to approach the associated changes with openness. The question of how we will work in the future also raises the issue of how we will work together in the future. Greater flexibility concerning how and where we work also calls for a new form of leadership called "remote leadership". As the name suggests, this involves managing employees who are not physically present. This cultural change in human resources is also being recognised by ABB and is being factored into its approach to personnel development. Furthermore, the issue of qualifications is not just relevant to the existing workforce but is also important at the initial training stage. That is why digital elements are being systematically integrated at the ABB training centre in Berlin, where young people train for a specific career in industry. In addition, the term "continuous professional development" has now replaced the term "further training". As far as Work 4.0 is concerned, some things have already been set in motion internally so that the effects and potential of digitalisation can be harnessed in the future. Within the five areas for action – forms of work, qualifications, leadership, significance of work and social security systems – various sets of issues are being examined and measures are being implemented to promote digitalisation of the world of work.

Doro Zinke stressing how important qualifications and training still are

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Doro Zinke, Chair of the Berlin-Brandenburg branch of the Confederation of German Trade Unions, started her talk by pointing out that although there were lots of technical possibilities; the real question was "under what societal and social conditions are people working?" She said that greater flexibility in terms of where and when we work and the blurring of boundaries between work and private life could cause working conditions to deteriorate, e.g. in the case of home working. This is allowing employers to cut down on workstations, but means that employees must set them up at home instead. Some changes seem "female-friendly," can however turn out to be a raw deal for women who then are burdened with children and housework in addition to computer work, and who miss out on collegial contacts on top of it all. She said that digitalisation was not just about being defensive of workers' rights but also about the opportunities available for shaping events. Consequently, works councils must also be allowed to join in with discussions at their companies about the processes of business development and change. The work of the future would not only have to be effective, but also humane and meaningful. This would involve respect for employees on the part of managers and the rights of the work council to participate in management decisions.

The growing number of self-employed persons must also be considered. Although, the general conditions under which they work might often seem attractive at first glance, in the event of illness or pregnancy the worker receives neither continued pay of wages nor protection. She said that the same was true of various types of contract, which must be addressed from the perspective of ensuring fair working conditions. Ms Zinke used "fair trade" coffee as an example of how Work 4.0 was often only considered in relation to industrial production despite the fact that it was also highly relevant to the service sector as well. She did this by highlighting that coffee is only traded fairly up until its arrival at the port, but then poor working conditions kick in as it is further transported and traded. She said that consumers also bore some responsibility in this regard. All in all, she felt that the discussion around digitalisation was too heavily focused on Industry 4.0. In her view, it was also important to consider the issue of personalised services within the context of Work 4.0.

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High-quality qualifications and training would have to be retained and enhanced under "Work 4.0". Many start-up companies and their staff believe that dual education programmes are unnecessary and that instead it is simply a question of acquiring particular skills. However, the strength of the dual education system lies in the very fact that it allows people to work in various sectors and under a variety of working conditions. Not all start-ups survive and so people need training that will equip them to find employment in various companies and sectors, too. Ms Zinke then added that the dual education system was regarded as a shining example – even abroad. Many countries were keen to implement the dual education model themselves. In order to keep it competitive and fit for the future, it would have to be adapted to the new requirements. She said that some companies were now starting to offer training in collaboration with start-ups and that this was a step in the right direction.

Ms Zinke concluded by affirming that Work 4.0 represented both an opportunity and a challenge; as for the kinds of developments that would emerge, she said this was a social and political question.

Summary of the chaired talk

In spite of all the differences of opinion concerning the opportunities and challenges posed by Work 4.0 and the associated possibilities and limits of regulation, there was one thing on which all the participants agreed: the stakeholders have a duty not just to respond to changes but to actively shape them. It is absolutely crucial to get employees involved in the increasing use of technology. As politicians, business people and social partners set about defining the general conditions, it is important for works councils, trade unions and employers' and industrial associations to be involved as well. The task of shaping events must be tackled jointly by all those involved, as that is the only way to bring about a positive process of change.

Academic input: “Work 4.0 in metropolitan regions? Between digital structural change and social innovation”

Professor Buhr: Digitalisation is not just happening in the world of work

In his presentation *Professor Daniel Buhr, Professor for Policy Analysis and Political Economics,* outlined the debate around digitalisation and the distinctive features of Berlin within this context. He explained that automation and digitalisation were processes that affect every area of human life. He said that Work 4.0 was an integral part of many other developments such as demographic change and ongoing technological advances. In his view, Work 4.0 brings two aspects to bear: firstly, it represents the disruptive gale of creative destruction (a term coined by the economist Joseph Schumpeter) and, secondly, it is a gradual evolutionary process. He demonstrated how previous occurrences of industrial upheaval had given rise to developments and trends that had remained a part of society for centuries. The development of mechanical production systems (Work 1.0) had not merely resulted in new forms of work but had created a new social structure. The introduction of mass production based on the division of labour (Work 2.0) had triggered the beginnings of globalisation and the welfare state. The use of electronics and IT (Work 3.0) had changed the nature of cooperation between social partners, the business world and politicians and had initiated progressive consolidation of the welfare state. Meanwhile, the distinguishing features of the current digital revolution (Work 4.0) – which is based on networking and cyber-physical systems – are that it is fast and highly dynamic. Not only that, but it is changing the whole of society. As regards the impact of digitalisation and robotics within the context of Industry 4.0 and Work 4.0, the academic view is that there is not yet enough empirical evidence. The various scenarios have not yet been researched in sufficient depth and so they are more like rough predictions.

According to Professor Buhr, the increase in digitalisation is not just restricted to the world of work but is also happening within society itself. Despite the fact that the issue has – to a large extent – so far been analysed and advanced from a technical perspective, humans are still very much a part of the decentralised and self-organising world of Industry 4.0. However, many areas of human work are going to undergo dramatic changes in the future. Tasks are becoming more complex and value creation networks more dynamic and this calls for a high degree of flexibility. New learning aids are required – such as assistance

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systems, robots or e-learning facilities. In relation to this, he said that the issue of opportunities and risks was cropping up time and time again. As examples of opportunities, he mentioned the ability to make work less burdensome, inclusion, using real-time networking to create more efficient ways of working while also conserving resources or even the creation of new jobs. Possible risks were said to include a growing digital divide between those who have access to digitalisation and are able to deal with it and those who do not and cannot. In addition, he claimed that there was a danger of data becoming concentrated in the hands of a few monopolists. He added that the loss of work boundaries and the faster pace of work were creating extra stress and leading to a loss of intellectual capabilities, such as the ability to empathise. In addition, there was the potential threat of machines replacing human tasks and jobs. He stated that the opportunities and risks associated with changes in qualifications also played a role here. Highly qualified people would certainly benefit from digitalisation to a greater extent. However, according to a study by Frey/Osborne, there might be benefits for the less well qualified too.

Up until now, Industry 4.0 and the Internet of Things had – to a large extent – been considered and discussed from a technical perspective. Somehow, this debate had managed to lose sight of people. As a result of Work 4.0, a change in perspective was now occurring – a development welcomed by Professor Buhr. He said that people were now starting to recognise the increasing need for empirical knowledge and joined-up thinking. Although machines were very good at standardised production with assistance from humans, people were still important for controlling and reorganising processes so that the machines would be able to make better decisions. It was not a question of "humans or machines" but "humans and machines". Consequently, Industry 4.0 offered a great deal of potential for digital innovations as well as new services and business models. Company forms such as start-ups, in particular, were a prime example of how humans have a competitive advantage over machines. Consequently, the debate about shaping the working world of tomorrow must not be reduced to the question of humans or machines. Different scenarios apply and must be defined on a sector-by-sector basis. On the one hand, there is the automation scenario in which people are controlled by machines and, on the other, there is the more desirable specialisation scenario in which humans are responsible for supervision and control. Buhr asserted that a productive approach could only be achieved by examining the interaction between humans and machines and actively shaping this.

He said that up until now, innovation policy had often attempted to solve issues relating to technical innovations with technology itself. However, innovations do not necessarily have to be technical; they can also be social. Professor Buhr defined social innovations as the reconfiguration of social practices and approaches that attempt to consider the needs of everyone involved. As examples of social innovations, he cited employee participation in management decisions, the right to vote and health insurance as well as car sharing and fair trade. He said that the role of innovation policy was to contribute to the creation of a learning society, investment in training and qualifications and to empower beneficiaries to become critical participants. This was the only way to generate social innovations and facilitate the spread of technical innovations. In addition, he said that the risks associated with increased flexibility would have to be attenuated before any form of social progress could be achieved. This is because the promise of flexibility can only be honoured if it is accompanied by a Welfare State 4.0.

Workshops

Workshop 1: Technology and employment: Automation, digitalisation and robotics

Moderation: Silke Richter, Industrial Sector Coordinator, Chamber of Industry and Commerce (IHK) Berlin

Silke Richter: It is vital to ensure good working conditions within the services sector in particular and also in relation to new forms of work

Workshop 1 focused on the impact that the increased use of technology will have and on the interaction between people and machinery both within and outside the world of work. The future envisaged by Industry 4.0 is one that is primarily characterised by robotics, cyber-physical systems and smart technology that will assist people in their work. However, algorithms and online databases, platform business models, software tools and new media are some of the other elements involved in this vision of the future. By digitalising the entire value creation process and some parts of services, the intention is to boost efficiency and productivity, thereby taking the pressure off human resources. All these scenarios raise the question of what the role of humans will be.

Dr Ivo Boblan – robotics cannot replace human attention

Service robotics – a chance for Berlin

In his presentation, *Dr Ivo Boblan, Head of MIT-engAge and of the MIT-FabLab at the Technical University of Berlin,* explained that, although robotics offer major opportunities in areas such as ergonomic assistance in nursing, risks cannot be dismissed out of hand. The technophobia of the 21st century has been the subject of numerous Hollywood films, which depict loss of control and role reversal and culminate in end-of-humanity scenarios. In developing robotics, engineers trod a fine line between a successful business model and unease with the procedure.

At the MTI-FabLab at the Technical University of Berlin, a workshop for ideas and invention open to those interested in such matters, both humanoid and non-humanoid robots are being developed and tested. Their purpose is to support human muscle power in the service and assembly sectors as well as being deployed in the house and home. Dr Boblan made it clear that no revolution in robotics could be expected without interdisciplinary research in the fields of technology, information technology, technical sociology, behavioural biology and interaction design. Engineers were under the assumption that robot technology should largely be adapted from human biology. In other words, robots needed to exhibit a human impression and smooth dynamic movements if they were to be fit for society and acceptable to consumers. In order to corroborate this, interaction between humans and these robots were being tested in terms of intuition, pleasure of engagement and expectation at the FabLab. The scientific researchers and engineers were of the opinion that technically effective simulations were feasible. Policy makers and society needed to decide the extent to which technical solutions would be implemented.

Dr Boblan sounded the all-clear with regard to the debate surrounding the effects of robotics on the role of the human being. Smart systems were not yet in a position to take decisions which had not previously been pre-programmed into them and currently functioned only in highly simplified artificial environments. This meant that humans remained indispensable. For this reason, the necessity for policy makers to manage the situation in order for the productivity increase effect forecast to enter into effect presently tended to derive much more from the question: “how well trained do employees need to be in order to exploit the areas of potential offered by robotics and in order to be able to operate the smart machines? Meanwhile, scientific researchers are unanimous in arriving at the conclusion that, in cases where physical assistance is provided by robotics in service sector occupations such as nursing and care support, human attention and human face-to-face contact must not be replaced and are indeed irreplacable.

Sandra Reuse: In the service sector in particular, there is a trend towards the outsourcing of work. The aim here is to undertake a critical investigation of this development.

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Human-machine interface labour market – how do we achieve a sustainable and intelligent division of Work 4.0?

Sandra Reuse, an advisor on employment policy and industrial relations in the Policy Department of the Federal Ministry of Labour and Social Affairs (BMAS), emphasised that most previous predictions and extrapolations on the replaceability of people had been calculated on the basis of technical feasibility. Apart from this, the focus was usually on individual activities which would be capable of automation. This could not be equated with the disappearance of whole occupations. Occupational profiles were already subject to permanent change. Against the background that 3% of all employees in Germany change their occupation each year and given the fact that 20% do not work on a long term basis in the occupation in which they have trained, the labour market appeared to be flexible enough to absorb change processes. An academic research investigation commissioned by the BMAS to look at the study into "The Future of Employment" conducted by Carl Benedikt Frey und Michael Osborne (Oxford 2013) had, for example, shown that the predictions contained within the latter regarding extensive mass unemployment (47% of employees in the USA in 10 to 20 years) was probably heavily exaggerated. Nevertheless, it was important to say that workers already needed more support in continuing training and vocational orientation.

Unfortunately, the debate surrounding the future of work had hitherto been conducted by means of a type of technical determinism which was fuelling unnecessary fears and distorting the view of positive structural options. In the nursing and care sector, for example, robots could provide important and useful support for employees with work such as lifting. By precisely the same token, intelligent machines could increase the self-determination of patients who wished to go to the toilet without human assistance. Society needed to address the issue of the areas in which artificial intelligence was desired and the fields in which humans remained indispensable because of aspects such as judgement and social skills and also for safety reasons.

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There were indeed labour market developments which were giving cause for concern, such as when Internet-based business models aimed to outsource human work performance to the crowd in return for the lowest possible remuneration and without any long-term contractual commitment. Furthermore, closer inspection revealed that humans would be replaced by humans rather than by intelligent algorithms and machines, as was frequently stated in the "Industry 4.0" debate. This was especially worrying if it tended to take place in conjunction with poorer pay and the discontinuation of good social security.

One development which could be observed in overall terms, and especially via platform-based online comparison and the online arrangement of products and services, was that competition was becoming significantly tougher in a growing number of branches, something which frequently culminates in price wars. This could possibly result in disadvantage for providers who set store by quality and good service. In this area too, attempts to enter into working relationships without longer-term commitment would be an expected consequence, and a further strategy adopted by companies was to outsource work to customers.

It would be useful to undertake a closer inspection of these processes of outsourcing and outplacement of work to non-employees and customers and to examine the societal costs of such externalisation. Good and sustainable division of labour between humans and machines presumably did not comprise a situation in which algorithms exploited labour market participants or in which workers and customers were pitted against each other.

Dr Werner Eichhorst: We should expect increasing tendencies of polarisation between digital layers of society and layers of society detached from technology

On the relationship between man and machine

In his capacity as *Director of European Labour Market Policy at the Institute for the Study of Labour (IZA), Dr Werner Eichhorst* deals with comparative employment policy strategies in connection with increasing digitalisation. According to the IZA study "Flexible Worlds of Work", which was commissioned by the Bertelsmann Foundation, increasing tendencies of polarisation between digital layers of society and layers of society detached from technology should be expected on the German labour market. From the point of view of Dr Eichhorst, however, the predicted collapse in the employment model will not take place. In Germany, a wave of unemployment occurring for technological reasons would meet a stable middle labour market segment which, because of the higher level of occupational competences of skilled workers and thanks to the solid dual training system, would turn out to be less fragmented and polarised than would be the case in the Anglo-Saxon countries, for example. The qualified central sector of the labour market in Germany was not easy to replace. However, the world of work of the future would primarily feature occupational profiles of an interactive and communicative character. A massive growth in academic professions in the educational, research, consultancy, management and creative sectors would continue to take place. New occupations would arise and human work would mainly be in demand in areas where it was available to complement the technical solutions and specifically human competences were required.

Dr Eichhorst also did not share the fear that more poorly educated persons would no longer find any work. The low-wage sector and its limited level of remuneration would continue to exist because local services were not so rapidly replaceable. Like other flexible forms of work, temporary employment created jobs and had played its part in the economic upturn in Germany. This flexibility was important due to the fact that the labour market and the macro economy were exposed to constant competitive pressure. At the same time, there was permanent development of technical innovations which were also changing the markets. Companies and employees needed to be able to react to this. According to the evaluation of the IZA, these forms of flexibilisation had made a major contribution over the past ten to fifteen years to ensuring that more employment could be created, even under the demanding conditions of a globalised and highly technicised economy.

Companies had also become more flexible with regard to remuneration, working time and working venue. Home offices had become more common than had been the case some years ago. This did not, however, mean that everyone would be working from home in the near future. One of the important components of Work 4.0 was that companies were moving away from strictly hierarchical work organisation and towards project-related work situations. Demands were being placed on the social partners and on companies in respect of the limits of flexibilisation. They needed to structure flexibility in such a way so as to make it sustainable for all parties involved.

Professor Pianta argues that the term "evolution" should be used in connection with "Work 4.0" rather than "revolution".

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Digitalisation and social inequality

Professor Dr Mario Pianta, who teaches Economics at the University of Urbino, did not share this optimistic view of the 4.0 world of work of the future. He is looking at the social inequality caused by digitalisation and presented the results of his pan-European empirical survey. He began by advocating that "evolution" was a more appropriate term to use than "revolution". From his point of view, the keyword "Work 4.0" tended to relate to a deepening of the digitalisation debate which had begun as long ago as the 1970s rather than to a revolution.

Professor Pianta states that social inequality rises in line with digitalisation. He uses the example of Italy to make it clear that, in the digital world, the usual autonomy enjoyed by freelancers and e-lancers represents more of a social risk than an opportunity. His investigations have revealed that the number of management positions has risen on each occasion during past periods of crisis whilst the strata dependent on technology have become unemployed. The fact that about 50% of Italy's companies are sole traders indicated that starting a business is born of necessity or unemployment and that the intention pursued is not business formation within the actual meaning of the term. An absence of dual vocational education and training was one of the reasons for the high level of youth unemployment in southern Europe. And although there had been a strong increase in work productivity in Europe, this had resulted in very few effects on income. Actually, stated Professor Pianta, there had been a rise in company profits and a decrease in general prosperity. The picture after the crisis would probably be characterised by an even more polarised industrial structure. This would mean that weak countries, regions, branches of industry and companies would weaken still further, possibly ultimately culminating in a lower level of demand and a lesser ability to develop new technologies even at the "centre". Changes would probably be more difficult to bring about in the light of a slowing down in growth in Europe in overall terms and the economic decline of several countries.

Inequality of income was becoming particularly apparent in Germany. A new policy direction in this area was urgently required. Polarisation was not taking its expected course on the basis of the line between technical affinity and technical unease. The line being pursued was one between full-time permanent employment on the one hand and precarious fixed-term work on the other.

For this reason, even more extensive support should be given to the areas of potential inherent in technisation for broader fields of application, increased productivity and societal benefit. Nevertheless, Work 4.0 and web-based activities were currently causing a shift in the border between the economic and social sphere, as the success of open source software, copyleft and peer-to-peer solutions made abundantly clear. Policy making should therefore view innovation as a societal, cooperative and open process and ease the rules for accessing knowledge and joint use instead of enforcing and tightening laws relating to intellectual property which had actually been conceived for an earlier technological era. In societal terms, consideration needed to be accorded to how the level of employment and performance could be secured for the long term. These could only be made future-proof and sustainable if conventional fall-back systems fell by the wayside. This is an area in which Professor Pianta believes Berlin has the opportunity to become a sustainable city. Major conurbations offered a heavy concentration of private sector and entrepreneurial provision as well as plenty of public provision.

Workshop 1 resulted in the following areas for action:

Opportunities that could arise from service robotics must be explored academically. In addition, **spaces must be created to bring together technologies and users** so that the worlds of academia and practice can meet.

To strengthen the role played by humans, ways must be found to ensure **data security** for users and **good working conditions,** particularly within the services sector and in relation to new forms of work.

Workshop 2: Impact on professional and private life: Individual work-life balance and worker rights under flexible working conditions

Chaired by: Christina Schildmann, Hans Böckler Foundation

Christina Schildmann: Overall, digitalisation must become a participative process

In the future world of work, not only will there be greater flexibility with regard to the place of work and working time, but the structure of the work itself will also change. As a result, questions concerning control over working time, employee participation in management decisions and good working conditions will have to be considered anew. During the workshop, the participants discussed how employee rights could be transferred to the world of Work 4.0 and how greater flexibility might be shaped. Key concerns here included the role of social partners and the discussion around how productivity gains should be distributed.

Dr Martin Beckmann (left): The focus needs to be placed on training people for the digital world of work

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Service Sector 4.0 – the business as a place of learning and co-creation for employees and interest groups

Dr Martin Beckmann, who works for the National Executive of the service sector union ver.di in the field of policy and planning, emphasised the necessity of designing the process of digitalisation in such a way so as to enable technological innovations to contribute to bringing about improvement in working and life conditions. If this did not succeed, the impending risks would include job losses, stress caused by an absence of restraints to work and a lack of labour law regulations and social security in areas such as click working and crowd working. Alongside the legislation that would be required at Federal Government and European level, there needed to be a focus on the part of the federal states on training people for the digital world of work. At the federal level, ver.di was striving to achieve the introduction of statutory part-time educational leave on the basis of the Austrian model.

Dr Beckmann also stressed the importance of the company as a place for making things happen. In order to get all employees on board, it was important to strengthen the competence and organisational expertise of works councils. Work in the service sector also needed to be upgraded, and the development of service networks had to be fostered in structural policy terms. In addition to this, there was a requirement to intensify work and service research. For this reason, Dr Beckmann took a positive view of the Berlin initiative to fund a professorship in the field of Work Research 4.0.

Dr Nadine Absenger: Training and social security are also key action areas

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Mobile working, working times and questions relating to the work-life balance in digitalised worlds of work – empirical investigations show areas in which action is needed

Dr Nadine Absenger is Head of the Employment and Social Law Department at the Institute of Economic and Social Research (WSI) at the Hans Böckler Foundation. Her paper presented the results of empirical investigations into today's world of work and into the implications of digitalisation and uses these to identify areas in which action is needed.

Surveys reveal that digital technologies exert an influence on the structuring of working times, working venues and work organisation. 88% of employees are also available outside working times, and many work on a mobile basis.[1] At the same time, 62% of companies have no regulation in place to limit constant availability[2] whilst 44% of staff perform work which is unpaid.[3] The blurring of the borders between professional and private life and the permanent availability this entails were growing challenges. 80% of respondents stated that intensity of work had increased in recent years.[4] 50% felt stressed by their jobs,[5] and the proportion of sick days caused by mental strain was rising.

A further factor was that around one third of workers were employed under atypical conditions such as in "mini jobs", under fixed-term contracts and as temporary agency staff. A particular problem was that such workers were less likely to assert their rights or indeed to know what rights they had.[6] Around 58% of all employees also worked in rigidly stipulated working time models which do not permit any sovereignty in respect of working hours.[7] Two thirds of the population are under the impression that it is not possible to arrive at a good work-life balance.[8] Dr Absenger emphasises here that statutory rights such as adapting working times to meet various phases of life are insufficient in order to reach a balance with family life, care responsibilities and leisure time.

In order to meet these challenges, statutory regulations such as the Law on Working Time and the Part-Time and Limited Term Employment Act (TzBfG) and provisions relating to health and safety at work would need to be adapted. It was also necessary to involve employees and expand co-determination. Companies would also need to carry out more risk assessments and should receive relevant support in this regard. Further significant factors were collective wage and company agreements and an amendment of the definitions of "company" and "employee" contained in the Labour Management Relations Act. Dr Absenger also went on to state that training and social security were central areas of action which needed to be actively and jointly structured in the interests of both employees and employers.

[1] "Network society", BITKOM 2011
[2] "Work 3.0 – working in the digital world", BITKOM 2013
[3] "Working time monitor", Gehalt.de 2015
[4] "Good Work Index", German Confederation of Trade Unions (DGB) 2012
[5] "The 2015 Workforce View in Europe", ADP 2015
[6] See, e.g., Institute for Employment Research (IAB) Brief Report 18/2015
[7] Worker survey, Federal Statistical Office 2010
[8] "Family Life Monitor 2013", Allensbach Polling Institute

Peer-Oliver Villwock: We need to be familiar with the specific requirements at the companies

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A new flexibility compromise and a modern management culture for the world of Work 4.0

Peer-Oliver Villwock heads an advisory group at the Policy Department of the Federal Ministry of Labour and Social Affairs (BMAS) which is looking at "future-proof structuring of the world of work and securing a supply of skilled workers." He began his input by presenting the Green Paper "Work 4.0," which was launched in April 2015 and which has helped instigate a broad specialist and public dialogue on the future of work. Associations and other interested parties were able to submit responses until November 2015, and a national film festival is being staged. In March 2016, a half-time conference will take place, which will also commence the planned online dialogue. At the end of 2016, the White Paper on "Work 4.0" will be published, which will continue the impetus created throughout the entire dialogue process. The White Paper will offer responses to issues posed in the Green Paper and identify areas of organisational action for the future of work. The BMAS is also investigating questions related to good work and management culture and organisation of labour which are undergoing change as part of the "New Quality of Work" initiative.

Mr Villwock pointed out that it is important to start with the specific requirements in the companies, since this is where relevant decisions are made. For tailor-made solutions, he considers that tried and tested, locally-active structures for worker participation will continue to be crucial. Although meeting points such as table football games and table tennis are "nice," a vibrant social partnership between works councils and management is important, especially when crisis situations occur. The economic crisis of 2008 showed the importance of a durable social partnership and binding regulations between employer and employee representative bodies, but also revealed how few of these there were in flexibilised sectors. At the same time, many changes involved operationally necessary cultural issues which could only be influenced to a very limited degree by classic government instruments. Online platforms such as Airbnb have also demonstrated the limits of existing national regulations. Providers in a globalised platform economy do not wish to perceive themselves as employers or local corporations, and therefore do not sufficiently pay into social security systems or even the national tax systems. The regulations are insufficient to impose duties on such globalised providers in order to refinance (national) social responsibilities.

Anna Kaiser: Employees are increasingly asking themselves the question of how work fits into their lives and not vice versa

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0.5 + 0.5 = 1.5 – Why everyone wins in job sharing!

Anna Kaiser, founder and Managing Director of the job sharing platform Tandemploy, presents the concept of "job sharing". Job sharing involves a division of labour between two or more members of staff performing dependent tasks and holding joint responsibilities.

Both job sharers themselves and companies can use an online platform developed in conjunction with research institutions and universities to search for the perfect partner to split a qualified job on the basis of formal and "soft" factors. This brings about an increase in staff productivity and motivation. Ms Kaiser explained that willingness to give up part of a salary for greater flexibility was on the rise. There was a growing need for part-time employment provision amongst highly qualified persons in particular. Employees were increasingly asking themselves the question of how work fits into their lives and not vice versa. This trend had, however, received too little recognition. Part-time positions had tended to be created by chance thus far.

Andreas Schulz: The UVB instigated "Economy 4.0" in order to support stakeholders in the field of digital labour

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Chaired discussion with representatives of the German Confederation of Trade Unions (DGB) and of the Berlin-Brandenburg Association of Employers' Organisations (UVB) on the topic of Work 4.0

Christian Hoßbach, Deputy Chair of the German Confederation of Trade Unions in Berlin-Brandenburg and Andreas Schulz, Head of the Collective Wage Policy Department at the Berlin-Brandenburg Association of Employers' Organisations (UVB) and of the Association of the Metalworking and Electronics Industry (VME) represented the social partners in a discussion on the opportunities and challenges of "Work 4.0".

The focus is on assisting stakeholders with issued relating to digital change. Digital labour particularly addresses area of the digital world of work, digital business models and digital training.

From the point of view of Mr Schulz, digitalisation of the world of work opens up new opportunities for employers and employees in equal measure. It particularly offers forms of structuring of working times and working venues that provide the chance to strike a better work-life balance. Staff could, for example, fulfil their family or caring commitments in the afternoon and be available to the company in the evening once again. Mr Schulz takes a critical view of the the regulations contained within the law of working time. These include provisions which inhibit compatibility between family and working life, such as the requirement for an uninterrupted period of rest of 11 hours. With regard to the structuring of working time, the collective wage and company partners would be accorded a crucial role, and they would need to be provided with the necessary leeway to act. According to Mr Schulz, training is a further important building block within the process of digitalisation. This could also be fostered via provisions in collective wage agreements.

Christian Hoßbach (right): It is important to discuss the use of the benefits provided by digitalisation

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Mr Hoßbach questions whether statutory working time regulations and the achievement of a work-life balance are actually a contradiction in terms and believes the opposite is the case. New flexibility is neither automatically positive nor automatically negative. From his point of view, lifelong learning needs to be included in a binding manner in collective wage agreements. Companies fundamentally display too little readiness to invest in innovations and incline towards short-term strategies. Within this context, it is also important to discuss the use of the benefits provided by digitalisation. "How is the money distributed?" Mr Hoßbach gives as an extensive example the model of the Swedish corporate training fund, which was established in individual companies in statutorily regulated form as long ago as the end of the 1980s. This enabled funding for training and research to be handed out with the co-determination of employees. Looking towards Berlin, Mr Hoßbach generally urges a closer linking between employment and structural policy. Policy makers need to strengthen works councils because they stand for the implementation of more sustainable digitalisation approaches.

The trade unions need to address solo self-employment more intensively. The new flexibilisation is creating an agenda of organisational issues both in social and economic policy terms. There is a need for a new debate on citizens' insurance which, inter alia, facilitate change of status. The formation of cooperatives could be one way of developing one-person companies from the precarious status of solo self-employment into more effective economic units.

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The discussion following these inputs addressed the opportunities that were available for shaping events in practice. Escape clauses in collective bargaining agreements were seen as an opportunity for greater autonomy over terms and conditions. It was decided that working time arrangements would also have to be discussed at both a managerial and a collective bargaining level; Berlin was viewed has having fallen behind in this regard. However, the participants said it was important to bear in mind that many employees (e.g. those working in the healthcare and retail sectors) could in no way afford to exercise control over their own working time due to their low incomes. Aside from this, the issue of social security arrangements for various forms of self-employment was identified as another important area for action. For instance, a great deal of emphasis was placed on the idea that new kinds of flexibility can only be introduced in exchange for new forms of security. In this regard, Berlin was considered to be the obvious testing ground for new forms of work and for breaking new ground.

A fundamental question arose as to what cooperation between start-ups and companies might look like in the future, e.g. whether they would compete with or learn from one another. Another point made was that some of the key issues had not even been broached at the companies yet, such as the discussion around how gains from digitalisation should be distributed. The participants felt it was vital to have everybody on board during the ongoing shaping and development processes: not only those already engaged in mobile and digital working in coworking spaces or at the "Sankt Oberholz" start-up hub, but also sales assistants at "Lidl" or the works councils, who would have to be trained up so that they were ready to help shape Work 4.0 at a practical level. The crucial factor would be making sure that the transition to the world of Work 4.0 was a participative process.

Workshop 2 resulted in the following areas for action:

Control over working time will have to be negotiated through dialogue with social partners. It will also be necessary to hold a debate around **how gains from digitalisation should be distributed,** particularly in terms of investment in **qualifications and social innovations.** In addition, **social security** mechanisms will have to be put in place along with **criteria for what constitutes "good work" when it comes to new forms of work** such as crowdsourcing. Overall, digitalisation must become a **participative process,** which is also a matter of s**trengthening the works councils.**

Workshop 3: Urban aspects of work 4.0: Cities as testing grounds for innovation? The example of Berlin

Chaired by: Dr Mary Dellenbaugh, gsub mbH – Gesellschaft für soziale Unternehmensberatung (a business consultancy specialising in social issues)

Dr Mary Dellenbaugh: To harness the power of Berlin as a live testing ground, spaces must be created where people can share ideas and information and where innovations can be encountered.

Large cities offer unique conditions and opportunities for innovations, but they also face specific challenges when it comes to shaping the digitalisation process. Thus, as "live testing grounds", they are able to shed light on future developments while at the same time acting as trailblazers. This workshop addressed the question of what makes Berlin so special with regard to digitalisation processes and how the potential could best be tapped.

Professor Martin Gornig: An atmosphere of urban creativity prevails in Berlin

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City and Industry 4.0 – location profiles of a digital economy

Prof Dr Martin Gornig from the German Institute for Economic Research (DIW) began his presentation by looking at the relationship between economic dynamism and urban development. Over the course of history, the pattern of industrial locations had undergone constant and fundamental change. Whereas Industry 1.0 had created cities, Industry 2.0 and 3.0 had been associated with a movement away from urban areas. Industry and Economy 4.0 were now altering cities and presenting a particular requirements profile. At the same time, the significance of necessary location factors had successively decreased and, also because of digitalisation, companies today enjoyed a high degree of freedom in terms of where they were based.

Professor Gornig stated that the important factors for Economy 4.0 were a buoyant research sector, good conditions for business start-ups, strong networking between stakeholders and an opening up to consumers. In terms of research and start-ups, the prerequisites offered by Berlin were above average, and the city also exhibited particularly large areas of potential with regard to opening up and involvement of customers in production processes. The only field in which Berlin needed to catch up was in respect of the issue of networking between the stakeholders in new technology and existing industry. Berlin was able to benefit from digital developments in many ways. Over recent years, for example, the demand for commercial space had grown significantly in the wake of the economic dynamism shown by the IT branch, and Berlin was profiting increasingly strongly from an innovative start-up scene. Changed forms of working (“co-working spaces”) were finding that city provided outstanding conditions and were themselves contributing towards an atmosphere of urban creativity.

Sven Weickert: The networking of start-ups and established companies offers a particular opportunity for Berlin

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Berlin: the digital hub of Europe – vision or reality?

Sven Weickert, who in his capacity as *Managing Director of the Berlin-Brandenburg Association of Employers' Organisations (UVB)* is responsible for the areas of training, digitalisation and business start-ups, linked his presentation to the question of the relationship between the city and innovation.

The start-up sector had come of age and was now changing the city. Berlin was an excellent ecosystem for innovations and had the best prerequisites in place to become a trend setter in the area of digital change. The question that posed itself was whether Berlin was already a European digital hub or was still on the way to becoming one.

Whatever the case, development was dynamic. DAX-quoted companies were setting up digital corporate units in Berlin, and the city had already overtaken London in the area of venture capital. The digital economy was also enormously significant to Berlin. In 2013, it had been the third-best sector in terms of generating added value and in addition to this also created "conventional" jobs.

Mr Weickert believes that the networking of start-ups and established companies offers a particular opportunity for Berlin. In order to support companies in making the digital transformation, the UVB had established a networking platform in the shape of the "Economy 4.0" digital laboratory. The main focus was on the topics of the digital world of work, digital training and digital business models.

In order to exploit areas of potential, a joint digitalisation strategy was also required from policy makers, trade and industry and the scientific research sector. In addition to this, considerations needed to be instigated in the areas of open data, collaborative governance and integrated process solutions under the keyword of "Administration 4.0".

Sue Duke: The Economic Graph shows that users in Berlin are characterised by multilingualism, knowledge of programming languages and online marketing savvy.

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LinkedIn's Economic Graph

Sue Duke, responsible for public policy at LinkedIn, discussed the effects of digitalisation on the labour market in her presentation. She introduced the Economic Graph, which creates digital maps of labour markets based on data contained in LinkedIn user profiles. It makes a graphic portrayal of the economic networks of more than 400 million LinkedIn users possible. Their current positions, their level of networking and which qualifications and skills they have can all be depicted. These aggregated data could be a helpful instrument, in particular for political decision-makers, in order to recognize and react to dynamics and address labour market mismatches.

Through the example of Berlin, Ms Duke offered insights into how the Economic Graph works. In comparison to other cities, multilingualism, knowledge of programming languages and online marketing savvy distinguished the users in Berlin from those in other cities. Skills in high demand in the city included web design, online marketing and database management. Through these data, untapped potentials of the workforce and unmet demands of the labour market can be equally identified.

Ms Duke noted however that the results presented here represent a snapshot of the Berliner labour market, whose characteristics are based exclusively on LinkedIn members who work or study in Berlin. Employees from particular sectors, such as digital, finance and the professional services, have historically been more represented on LinkedIn than others although this is changing all the time as the membership grows and diversifies. Important conclusions and unique insight which are relevant for labour market policy instruments can nonetheless still be drawn from the data.

Lea Böhm: A "feel-good manager" who has launched a digitalised management staff development business

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If you want to pursue new routes, you need to start by questioning the old ways

Lea Böhm, the founder and Managing Director of AllesRoger, addresses the issue of how human resources management is changing in the digital age. She describes how she digitalised management staff development with a start-up business which provides online consultancy tools for the recognition of potential, company analyses and relevant strategy workshops.

Ms Böhm stated that management staff frequently simply distributed work to staff in a centralised way. This meant that there was scarcely any scope for independence and for self-directed work on the part of employees. A cooperative work environment could be created by restructuring the organisation of work to place the main focus on "jobs to be done". The aim here was for everyone to be able to act autonomously in assessing their own strengths. Good work which delivered satisfaction because areas of potential were used could only be achieved via networking, curiosity and courage. Ms Böhm added that small and medium-sized companies in particular were having to reinvent themselves via means such as adopting new technologies for their work processes in order to create new added value chains. Networking between start-ups and "old economy" companies was an especialy important building block for this purpose.

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The discussion following these inputs dealt with the issue of whether it might prove impossible to equip certain groups with digital skills. It was proposed that this problem would have be counteracted by ensuring more effective access to education and by making sure that digital skills were being taught in schools. In the course of the discussion, it was also suggested that a common thread would have to be found for the digitalisation project; the best way to paraphrase this would be "for the common good". In light of the interplay between urban structures and digitalization, it also became clear that the situation might lead to decentralisation processes as well as tensions between urban and rural communities. At the same time, cities would be required to specialise and cater for niche markets as part of their efforts to compete for specialists.

Workshop 3 resulted in the following areas for action:

Digitalisation is important in every sector, including administration, and this calls for **integrated process solutions.** Another key factor is that **spaces must be created where people can share ideas/information and where innovations can be encountered** if the power of **Berlin as a live testing ground** is to be harnessed. The barriers that prevent **cooperation between and networking of the old & new economies** must also be dismantled so that the **Berlin ecosystem** can be **maintained.** So that Berlin can build on its solid foundations as a business location, **targeted initial and continuing training** will also be required.

Workshop 4: Qualification 4.0: New challenges and possibilities in initial and continuing training

Chaired by: Gabriele Fellermayer, gsub – Gesellschaft für soziale Unternehmensberatung mbH (a business consultancy specialising in social issues)

Gabriele Fellermayer: New forms of learning and new e-learning spaces must be designed and integrated

Digitalisation will also bring opportunities and challenges in the area of initial and continuing training. Lifelong learning will continue to be an important issue, but professional development formats will undergo radical changes. Learning – like work – will no longer be tied to a particular time and location, making it easier for people to acquire new knowledge because they will be free to decide for themselves when learning should take place. Skills development will stop being linked to companies alone and instead will become increasingly networked. Vocational training systems will likewise have to change. This workshop provided an idea of likely developments concerning initial and continuing training within the digitalised world of work.

Dr Peter Schlögl: Existing educational systems will need to be adapted in order to implement a joint standardised European educational system

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Learning for tomorrow today – old and new challenges from Work 4.0

Dr Peter Schlögl, Head and Managing Director of the Austrian Institute for Research on Vocational Training, explained that previous continuing training programmes would need to be modified if people of today are to feel at home in the world of work of tomorrow. They acted as a conduit to technical change and provided information on trends in and barriers to information and communication technology (ICT). The barriers to initial and continuing training which offers future sustainability included backward educational systems and obsolete expertise on the part of lecturers. Dr Schlögl also stated that there was a lack of awareness of the potential of ICT and no common vision for Europe of its significance. Existing educational systems would need to be adapted in order to implement a joint standardised European educational system For initial and continuing training (policy), this meant that the demand side would need to be explored and the question as to which jobs will disappear and which jobs will change would need to be addressed. The occupation of bricklayer, for example, had a high risk of being replaced by machines in future, whereas the profession of IT analyst did not. For this reason, learning conditions also needed to be revised in order to enable the necessary skills to be imparted.

Both company-based and university training should be interlinked. This reciprocal learning would bring about new opportunities. In continuing training, content bridges would be created to new or additional university specialisms. The structure of qualifications was changing, and the new opportunities would also be utilisable for the teaching and learning processes themselves. Dr Schlögl mentioned the example of MOOCs (Massive Open Online Courses) – online courses which impart knowledge at a high level. He points out that learning strategies require short innovation cycles and a high degree of flexibility via relevant expertise. Additional learning venues therefore needed to be created. As a new learning venue, the Internet provided an additional option for reflection on learning. Attention needed to be paid that no exclusion took place. Awareness for the great potential offered by ICT was, however, still developing.

Dr Julia Behrens: Mobility, self-organisation and networking will play a major role in learning and work in future

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Digital learning – potential for more participation and equal opportunity

Dr Julia Behrens, Project Manager at the Bertelsmann Foundation, reported on the opportunities for overall societal participation being provided by increasing digital training. The digital society was making new demands with regard to the way in which people learned and worked. The concepts of mobility, self-organisation and networking would play a central role in this process in future. Dr Behrens predicted that, in an environment that was rapidly and permanently changing, the significance of short-term and self-directed acquisition of knowledge on an "on-demand" basis would strengthen. Digital learning would need to be actively structured in order to ensure that no one was excluded. Three areas were indispensable to learning in future. These were firstly the infrastructure, or technical prerequisites, secondly access to technology and therefore also to learning and thirdly the necessary expertise. A "digital gap" could be the consequence for persons unused to learning if access to one of these areas was denied. Nevertheless, digital learning offered the potential for better equality of opportunity if access is facilitated. In future, learning would be personalised, freely available, networked, play-based, competence oriented and driven by algorithms. Ms Behrens gave so-called "digital badges" as one example of digitally designed learning that provided motivation. These enabled learning to be quickly documented in an effective way visually and thus created incentives for further learning. Persons who were unable to come to terms with the conventional training system (such as with whole-class teaching or examinations) would be able to find an alternative adapted to their requirements within individualised digital learning.

Tim Fahrendorff: A combination of the benefits of online and offline learning will deliver the best results

Learning in the digital age with CareerFoundry

Tim Fahrendorff, Business Innovation Manager at CareerFoundry, offers e-learning online courses in areas such as Web Developer UX Design and UI Design. The mission of this start-up is to give people the ability to teach themselves online. This is becoming increasingly important in light of the fact that the proportion of jobs requiring digital knowledge will rise to 90% by the year 2020. Courses at CareerFoundry are usually of six months' duration and are supported by mentors. During this period, six modules are taught. These are divided into 66 topics and take up a total of 480 hours, the equivalent of 20 hours per week.

Mr Fahrendorff explained that a wide range of educational provision was already available on the Internet. This included distance learning courses varying widely in cost, cost-effective e MOOCs (Massive Open Online Courses) with a university background and a low level of participation by students and boot camps guaranteeing the autonomous imparting of knowledge.

CareerFoundry was the provider of a technical boot camp, and courses were personalised by the use of mentoring. These mentors are experienced experts from the field of practice.

Mentees and mentors regularly meet online via such vehicles as Skype. Mr Fahrendorff used the example of web developer courses to explain the particular characteristics of competence-oriented learning. These courses involved the creation of websites which then served as a portfolio for future applications made by learners. Such a "mixed approach" combined the mentoring technique used in offline provision with the flexibility of online courses. Thanks to digitalised communication programmes which facilitated virtual collaboration, students were able to learn online whilst integrating with their mentor or learning group at the same time. Learning tasks were uploaded via log-in to the learner's own learning interface, on which a process summary remained visible at all times, and authorised by the mentor. These collaborative tools made the experience of studying online less isolated and were crucial to participant success. The drop-out rate was very much lower in these online courses.

Mr Fahrendorff concluded by saying that technical boot camps would continue to grow and develop in exactly the same way as the whole of the industry for which they were providing training. It was already clear today that such a combination of learning environments could only be made possible by online learning and that the benefits of online and offline learning could deliver the best results.

Workshop 4 resulted in the following areas for action:

Education systems will have to be adapted in line with the new requirements of the digital revolution. For the purpose of imparting digital skills, **updateable basic and job-specific modules** will have to be developed for **initial and continuing training programmes. New forms of learning and new e-learning spaces** will have to be designed and integrated. To discover more about the qualifications that will be required in the future, sponsorship will be provided for the **Arbeitsforschung 4.0 (Work Research 4.0)** programme. The **digital divide must be closed by providing access to digital infrastructure.**

Closing words

Boris Velter, State Secretary for Labour, Integration and Women's Issues in Berlin, thanking the participants for sharing their ideas and information so successfully

At the end of the conference, *Boris Velter, State Secretary for Labour, Integration and Women's Issues in Berlin,* stressed that the conversation begun at the conference would continue over the coming months at an in-depth level. He reiterated what a complex yet palpable issue "Work 4.0" was and the kinds of changes that would result for people's working lives. He then went on to emphasise that the areas for action identified should now be used to develop pilot projects from Berlin with a view to actively shaping the opportunities and challenges associated with digitalisation.

After thanking the podium discussion guests and the workshop speakers and contributors, State Secretary Velter wrapped up the conference by thanking the participants for coming and for sharing their ideas and information so successfully.

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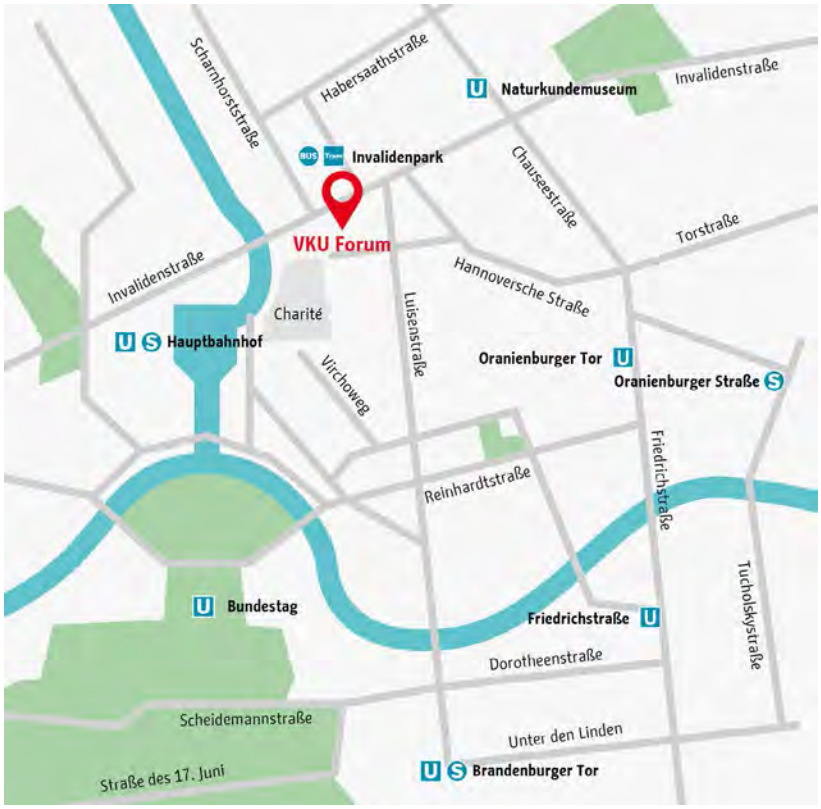

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