IMPULSE PAPER

… and what are you doing about it?
Mastering the impact of digitalisation
# through education and training

Content

Introduction

Digitalisation is driving change in the economy and society at a rapid pace. Industry is both driving these changes and affected by them. A modern, digitally networked world of work touches every area of the value chains and value networks – with effects on all employee groups in development and design, scheduling and administration, manufacturing, assembly and shipping.

The impact on the occupational landscape varies greatly: many job profiles are changing through the use of digital tools and new work organisations, new occupations are emerging, others are disappearing.

The way in which employees are affected and the individual need for (adaptive) training also varies. Whereas previously the focus of efficiency increases was more on production and manufacturing, current developments show that digitalisation also increasingly affects commercial, planning and engineering professions:

- New digital tools such as virtual reality, artificial intelligence (AI), product lifecycle management and digital twin bring significant efficiency gains throughout the value chain, but require continuous training for **engineers**.

- Increasingly autonomous, intelligent driverless transport systems and developments in automatic picking[1] are leading to many jobs being cut in **logistics** and dispatch centres. At the same time, the need for staff with advanced skills to programme or maintain these systems is increasing. The trend is therefore towards fewer employees, but with a significantly higher level of competence.

- Standard administrative processes, such as **accounting**, are increasingly controlled by software robots and AI systems. The substitution risk of jobs in the commercial sector is correspondingly high.

- New forms of cooperation, for example in agile work forms or in international and inter-professional teams, require more s**elf-organisation and intercultural competences**. New approaches to company competence
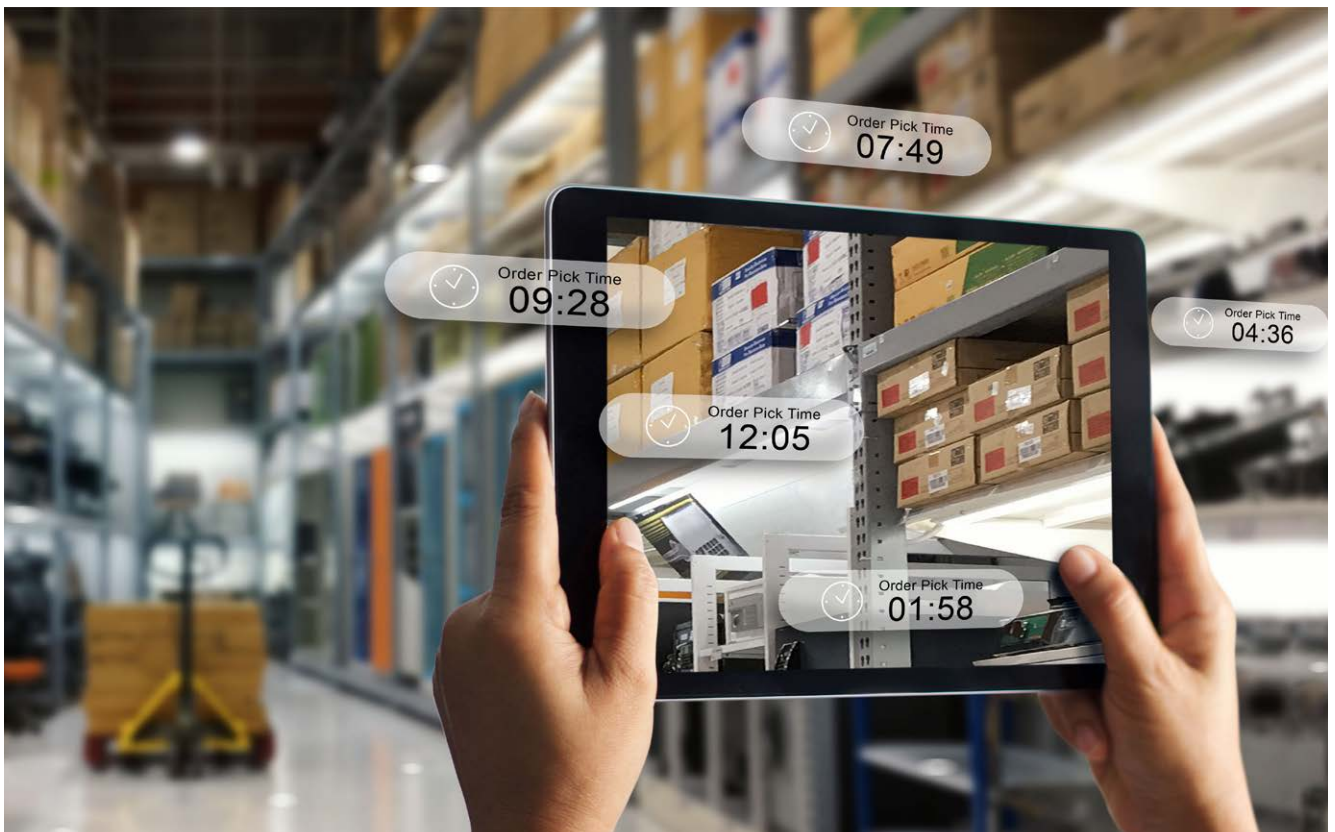
1   Automatic picking describes the removal of goods from the shelves and placing them in a shipping package by a robot.

development for more **personality development** are necessary.

- AI-based speech recognition is leading to job losses in **call centres**.

- The introduction of digital tools, especially for communication, is also changing the meaning of leadership. **Managers** need new qualifications to cope with this change.

Basic digital skills need to be developed across all employee groups, complemented by job-specific technological skills.

Doing nothing is therefore not an option – neither for employees, nor for companies and the social partners.[2] The digital transformation cannot be turned back or slowed down. In order for Germany to remain successful on the global market as an attractive and competitive industrial location with innovative products and services, we need an education offensive to attract and retain skilled workers.

In this impulse paper, we build on the findings of an earlier impulse paper "**For a sustainable learning culture in companies**".[3] This was published in 2019 by the working

group "Work, Education and Training" of the Plattform Industrie 4.0. In it, the working group presents recommendations for action based on a three-dimensional reference framework model consisting of corporate and leadership culture, organisation and structure, and personal responsibility. These three "branches" contribute to developing a sustainable learning culture in the company.

Against the backdrop of this three-dimensional, normative structure, the working group now focuses on company and government practice: we present examples that show how companies maintain their competitiveness through proactive further training measures. In addition, we show how the social partners are responding to the challenges of digitalisation. With this holistic view of the topic, readers should get concrete advice on possible solutions to shape the digital transformation in the company. The practical examples listed are primarily intended to show the principle of the measures and how they can be implemented. It is less about the concrete content of the measures.

2   The term "social partners" refers to the employers' associations and trade unions.
3   https://www.plattform-i40.de/PI40/Redaktion/DE/Downloads/Publikation/impulspapier-fuer-eine-zukunftsfaehige-lernkultur-im-unternehmen.html.

Examples of Good Practice

The Future Fund at Siemens AG

Siemens AG and its general works council want to proactively shape structural change. Together, the company partners want to create a learning organisation in order to minimise the risks of structural change and at the same time optimise the opportunities of change in the interests of the employees. Everyone agrees: employees must have the chance of continued employment in new, sustainable jobs, both today and tomorrow.

Against this background, the company and the general works council have concluded a general works agreement. The goal: to create a new learning culture in a sustainable way. In addition, a **Future Fund** was created that enables qualification and learning – with many new approaches – even beyond the existing level. The Future Fund contributes to a new understanding of what it means to be a learning organisation and to creating **individual freedom for learning**. A significant cultural change at Siemens AG is to be brought about in this sense and established on a sustainable basis. Local implementation is promoted by the works management and works councils.

The Future Fund promotes learning programmes that give employees **new orientation** in disruptive employment. It also finances projects within the framework of structural changes that support the exchange of knowledge and capacities – across site boundaries.

Siemens is convinced that employees and their representative bodies, companies and social partners ought to be called upon to jointly and actively shape the many changes. This is in the interest of everyone involved. Employees expand their employability and job security in the company through regular job-related further training, based on existing experiential knowledge supplemented by mastery of new technologies.

A total of up to 100 million Euros has been made available for the Future Fund for four years since January 2019. The funds are allocated by an allocation committee (with equal representation between the central works council and company management). In principle, applications to the Future Fund can be submitted by the organisational units as well as the management together with the Works Council.

Upskilling & Reskilling: "Capability Shift" at Festo

Festo has its roots in pneumatic automation technology – a field in which the technology company is still a global leader today. The shift to industry 4.0 brings with it new demands on employees. For example, certain skills will be less in demand in product development in the future, while others will be in greater demand. In order to meet these requirements and Festo and Festo Didactic have launched the **"Capability Shift"** project to provide strategic support for the change in skills.

The project is divided into three phases:

1. **Derivation of competences that will be decisive for success in the future**
   Competences are derived from the corporate strategy.

2. **Identification of necessary qualification requirements**
   Needs are derived from the existing and future competence profiles of the employees.

3. **Competence development based on concrete measures**
   This involves the planning and implementation of concrete measures.

The measures in the Capability Shift project are roughly divided into **upskilling and reskilling**:

● **Upskilling**: expanding the current job profile/skill set through further qualification.

● **Reskilling**: retraining for a new job profile.

In the first phase, the following areas were identified, for example:

Occupational Change	Future Focus	Upskilling or Reskilling?
Design engineer to lightweight design engineer	Resource-efficient construction	Upskilling
Mechanical Engineer to Mechanical Engineer with Advanced Software Competences	Among other things, basic knowledge and additional skills in the field of software and electronics	Upskilling
Mechanical Engineer to Junior Software Developer	Advanced IT skills	Reskilling

courses on the Festo learning platform LX. This is the best way to learn the skills while working. Since the desired qualification is at university level, further courses are to be offered in cooperation with local and national universities.

Existing software tools such as **competence management systems** or the **Festo learning platform LX** are used to plan and control the measures.

An important success factor is the early involvement of all stakeholders: from the requesting departments to Human Resources (strategic project management of the measures) and training experts from Festo Didactic to works council representatives. The first measures are currently underway and should be successfully completed by 2025.

As part of its strategic orientation, Festo invests specifically in lifelong learning for its employees: around 1.5 percent of turnover is used in training and further education in the learning company, including the "**Capability Shift**" measures.

In the first two cases, the target competences are much closer to the competences of the existing job profiles. Therefore, an **upskilling measure** is sufficient. In the third case, a more far-reaching competence development is required: a reskilling measure is necessary. Depending on the **individual competence profile** of the respective employee, there are individual learning paths.

Festo and the experts at Festo Didactic, the world market leader in technical education and training, plan and implement the upskilling and reskilling measures. In doing so, they use their own training offers, but also call on cooperation partners.

Reskilling for Junior Software Developers is prepared in close cooperation with local universities. Depending on the previous knowledge of the participants, certain basic knowledge must be acquired (e.g. mathematics). The requirements are mostly covered virtually with digital

Qualifying for digitalisation with the industry 4.0 learning factory at BENTELER

The rapid changes in the digitalised world of work are a challenge for education and training: new technologies must be integrated into qualifications.

With all the developments, it is also increasingly necessary for people to be fit not only in their own core area (for example, electrical engineering), but also to have skills in related professional areas (e.g. metal technology and information technology). This then enables qualified thinking and shaping in the overall process of value creation.

This is why BENTELER (a metal process specialist and partner for the automotive industry) relies on **interdisciplinary training:** for example, IT trainees also learn the basics of metal and electrical engineering, metalworkers are trained in electrical and PLC technology, or electronics technicians in the metal sector also learn welding or how to handle machine tools.

In this way, the trainees also work very closely with colleagues from other professions. This improves networking between the occupational groups and contributes to employability. This is also evident in joint cross-professional projects in which trainees from different occupational fields contribute their competences, deepen the inter-professional cooperation and internalise the advantages. IT has become an important component in all apprenticeship occupations.

Overall, BENTELER focuses on three core areas in Training 4.0:

- Changed technical content on digitalisation and Industry 4.0 as well as participation in global structures through stays abroad;

- Development of the personal and social competences of trainees;

- Combining job-specific competences (specialist knowledge) with overarching interdisciplinary know-how (generalist knowledge).
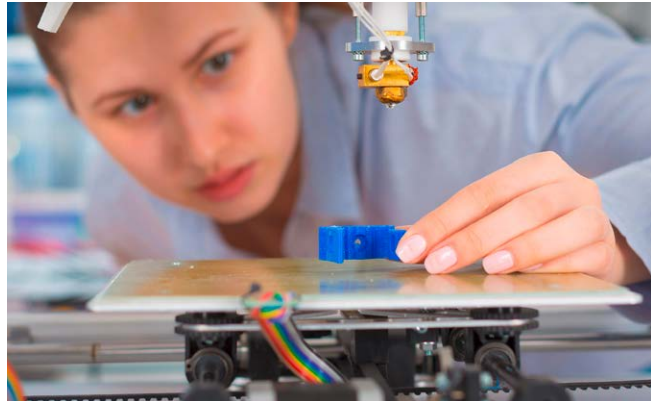
To implement these, BENTELER – in close coordination between the training and specialist departments – has identified content that will become increasingly important in the future:
- Radio Frequency Identification (RFID)
- Networking
- Cloud
- App control
- QR codes and barcode
- Big Data
- 3D printing
- Data security
- Smart Glasses
- Visual detection of workpieces
- Quality control with cameras
- Network technology
- Remote Maintenance
- Raspberry Pi

The company has implemented these technologies in a specially developed **industrial learning factory** where all apprentices are trained. The training courses were created under scientific supervision for different training professions. A basic course, which was designed for all technical and commercial professions, introduces the content of industry 4.0. In more advanced courses, the trainees can then deepen the content in a targeted manner.

The courses were also redesigned in terms of methodology and didactics, so that they now work with tools such as Kahoot, Mentimeter, self-learning instructions, short presentations or a crime game on data security.[4]

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4   An exciting insight into the learning factory can be found on YouTube using the keywords BENTELER and LERNFABRIK.

Agile further development of vocational training

Initial and continuing education and training are an essential key to the forward-looking securing of the next generation and the future-oriented development of skilled workers. In this understanding, the reorganisation of training occupations and further training regulations also takes place in close cooperation and joint responsibility of the social partners. After all, the maintenance, adaptation and further development of skills are crucial – both for the competitiveness of companies and for the employability of their staff.

Against this background, the social partners agreed at an early stage to incorporate the new qualification requirements of the digital world of work into vocational education and training in an agile process, to set new standards and to align skilled work with the future. Four milestones of this process are explained in more detail below.

Milestone 1: Modernisation of training occupations

In order to modernise the training occupations, experts representing both employers and employees revised the training regulations and the company training framework plans for metalworking and electrical occupations in 2018 and for IT occupations in 2020. They were supported by

the **Federal Institute for Vocational Education and Training (BIBB)**. Correspondingly, the framework curriculum committees of the Standing Conference of the Ministers of Education and Cultural Affairs in the Federal Republic of Germany (KMK) have developed the curricula for school teaching.

As part of the modernisation of the industrial **metal and electrical occupations** and **mechatronics technician**:

- a new occupational profile item "Digitalisation of work, data protection and information security" was introduced,

- the in-company learning content was updated with regard to **qualification requirements relevant to industry 4.0,** and

- the relevant competences for central fields of action of digitalisation and industry 4.0-technologies were set out in the form of so-called "additional qualifications" and regulated as uniform national qualification standards.

With the aim of taking into account the increasing complexity of data, systems and networks, the **IT occupations** were also comprehensively modernised and adapted to the associated qualification requirements.

- A distinctive feature of the training occupations in both fields are broad-based qualification profiles. They are based on a holistic understanding of the occupation, which is consistently oriented towards business processes and the system-technical interrelationships of digitisation and industry 4.0 technologies as well as the respective customer relationships. The training occupations are thus extremely flexible in their operational design with regard to technological changes.

- With a view to the digitalisation of work processes and business models, the new apprenticeship occupation **"Businessperson for digitalisation management"** was developed.

- the IT specialist was expanded – with regard to network infrastructure and interfaces as well as Big Data and process optimisation – to include the two specialisations **"digital networking"** and **"data and process analysis"**.

- All occupational profiles are characterised by the fact that the topics of **data protection and security** are widely integrated and comprehensively present.

Milestone 2: Implementation aids for training and qualification

Implementation aids are offered for the individual occupations which experts from the social partners from in-company practice have developed together with the BIBB's "Shaping Training" team. They provide important instructions, application examples and practical tips for planning and implementation.[5]

Furthermore, the joint project IT:D of the Nachwuchsstiftung Maschinenbau (NWS) and the IG Metall can be seen as a step towards how the social partners develop competence development concepts for the players in in-company vocational education and training and for the trainees.

With the BMBF-funded project entitled "IT:D – Digitalisation in Vocational Education and Training"[6], the joint partners NWS Maschinenbau and IG Metall have created a regional network in Baden-Wuerttemberg in which trainers, training officers and trainees from almost 50 companies in small and medium-sized enterprises (SMEs) can regularly exchange information.

The network partners from the SMEs are joined by selected knowledgeable companies from the mechanical and plant engineering sector. They contribute current content on digitalisation and the development of digital transformation to this exchange.

As a result, concrete solutions are available for company training needs in the digitally networked world of work – also for SMEs in other sectors. The offers are as diverse as the interests and needs of the participants: Training offers as seminars or workshops – in presence or as web seminars – or digitally supported learning modules and learning tasks on the project's own learning platform MLS find their way into the training activities of SMEs.

Companies need qualified specialists to master the current and future challenges of a digitalised working world. The exchange in the IT:D network shows in particular how counselling and mentoring at eye level and a regional offer of education and learning structures can support numerous small companies on their way to digitally networked vocational training.

Milestone 3: In-company training for central fields of action in digital transformation

In the modernisation of industrial metalworking and electrical occupations and mechatronics technicians, seven central qualification focus areas were named as optional additional qualifications. These bundles of competences are described **as uniform national qualification standards** and correspond precisely to the skills, knowledge and abilities required in these fields of action.

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5   The implementation aids are available free of charge for download as a PDF or can be ordered as a print-on-demand version. In addition to the implementation aids, interested parties can find further documents to supplement the booklets on the BIBB careers pages under the heading "Additional materials".

6   www.itd-bw.de.

These standards can also be used for in-company continuing education. They give companies, which are positioned differently in the digitisation process, the opportunity to build up competences for the digital transformation in line with their needs. In this way, the qualification of skilled workers can be designed on the basis of the described qualification standards in a **job-related, needs-based and team-oriented** manner in connection with current or future work requirements. The standards thus represent an attractive opportunity to promote the vocational capability of skilled workers and to link vocational learning with the current work requirements in the company.[7]

The qualification content is consistently oriented towards the technical and content-related dimensions of work activities as well as the data-based processes and technologies of company performance. Against this background, they provide companies with an important orientation for the design of appropriate qualification measures within the framework of necessary adaptation or maintenance qualifications.
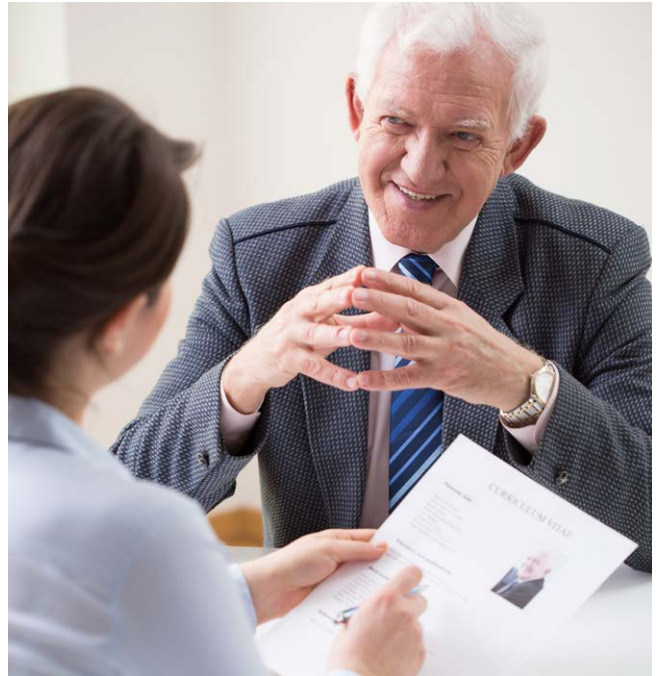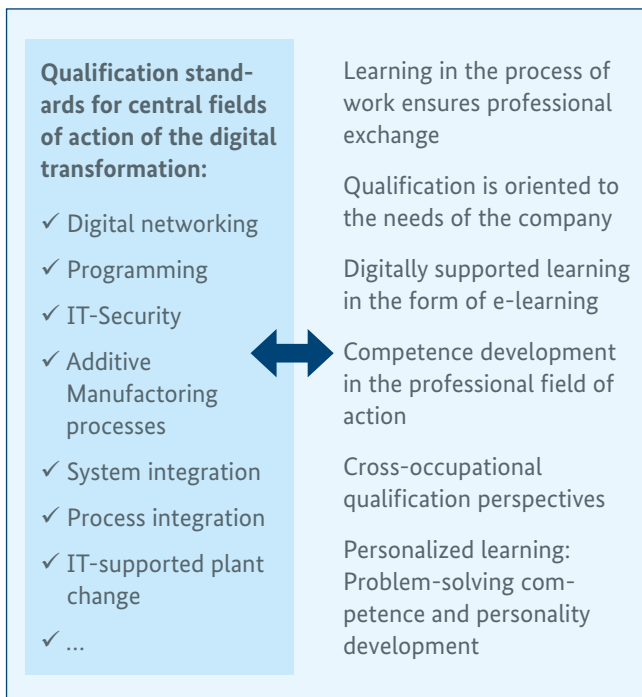
Figure 1: In-company continuing education with a perspective

Qualification standards for central fields of action of the digital transformation:

✓ Digital networking
✓ Programming
✓ IT-Security
✓ Additive Manufactoring processes
✓ System integration
✓ Process integration
✓ IT-supported plant change
✓ …

⟷

Learning in the process of work ensures professional exchange

Qualification is oriented to the needs of the company

Digitally supported learning in the form of e-learning

Competence development in the professional field of action

Cross-occupational qualification perspectives

Personalized learning: Problem-solving competence and personality development

Micro-credentials
Integrated into the company process, flexible and modular continuing education offers the option of further qualifications over a longer period of time. Micro-credentials analogous to or compatible with the ECDS in higher education (which could also be awarded in cooperation with universities) are a starting point for making lifelong learning attractive for employees and employers alike.

Industry certificates
In other countries, non-profit organisations have been formed to standardise continuing education. These are often supported by companies and, in addition to the actual competence descriptions, also develop curricula that can then be used by training providers (usually for a fee). Examples include the National Institute of Metalworking Skills (NIMS) or the National Coalition of Certification Centers (NC3) from the USA, which have also developed standards for industry 4.0. Flexibility and speed are often cited as particular advantages of this principle. However, the agile procedure for integrating digitalisation and Industry 4.0 into initial and continuing training shows that the German VET system can also be flexible and fast.

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7   See also information from the social partners: 2021 IG Metall, Gesamtmetall, VDMA, ZVEI, Fachkräftequalifizierung für Digitalisierung und Industrie 4.0 – Betriebliche Weiterbildung mit Perspektive, Arbeitsplatzbezogen – Bedarfsgerecht – Teamorientiert https://www.gesamtmetall.de/sites/default/files/downloads/flyer_fachkraeftequalifizierung-fuer-digitalisierung-und-industrie-40_final.pdf.

Milestone 4: Attractive further training regulations

With the introduction of transparent further training levels as part of the Vocational Training Act (Berufsbildungsgesetz BBiG) Amendment 2020, the vocational competences acquired during vocational training can now be expanded in a targeted manner within the framework of federally regulated further training that builds on each other in terms of content, and thus the ability to act in the context of new vocational challenges can be further developed and promoted.

A core element of this **"higher-qualification vocational education and training"** is the uniform, attractive and internationally comprehensible qualification designations:

- **Certified occupational specialist**

- **Bachelor Professional**

- **Master Professional**

They underline the equivalence of vocational and academic education, improve the attractiveness of vocational education and training and thus sustainably strengthen future-oriented skilled labour security/development in a changing vocational environment.

On the basis of these new regulations, the fourth step of the social partners' agile procedure is now to amend the further training in the metal, electrical and IT sectors.

The goal of modern continuing education must always be to integrate it into the operational process, which includes flexible and modular continuing education with the option of further qualifications over longer periods of time. To this end, micro-credentials analogous to or compatible with the ECDS in the higher education sector (which could also be awarded in cooperation with universities) are a starting point for making lifelong learning equally attractive for employees and employers. This would also allow the alignment of corresponding funding instruments.

IT advanced training system

The BIBB preliminary studies on the first continuing training stage of the IT continuing training system have confirmed the need for occupational specialists. They provide valuable information on employment opportunities and qualification needs in the field of IT security and data protection. There are also recommendations for content adjustments and for the redesign of profiles at the first continuing education level:

- **Development Specialist**

- **Network & System Specialist**

- **Customer Advisor / Problem Solving Specialist**

- **Digital Network Specialist**

- **Data Specialist**

- **Security Specialist**

With the profiles of the second and third advanced training levels – which already exist in a comparable form in the IT sector – the ordinance can now be further developed very quickly in the expert procedure, taking into account the content-related follow-up options and the professional requirements.

M+E further training system

In the metal and electrical sector, the existing further training regulations – with a few exceptions – reflect qualification requirements oriented towards the specialist disciplines and the classic image of the master craftsman, as has been the case up to now. In the context of digitalisation and Industry 4.0, however, skilled workers and managers are required to have competences that are oriented towards systemic structures, process-oriented workflows and collaborative, inter-professionally networked cooperation.

In this understanding, the M+E sector is concerned with a comprehensive reorganisation of the content and structure of continuing vocational education and training, which also includes the new BBiG regulations on higher-qualification vocational education and training.

Taking into account the results of the BBIB development projects, the premises for further work have already been formulated. The aim is to develop a future-oriented further training system for the M+E sector to promote the development of vocational competences in the process and system technology contexts and the required interoperability of networked systems:

- with profiling for specialist and management tasks in the areas of:
  - **Product & System Design** and **Shop Floor Management** at the second further education level (Bachelor Professional) and
  - **Systems Engineering** and **Manufacturing Engineering** at the third level (Master Professional);

- with meaningful degree titles in the sense of an **identification and transparent orientation function on the labour market**;

- with **multiple access regulations** to the first continuing education level (certified occupational specialist) for all M+E occupations including mechatronics engineers, production technologists and construction occupations to develop and promote the potential of inter-occupational cooperation;

- with consecutive qualification content and an increasing degree of complexity across advanced training levels 1, 2 and 3;

- to organically link **horizontal competence development and professional advancement**.

In this area of further training, too, the initiative of the social partners – both in terms of the content of the qualification and its structuring – has developed to such an extent that the procedure for drawing up the further training regulations has been applied for.

Achievement of objectives and challenge

With the agile procedure and the milestones described, it has been possible to align initial, continuing and further vocational training with the requirements of digitisation and industry 4.0 technologies in the shortest possible time and thus to provide a reliable basis for securing the next generation and developing skilled workers in the various sectors, which must now be taken up in a targeted manner at the company level, innovatively designed and sustainably used in order to master the technological transformation with qualified skilled workers.

Reflections

Promote STEM professions

In addition to the further education of employees in active professional life, it will also be crucial to inspire young people (especially girls and young women to take up STEM professions (science, technology, engineering and mathematics) so that they are able to take up corresponding professions in industry 4.0.

However, STEM education is not explicitly about encouraging vocational training. It is rather about enabling young people to find their way in a world increasingly shaped by technology, to participate as mature citizens in political dialogue and to handle technical subjects responsibly.

Of course, good STEM education also offers young people the opportunity to discover their interest in technical and scientific topics and to make a qualified career choice later on. Therefore, STEM subjects should be included in the curriculum of all types of schools.

Companies and social partners can also contribute positively to the promotion of young people. They are already doing this by enabling pupils (and teachers) to take part in taster days and work placements, by introducing career profiles through classroom visits or by engaging with young people (e.g. through the SAP Young Thinkers and SAP Young Thinkers community). They support technology education by training teachers and providing materials for the classroom. Representative of many other activities is the Wissensfabrik (Knowledge Factory), an association with over 100 company members that has been supporting partner schools for many years to implement attractive technology projects in STEM lessons through lighthouse projects.

Of course, it is important that companies do not misuse these activities as hidden advertising. The focus remains on STEM education for the pupils.

Lifelong learning

Collective agreements

The dynamics of rapid changes in change processes and the driving forces of permanent further development in companies make it difficult to recognise which changed occupational structures and qualification profiles will endure in the future and contribute to competitiveness and job security.

In the search for solutions in less plannable and determinable work systems, it is necessary to learn in a diverse and continuous way. Being and remaining innovative requires an interaction between individual competence and organisational development. One therefore also speaks of learning organisations, learning companies, even learning regions. Learning has become the key category of a society today, with different concepts of learning being applied. On the one hand, it is "adaptation learning", whereby individuals are compelled to relearn, which can be associated with anxiety and effort. On the other hand, there can be "unfolding learning", when individuals develop their own identity and expand their possibilities for action.

Increasing learning opportunities and opportunities to learn in the workplace make it more important to design work in a way that promotes learning and competence. In combined work and learning situations, comprehensive professional, social and personal competence developments can be pursued in "blended learning concepts". As a result, there is an increased chance of a learning culture in companies that takes away employees' fear and gives them the support to accept the new challenges and unfamiliar situations. Employees and managers benefit together from a strong **learning culture**.

With the support of self-directed learning, especially through digital offers and corresponding framework conditions for their use, learning can be individualised and flexibly integrated into everyday working life (cf. Plattform Industrie 4.0 2021: 5).[8]

The spirit of collective agreements in industry supports the design of in-company continuing education processes. The preamble of the collective agreement on qualification in the metal and electrical industry in Baden-Wuerttemberg states: "The parties to the collective agreement agree that the issue of qualification and lifelong learning is a key to securing the competitiveness of companies and jobs as well as the employability of the workforce. With this collective agreement, the parties to the collective agreement commit themselves to the objectives and to their task of creating the framework for this issue of the future".

Collective agreements define the quality of qualification measures and allocate responsibility for corresponding measures, e.g. in the form of the time made available and the financial means for implementation. They formulate minimum standards that can be further developed at company level. In addition, they affirm the tasks of interest representation and involvement of workers.

The collective agreements on qualification and training provide the opportunity to keep professional skills up to date and to develop personally. They support the opportunities for personal vocational training of workers via fixed-term severance agreements with a promise of re-employment, part-time models and financial support.

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8   cf. Plattform Industrie 4.0, 2021: Charter for Working and Learning in Industry 4.0, page 5.

Qualifying for the work of tomorrow

At present, the picture of developments remains complex: companies and employees are increasingly investing in further training measures and participation in further training measures is rising in companies. At the same time, it is obvious that further training activities will be cut back or discontinued if companies lose orders and income, employees have to be put on short-time work and the continuation of business activities is uncertain.[9]

The state reacts with **"qualification offensives"** (wage subsidies for all further training measures, staggered subsidy amounts, promotion of training measures and qualifications with a smaller minimum time scope) and with a **national further training strategy** (Nationale Weiterbildungsstrategie) to support the shaping of change in the world of work.[10] In this strategy, among other things, the amended training occupations, modernised further training and qualification standards are to ensure that the qualification offers and measures are up-to-date.

In view of digitalisation, industry 4.0 and the need for appropriately qualified skilled workers, the **"Work of Tomorrow Act"** of May 2020 is intended to encourage companies to use the time freed up by a decline in work to qualify their employees. Subsidies for qualification measures as well as remuneration subsidies are available through the provisions of the Qualification Opportunities Act (2019). With this package, the legislator is expanding the possibilities of the **Federal Employment Agency** to promote the further training of employees who are particularly affected by structural change. The Qualification Opportunities Act contains, for example, a legal entitlement for low-skilled workers to funding for vocational post-qualification in the sense of catching up on a vocational qualification. In the course of this, legal foundations have also been created to support qualification and training measures during short-time work.

In this way, qualification-oriented further training or adaptation qualifications that go beyond a purely job-related qualification can be improved. Adaptation training in the form of work process-oriented training can be geared to the individual needs of individual employees or entire teams, as well as to the specific needs of the company. They are an instrument to prepare for upcoming technical and organisational changes. The more employees in a company can take advantage of further training programmes, the higher the benefits paid by the Federal Employment Agency in terms of course costs and wages. If there are company agreements on continuing vocational training or corresponding collective agreements, funding increases even further.

The current guidance structures and support instruments of the employment agencies thus go beyond their previous core business of job placement and increasingly into prevention (of unemployment). The company-specific and/or individual orientation and decision-making advice and financial support support both companies and employees in the digital transformation. Against this background, the employment agencies fulfil a bridging function in the transformation (Federal Ministry of Labour and Social Affairs).

However, state funding and its funding criteria should be more open to digital continuing education concepts at all levels in order to facilitate low-threshold access.

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9   Cf. IW Weiterbildungserhebung 2020.

10   More information: BMAS on the Qualification Offensive and BMBF on the National Continuing Education Strategy; furthermore: Sup-port instruments for the labor market: Qualification Opportunities Act, 2018; Work of Tomorrow Act, 2020); https://www.bmas.de/DE/Arbeit/Aus-und-Weiterbildung/aus-und-weiterbildung.html.

Leadership in the digitalised production environment

Why do we need a new leadership culture? Digitalisation in production-related areas with new processes, methods, modern equipment and tools is permanently changing the production environment and will probably continue to do so at an increasing pace in the future. And will most likely continue to do so at an increasing pace in the future.

New technologies will change the way we work. Orders will be reported back digitally. Work documents are available in digital form and are linked to the physical environment at the workplace through augmented reality. Faults are recognised immediately and reported to the support functions without delay. Jointly developed solutions will then be directly implemented. Assistance systems with artificial intelligence will support employees in performing manual tasks, and much more. It is to be expected that this technical progress will accelerate. Managers cannot be expected to apply all these technologies at an expert level. In the future, this will increasingly be the responsibility of the teams and the employees. It is therefore necessary to question and redesign the understanding of roles and the distribution of responsibilities.

We will fully exploit the potential of digital technologies if we are also prepared to critically question traditional ways of working and methods.

- What knowledge and skills do production managers need to fully exploit the potential of digital technologies?

- What understanding of roles and leadership will managers of the future have?

- How will we work together in an operational organisational structure in the future?

- How will tasks and responsibilities be defined in the production areas and how will we ensure that both managers and employees take responsibility?

Managers' tasks and understanding of their roles will have to be adapted to the requirements of future working environments. This process must be strategically planned and actively shaped in the companies. The early involvement of employees and social partners will become a decisive success factor for the digital transformation.

How do we apply a new understanding of leadership in practice? In many companies, the transition process will lead to a situation in which a traditional understanding of leadership that has persisted over many years and been very successful up to now will exist in parallel with new, modern approaches to employee leadership. Also, the learned and trained behaviour of managers will not change overnight. The new requirements profile for managers can also lead to conflicts that can only be solved with time and human resources. This makes it all the more important for companies to win over and inspire existing managers for this process of change. However, it will be necessary for these colleagues to question their current understanding of leadership and be prepared to adapt to the new working environments. New leaders must be actively supported on their development path in the organisation. All the more it must be the task of the companies to win over and inspire leaders for this process of change.

How will the leadership role change? The manager must supervise technological change in the team. He or she will act as a coach, facilitate the change and focus on the employees. The future leader will be able to inspire the employees through her own authentic behaviour, working on an equal footing and will show what is required of the

employees. She will enable the team to work out joint solutions and implement them independently. Empathy and active listening are key competences in ensuring employees' development opportunities and supporting them in the resulting challenges.

The manager plays a key role in ensuring that all employees have the necessary skills and knowledge to operate in the new production environment when the time comes. They therefore need a broad understanding of the possible uses of digital technologies. Exchanges between managers in networks and collegial consultation can make a positive contribution to this.

The digital transformation has the potential for a sustainable improvement of production environments. The main task now is to develop the digital skills and also the social skills of managers so that they can actively support the transformation process. In the future, managers will increasingly have the task of developing individual employees and the team in a targeted manner and providing impetus for the sustainable improvement of the work and production system.

Conclusion

In a world with more volatility, uncertainty, complexity and ambiguity ("VUCA"), all developments are dynamic and bring about rapid changes for everyone. Digitalisation and technical developments are changing working methods, processes and procedures in working and private life enormously and at high speed. This poses new challenges for companies, employees, society and the state.

In order to shape this development well, the cooperation and commitment of all those involved is necessary. The focus is particularly on the qualification and competence development of employees.

Creative ideas are required here. An important focus is on teaching and studying subjects or the associated professions in the subject areas of mathematics, information technology, natural sciences and technology, whose added value contributes significantly to the prosperity of our national economy.

After the successful transition into working life, lifelong learning is necessary to ensure continuous adaptation to new developments. Here, in addition to companies and employees, works councils and trade unions also have an important role to play. Employees are called upon to ensure their employability and to commit to their own qualification. Companies must invest in the further training of their employees so that they are prepared for the future. Works councils and trade unions accompany this process in a constructive and critical way. The state and society complement each other where the commitment of those concerned reaches its organisational and financial limits. If all economic and social forces work together and get involved, it will be possible to successfully shape the transformation process and secure employment in Germany.

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