

Successfully developing workplace-related skills using digital assistance systems

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1. Digitising the world of work as a driver of new opportunities for developing workplace-related skills

In the “Future of Jobs Report 2020”, 94 per cent of the managers interviewed stated that they expect their staff to carry on with further training programmes and continue gaining new qualifications. Apart from the high percentage, it is the increase when compared to 2018 that is remarkable. Back then, 65 per cent of those surveyed expected their employees to continue with further training (Zahidi et al., 2020). Following the COVID-19 pandemic, the pressure on staff to gain further qualifications is rising. “Teaching future skills ¹will become more important than ever in Germany over the years to come. Even before COVID-19 took hold, disruptive business models had changed the world of work beyond recognition. The crisis resulting from this pandemic is accelerating digital change and influencing existing business models with ever greater force” (Kirchherr et al., 2020, p. 4). The survey shows that “in the short term, the focus is on the most urgent deficits in training, notably key digital qualifications, mainly in the fields of ‘digital interaction’, ‘digital learning’ and ‘digital literacy’” (Kirchherr et al., 2020, p. 5).

Besides the challenges brought about by the coronavirus, the ongoing, technology-induced transformation process is one reason for increased requirements in the development of skills. At the same time, the design of the workplace is changing in this context. It is becoming more context-adaptive, intuitive, networked and supported by assistance systems (see Figure 1). This article concentrates on the increasing significance of digital (learning) assistance systems.

¹ Future skills are those skills that, over the next few years, will become ever more important for working life and participation in social aspects in all sectors. They can be subdivided into “key digital skills”, “technological skills” and “key non-digital skills” Kirchherr et al. (2020, p. 5).

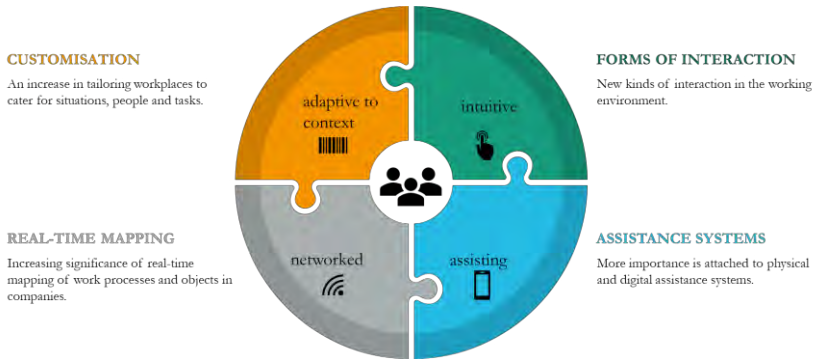


Figure 1: Workplace trends (Fraunhofer IAO)

The changing set-up of work often results in a change in the distribution of skills between people and technology and the need for adapted employee skill profiles (cf. (Ganz et al., 2019; Ittermann & Niehaus, 2018; Windelband & Dworschak, 2015)). The extensive debates in science and industry on this subject reveal both challenges and opportunities for companies. The company's goal is to design an intelligent work system that benefits from increased productivity and optimisation of resources. Technologies, such as artificial intelligence (AI), offer huge added value potential in this respect (Behrens et al., 2021). In order to develop the potential for change in terms of technical, organisational and social aspects, an intelligent learning system needs to be created at the same time that is directly linked to the work system. The use of artificial intelligence (AI) can promote needs and personnel-specific training which, at the same time, enables the improvement of the underlying technical system (reciprocal learning). The best scenario will be that both the work and learning systems are positively influenced by AI-assisted learning technology.

There has long been a debate in both research and in everyday life on the challenges posed by “lifelong learning” and “work-related learning”. Digitisation and new AI-assisted learning technologies are now able to reach these goals and help staff in the sense of “learning workers” in order to improve the efficiency of developing workplace skills. Innovative learning technologies refer to new ways of developing workplace learning. With the help of new learning technologies, the previous external control of learning modules and content is expanded to include the possibility of self-governed learning that is flexible in terms of both time and location. By tailoring the learning units and making it possible to learn in different locations, it will be possible to continuously develop skills and acquire qualifications that are specific to the individual and job role (Jenewein, 2018; Sammet & Wolf, 2019; Sauter & Sauter, 2013).

Creating a work system that promotes learning can, for instance, be supported by the use of a digital learning assistance system to convey content (Pokorni et al., 2021). Corresponding digital learning assistance systems will add a learning infrastructure to work, thereby creating work-related learning spaces in which a person can learn in a self-controlled and self-determined manner (Dehnbostel, 2020).

“Digital learning assistance systems” is a term that comprises, on the one hand, digital assistance systems that are used primarily to assist with work, and also include functions for imparting information and further training. On the other hand, digital assistance systems are created and used solely for further training within the company and without having an assisting function in a person’s job. A study revealed that roughly one third of the companies surveyed stated that they use learning assistance systems with the aim of getting their staff to gain further qualifications on an ongoing basis (Klapper et al., 2019).

This article aims to highlight the potential and challenges of digital (learning) assistance systems for workplace-related learning and to show the extent to which the introduction of corresponding systems can lead to further training in the workplace. We will initially present the joint project “TransWork” and the investigation that was carried out as part of the project (Chapter 1.1). This is followed by a sketch of the criteria for developing a successful introduction process with corresponding learning assistance systems (Chapter 1.2). Finally, the question will be examined as to the role that can be played by artificial intelligence (AI) in in-house further training measures (Chapter 2.1) and the challenges currently confronting the creation of AI-assisted learning (Chapter 2.2). Chapter 2.3 looks at two possible research and development projects. Finally, the development and planning of symbiotic interaction (human-machine) are examined in Chapter 2.4 and the ways in which mutual reciprocal learning in the interaction between humankind and assistance systems are analysed. The final section looks at the conclusions which can be drawn, offering an outlook on the development of workplace-related skills featuring artificial intelligence (Chapter 3).

1.1. The use of digital learning assistance systems

As part of the joint project “TransWork”² (TransWork - transformation of work through digitalization), research was carried out on digital tools and assistance systems. Here, digital assistance systems were investigated in terms of both their use as a working tool as well as their potential as a learning aid.

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The objective of the research carried out was to develop decision-making tools that primarily assisted those responsible for the standardisation process in assessing, selecting and reintroducing digital assistance systems.

The following topics were investigated:

- What digital learning systems are employed for which areas of use?
- What success criteria are key to introducing and using (learning) assistance systems?
- How is work transformed by the introduction of assistance systems (this does not constitute a part of this article, please see (Bauer et al., 2021; Link, Schnalzer, & Hamann, 2020))

As part of the TransWork project, a working definition was created first of all, which reflects the diversity of the different types of digital assistance. Accordingly, digital assistance “systems are computer-based systems that assist people with information intake (the way they perceive it), processing the information (decision-making) and carrying out work. A difference can be made between the extent, type and goals of support” (Link & Hamann, 2019, p. 684) in accordance with (Apt et al., 2018; Blutner et al., 2007; Busse et al., 2018; Link & Hamann, 2019).

In twelve collaborative projects from the main funding source “Work in the Digitalized World”, the procedures for the development and introduction of digital assistance systems were examined in 16 use cases³. Here a digital assistance system was used in one use case primarily as a learning tool, in six use cases it was used as a working tool and in nine use cases it was used as both a working and learning tool, depending on the area for which it was intended (Link, Schnalzer, & Hamann, 2020).

The ten assistance systems that offer the users learning opportunities are discussed below. An overview of the selected (learning) features of the learning assistance systems investigated is presented in the morphological box below, which was (Niehaus, 2017) expanded on the basis of, and adapted to, (Apt et al., 2018; Hacker et al., 1995) the investigation. The main points identified among all learning assistance systems investigated are in *italics*.

³ Data basis: 15 guided interviews with company representatives from ten collaborative projects and project documentation from two collaborative projects. Evaluation: qualitative, category-guided content analysis of interview transcripts and project documents and publications.

Feature	Attribute			
Assistance form	Learning tool		Working and learning tool	
Sector	Industry/ manufacturing industry	Service	Construction	Different industries
Target group	Employees without responsibility for staff		Employees with responsibility for staff	
Learning aid	Basic information	Advanced information	Knowledge query	
Usage interval	Once	Ongoing	Selective	Periodic
Support objective	Compensatory	Retentive	Widening	
Qualification requirements	None		Instruction (formal/informal)	
Adaptivity	No			
Documentation of learning success	Yes		No	

Table 1: Features and attributes of the ten digital learning assistance systems that were investigated (own source, *note: all stated attributes were found at least once in the assistance systems under investigation)

The evaluation showed the diversity of the possible applications (learning/training), the set-up (learning assistance/learning and work assistance) as well as the objective (basic knowledge/further information/knowledge query/documentation of learning successes) in different sectors (industrial/service/construction/industry-independent).

The digital learning assistance systems that were surveyed are mainly used for ongoing further training. This is shown in the characteristic attribute *further information* as the predominant learning aid, an *ongoing* usage interval as well as a support objective of expanding knowledge.

However, the learning assistance systems also partially provide support for *retaining* existing knowledge or for *compensating* for gaps in knowledge. Depending on the situation at work or the person using the assistance system, it can be used either *selectively* (with problems), *periodically* (regularly for recurring working processes) or to enable new members of staff to *learn the ropes*. The latter option allows the standardised preparation of information via the learning assistance system, in order to convey relevant aspects of work activities in a comprehensible manner and to ensure complete initial instruction. Most of the digital learning assistance systems observed are used at work on an *ongoing* basis. None of the learning assistance systems examined was able to cater to the member of staff *adaptively*, e.g. by adjusting the speed at which it was delivered. According to information provided by the interview partners, a brief in-house *introduction* (formal or informal) is required