

Workplace-based Learning in the Industrie 4.0: Multi-perspective approaches and solutions for the shop floor

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Today's workplace on the shop floor (the area of a factory where operatives assemble products) is highly demanding. The foremost goal is to maintain productivity to fulfill customer orders by producing the required number of products. The environment is a highly complex one: the machines become ever more complex, as do the products. The increasing automation requires maintaining a highly fragile equilibrium to enable the machines to run without human intervention for as long periods of time as possible. Furthermore technological innovation results in new materials and new technologies being used in production and for processing and assembling products. Last but not least, a decreasing workforce requires employees to become more flexible and master larger number of skills, for instance to be able to stand in when colleagues are not available. This requires to use machines that are not the primary area of expertise. As a consequence, the employee is under constant pressure to solve problems occurring on the shop floor as fast as possible, and simultaneously to improve his work-related knowledge, skills, and capabilities.

This makes the shop floor an area where the usage of technology to support problem solving and learning of the employee can result in significant benefit. Especially the usage of adaptive technology methods based on artificial intelligence methods carries a high potential: ideally, the support is context-depend (based on the affected machine, its state, the current product) and adapted to the individual employee (capabilities, work history, development goals).

This keynote gives an overview on current research on how AI-based architectures and tools can support humans and organizations on their way towards Industry 4.0.

We will elaborate on context-sensitive and intelligent-adaptive assistance systems for knowledge and action support for Smart Production, which focus on the skills and competencies of the staff and attempts to compensate for any skills that may be lacking with respect to performing tasks at the workplace (action support). In addition, knowledge-support services facilitate the continuous expansion of staff expertise through the acquisition of knowledge and skills in relation to production, product, and process. Such services serve to promote the professional development of the staff so that they can gradually start to perform more demanding tasks and serve as a counterbalance to the demographic change and the shortage of skilled workers. We will give examples of practical implementations, including the setup and operation of a manufacturing unit in the production process, as well as the preventive maintenance, maintenance, and troubleshooting.

Similarly relevant is the question how practical knowledge about work processes can be recorded and made available. There again, AI-based tools can provide support, e.g., by ensuring the recorded content contains all the relevant information needed for learning. Again, we will give examples of what such an authoring tool can look like.