Didactical Concept of Work-Based Training in a Virtual Working Space

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Future Technologies for Expertise Development (FuTEx) is a virtual company in which information technology (IT) workers can obtain a qualification towards an IT specialist certificate. The qualification addresses jobseekers, who naturally do not have an in-company workplace as a precondition for workflow-embedded learning and therefore cannot participate in a regular qualification according to Advanced IT Training System (AITTS). FuTEx was conceptualized and implemented by the Federal Association for Information Technology, Telecommunications and New Media (BITKOM), in cooperation with training providers. FuTEx is based on a virtual platform that provides a virtual work environment for the qualification of jobseekers according to the workflow-embedded method of AITTS. The German AITTS focuses on the development of professional competences through working experience. The individual working experience is enriched by a workplace which functions as a learning place and the real in-company job tasks which provide learning objectives. The main disadvantage of AITTS results from the exclusion of jobseekers, who are willing to undertake a qualification, but cannot earn a certificate, due to the lack of a workplace, which is a fundamental requirement of the certification. This article will address the theoretical basis of work process integrated learning environments, the regulative frame set by AITTS, the practical concept of FuTEx as a virtual work environment, and present final research results following completion of the qualifications. An earlier publication about FuTEx in the German language is based on interim results with respect to development and research (Schröder, Bernhardt, & Töpfer, 2010).

Keywords: work-based training, workflow-embedded learning, Web-based learning, virtual work and learning platform, experience-based learning, competence development

Introduction

Changes in work organization as the shift away from Taylorism in production processes and the penetration of all sectors with information and communications technology (ICT) are improving the conditions for targeted competence development at the corporate workplace (Dehnbostel, 2010).

As through knowledge- and theory- based learning and training processes, only a part of professional action competence can be acquired, especially in further vocational education and training, informal and experience-based learning have increasingly gained importance in Germany (Dehnbostel, 2007). Modern didactical concepts of workplace-integrated learning environments are based on action-theoretical approaches from work psychology (Hacker, 1982; Volpert, 1982; Frese & Zapf, 1994) and on experience-based learning approaches (Dewey, 1938).

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Web-based learning environments are mostly based on behaviouristic concepts. The challenge and the main research question of the concept described in this article is how to establish an experience-based learning and work environment for action learning and competence development in a virtual learning environment.

**Workflow-Embedded Competence Development Through Experience-Based Learning at Workplace**

Modern workflow-embedded education and training concepts are designed so that individual and corporate interests are both considered and workplaces are designed to be conducive to learning. Guiding dimensions for the improvement of a learning-conducive workplace design derive from industrial and organizational psychology. Work-based learning forms, integrated directly into the operational workflow and combining formal learning with informal learning experience, are fundamental to the organization of workflow-embedded training programs. Through these learning forms, targeted competence development processes become achievable (Schröder, 2009). The operational work infrastructure remains unaffected (Dehnbostel, 2007) through the implementation of work-bound learning forms. Among the workflow-embedded learning forms introduced into in-company work, process-integrated learning in recent years, the learning bay, quality circle, adequate approaches of coaching, communities of practice, working and learning tasks, etc. are to be mentioned (Dehnbostel, 2007). Working and learning tasks combine work and learning through the didactical expansion of real, operational tasks (Schröder, 2009). The processing of the tasks is associated with a high degree of personal responsibility, self-determination, and self-monitoring on the part of the learner.

Work-based qualifications include consulting and support concepts. As part of the workflow-embedded training concept of Advanced IT Training System (AITTS), the integral concept “facilitation of learning” has been developed. In order to support this kind of learning, the help of a learning “facilitator” is essential in order to ensure effective and sustainable learning, reflection of practice, and, conversely, application of theory to practice. The facilitator advises learning towards the person of the learner and towards the actual working/learning subjects. The facilitation of learning combines aspects of coaching and mentoring (Rohs & Käpplinger, 2004). It aims at supporting individual targeted competence development, the careful combination of the operational work and learning infrastructure, and the reflection of informal and implicit learning outcomes (Dehnbostel, 2010).

**The German AITTS**

The German AITTS was developed by various institutes of the Fraunhofer-Gesellschaft (which undertakes applied research of direct use to private and public enterprises and of wide benefit to society) under the auspices of the Ministry of Education and Research. Also, social partners in the German ICT industry were involved to monitor the process of development. The system is international by design—and not restricted to Germany with its own systems of education and training—as AITTS. Representatives of ministerial bodies and AITTS’ stakeholder organizations have been involved with the consultation and establishment of a European Qualification Framework (EQF). AITTS represents Germany in e-skills policies on multi-stakeholder partnerships in Europe and is a reference point for the European e-Competence Framework.

AITTS takes into account the acquisition of skills through informal learning at work. The development of individuals’ vocational competence is the focus of the final certification exam, which is carried out in accordance with DIN EN ISO/IEC 17024 (personnel certification).
At the specialist level, there are 14 information technology (IT) specialist profiles in five profile groups. Each profile defines requirements which consist of profile-typical work processes and competences (soft skills). Successful certification requires that the learner masters the work processes autonomously and has acquired the required competences (soft skills).

As part of the FuTEx, IT specialist qualification requirements for the certification and the contents and processes of IT specialist profiles are to be considered conceptually (see Figure 1).

**FuTEx—Future Technologies for Expertise Development**

FuTEx provides a virtual work environment for the further education of teams, consisting of several learners who learn through processing a real work task or project. This concept meets the requirements of AITTS, the certification authority and international standards. FuTEx links the participants of this concept for further education through digital media, who have to work and learn together but are located in different places. The virtual work environment becomes an “at distance” (remote) work and learning environment for linked learners. It is quite common for software developing projects to be realized by collaborators in geographically different locations. For example, the design of a software product and project management could be done in a company’s headquarters in Europe, whilst the coding is done in a branch office in India.
DIDACTICAL CONCEPT OF WORK-BASED TRAINING IN A VIRTUAL WORKING SPACE

FuTEx qualifications focus on job-seeking IT workers with professional experience. They have to meet the following requirements: (a) lack of up-to-date ICT qualifications, but experience in software development projects; (b) willingness and ability to learn new things, capacity for teamwork, willingness to work through networks, and interexchange of best practice experiences; and (c) readiness to participate in remote learning with digital media in the home office.

The IT specialist profiles can be certified through learning by completing a software development project: Software Developer, IT-Tester, IT-Project Coordinator, and IT-Quality Coordinator.

Characteristics of Workflow-Embedded Virtual Learning

FuTEx qualifications follow a blended learning approach which combines classroom learning, remote learning, and learning in projects.

Therefore, there is a need of:

(a) Diverse studying techniques (e.g., classroom learning, informal or experience-based learning, individual learning, and learning in communities);

(b) Diverse teaching methods (e.g., a classroom setting and remote learning, different types of courses in virtual classrooms, such as seminars, exercises, oral presentations, exchange of experiences, etc.);

(c) Different learning media (traditional, e.g., textbooks, learned journals, etc.; digital, e.g., e-learning, computer- or Web-based business games, etc.).

Participants in FuTEx qualifications are assembled in learning and project groups. They are coequal in the working and learning processes; they are facing different learning objectives in their training and have different roles in an actual software developing project.

The participants are accompanied by a tutorial team which consists of a facilitator, a (technical) expert advisor, and a project director. The support of a facilitator includes individual coaching and support throughout the learning process of the participants and the cumulation of working and learning processes as well as the progress of training. The facilitator is the essential contact person for participants for issues concerning the learning process. He/she determines individual learning targets and learning methods, structures the training chronologically, and supports the participants in developing awareness of the learning outcomes through shared reflection.

The conceptual frame of FuTEx schedules communication between the facilitator and the participants on attendance days or through the various communication tools of the Learning Content Management System (LCMS) (e.g., chat, forum, virtual classroom, telephone, or video conference).

The (technical) expert advisor is chosen with regard to the content and the needs of the (qualification) project. He/she is the essential contact person for the participants on functional and technical issues and an expert in a certain discipline concerning project objectives. He/she assists the participants with problem solving during the work on the (qualification) project and supports them with the documentation of the project in order to prepare the certification process.

The project director has two roles in this context. He/she is an expert advisor for project management for participants who are working towards an “IT Project Coordinator” IT specialist profile. He/she also monitors and controls the progress of projects.

Participants work and learn in a home office, which should be designed in a manner conducive to learning. The educational institutions that provide a virtual learning and working infrastructure must meet the following
requirements:

(a) Working and learning organization: ease of use, efficiency, usability, multivalent, and requirements-driven technical complementarity;

(b) Communication and cooperation by means of LCMS: Essential functions are telephone conference, chat, forums, e-mail function, who-is-online function, whiteboard, virtual meeting room with video conferencing, organizer function, “public documents” feature, and virtual classroom feature;

(c) Content/memory function: texts, curricula, learning modules, tools, with methodologically and didactically programmed content (e-learning tools), Web links, self-produced documents, and assessment materials.

(d) Database: administration, subscriber management, security, access permissions, storage and access of internally generated documents, reports, job results, photos, learning diary, etc.

(e) Software for the project work.

Central to the qualification are software development projects and real clients that need to be acquired by training providers. These should be “real” operational problems, which are invested with a real need. Projects must correspond in difficulty and complexity with the period of qualification and size of the learning team; meet qualification targets in their orientation, i.e., cover the work processes as described in IT specialist profiles; and be suitable with regard to data security, corporate security, and security classification.

The project owner should act during the project work as a customer, for example, during the order placement and the inspection of work results. Furthermore, the project owner should be available for consultation between the project manager of the project team and the expert advisor of the training provider.

**The Process of the FuTEx Qualification**

The process of the FuTEx qualification consists of the following phases:

1. Educational institutions conduct the acquisition by addressing the Federal Employment Agency and companies;

2. Educational institutions use summative and formative tools for competence assessment to access the suitability of the participants;

3. The FuTEx qualification begins with a kick-off meeting at the learning agency, which is conducted by a learning facilitator (coach), to get to know one another and to establish a trust relationship. As implementation continues, project teams and learning tandems are formed. Furthermore, participants are informed about the FuTEX qualification, the methods of the AITTS, the certification conditions, and the procedure and elements of work-based learning. Participants receive an introduction into the working and learning platform (LCMS) and define common rules of cooperation within the virtual room. Finally, individual learning agreements between the participants and the learning facilitator are developed and the suitable IT profiles for each participant are identified. The kick-off event lasts three days. Further meeting phases are established if required by the work process. Overall, the predominant share is remote learning (approximately 90-95%);

4. At the beginning of the qualification, a formal training phase is required. In this phase, participants will receive the opportunity to engage intensively with the learning capabilities of the platform in the network and the software development tools. Other key content in this learning phase arises out of the nature of the project and, in the case of software development including IT fundamentals, project management, and marketing/sales. The duration of the learning phase can be between one and two months;
5. The structural basis of the project phase and the combination of work and informal learning in the virtual space are based on the sequence “planning-implementation-experience-reflection” as a result of the transfer of the working and learning task concept in the virtual space (Schröder, 2009). The organization of the work process and the degree of informally acquired competences during the project phase derive from the nature and complexity of the project task. In practice, learning and project teams numbering five to six people have proven to be practical.

In the pilot, two different variants were developed and tested.

In Type 1, multiple project teams of five to six participants work at the same project task. The teams compete with each other. This version is suitable for project tasks of low complexity, so that a division of tasks is not possible (see Figure 2).

![Figure 2](image)

*Figure 2. Model 1—Small teams work on equal work tasks in competition or on different tasks with equal assistance structure (IT50PLUS, 2008).*

Type 2 is based on project assignments with a high degree of complexity that can be divided amongst several project teams (see Figure 3). This variant is characterized by an increased level of difficulty which requires extra effort in terms of coordination and consultation. The project teams handle the complex project task cooperatively. Each single team works on one part of the overall task. Their separate results are combined in a single overall result. This form of cooperation places higher demands on the IT project coordinators who have to cope with a higher degree of coordination and consultation. It transpires that this variant can serve to qualify two additional IT profiles: IT solutions developer and IT quality manager.

![Figure 3](image)

*Figure 3. Model 2—Work-sharing on a complex work task through three different teams (IT50PLUS, 2008).*
Training concludes with personnel certification under International Organization for Standardization (ISO) 17024. The certification exam is conducted by an independent and accredited certification body. The certification body evaluates the candidates, the fulfillment of their preconditions, and their individual work documentation. The test consists of a half-hour presentation and half-hour technical discussion, which has the function of verifying the plausibility of documentation. An important feature of this testing and certification is that theoretical knowledge is not queried, but the practical mastery of the defined work processes and process steps according to the IT specialist profile.

Conclusion and Outlook

Testing of the FuTEx qualification concept in the context of two six-month pilot actions was jointly evaluated by the Federal Association for Information Technology, Telecommunications and New Media (BITKOM) and the cooperating educational institutions. The main results of this evaluation are:

1. In virtual work and learning spaces, a competency-oriented IT specialist qualification, which meets the requirements of AITTS, the certification authority and international standards, is possible;
2. The processing of a real work task or project must be central to the qualification;
3. In addition to technical competence, social and personal competences, such as team skills, are developed;
4. The qualification structure and its elements have proved feasible and practicable for the training provider and participants;
5. Learning, project work, and communication in virtual networks can be achieved through the use of commercially available hardware and software, including freeware;
6. FuTEx qualifications have been involved in all educational institutions as an economically viable product;
7. Acceptance of FuTEx amongst participants was high. More restrained at the start of the measures, it increased significantly during the course of qualifications;
8. Participation in a FuTEx qualification with a recognized certificate significantly improved the chances of re-entry into the labor market. The integration rate for graduates of FuTEx is now at 75% (as of July 21, 2011).

FuTEx as a method opens new avenues for job training and forms of lifelong learning in the workplace by means of digital media and blended learning. Through its work process embedded training in the virtual space, FuTEx has created completely new perspectives and enhancements for competence development in vocational training. Development prospects for FuTEx arise from two directions: (a) expansion of the training concept to the other IT specialist profiles of AITTS; and (b) further deployment of the concept for action and competence-oriented virtual qualifications in other industries.

References


