

How much standardisation does e-learning need?

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SUMMARY: Online learning takes advantage of the Internet and enables the delivery of just-in-time training online. The main benefit gained from online learning is a higher degree of retention by the learner and an increased efficiency in supplying the learning material. The potential of e-learning to reduce overall training costs is, however, still somewhat debatable, and the “breathtaking” technological revolution in the delivery of education does not seem to have significantly enhanced the learner’s overall knowledge. The success of e-learning also depends upon how e-learning is defined.

This article deals with standards in e-learning and summarizes our recent experience of the development and use of learning environments and management systems in keeping with e-learning specification guidelines. We will also report on the use of different e-learning programmes in Germany in order to acquire the qualifications necessary for examinations and assessment.

1. FROM LEARNING INSTITUTIONS TO LEARNING PROCESS FACILITIES

Against the background of a radically altered situation in the field of IT professional training, education providers are faced with growing pressure to incorporate e-learning components into their plans for professional training. Until very recently a course trainer was available practically all the time, yet the changed economic conditions mean that self-study phases increasingly have to be included in training courses. This naturally places added demands on the ability of the learner to study independently. In this model, the trainer has to individually consult the course participants in all decisions about the planning and design of the training plan. In addition, he must be able to quickly recognise strengths and weaknesses, providing help with the latter. His role, as such, is that of a ‘learning process facilitator’ [HOD 2003]. Whereas purely factual knowledge, assessed by means of multiple choice exercises, can be very effectively standardized and implemented into an e-learning programme, dealing with knowledge of methods and process models proves to be clearly more complex.

2. STRUCTURAL PROBLEMS WITH THE GERMAN JOB MARKET

An investigation carried out by IG Metall indicated the following structural deficits in the IT field in Germany:

- 80 percent of employees in the IT sector have come to the industry indirectly from other professions without relevant training.

- Universities at present supply only approximately 6 000 IT graduates each year for an IT industry with 1.4 million jobs. At least 30 000 graduates are actually needed yearly.
- New career paths within the IT sector, for example, IT specialists or IT traders, have proven to be a huge success with a current total of almost 60 000 positions for trainees. There is, however, a distinct lack of suitable opportunities for professional advancement for the 20 000 IT specialists who qualify each year, and who, after a few years of professional experience, then wish to pursue further qualifications. The step from IT specialist to IT graduate, whether a graduate from a university of applied science (*Fachhochschule*) or from a mainstream university, is usually impossible to achieve.
- IT jobs continue to be offered to those currently unemployed. This situation is unsatisfactory because of a lack of reliable standards in IT qualifications. In spite of this lack of standards, 50 000 unemployed are presently undergoing further training in a variety of forms.

These structural problems were already present at the time of the severe shortage of IT workers. Naturally these problems have been exacerbated by the current period of stagnation affecting the entire economy.

3. E-LEARNING – THE STANDARDS ISSUE

One of the main goals of e-learning is to promote enhanced business performance through learning. Today's e-learning is not yet really delivering on its promises and the transition to m-learning is still of a rather theoretical nature. One of the main issues in e-learning involves standards. Standards enable interoperability between platforms from different suppliers and ensure compliance throughout the industry. Standards in e-learning aim to enable the reuse of technology-based learning content across multiple environments and products. For academic institutions and virtual universities, the primary focus is on the internal reuse of the learning content. For other institutions, developing and managing content to be reused by other external institutions is of greater importance.

There are, undoubtedly, many advantages to standardised e-learning, but there are as yet only specifications for standards and no actual standards. Given this situation, a more critical look at the issue is justified.

It has been observed that a number of educational initiatives in recent decades have served to disempower academics, ostensibly in order to empower students but frequently in ways which are suspiciously favorable towards governmental concerns and industrial agendas [HOL, 2000]. Instructors today are still reluctant to upload their learning objects (LOs) into repositories mostly because the added value of posting an LO is not clear to educators. In addition, they do not see the need to share resources with any group, other than with their own students.

The European Parliament recently decided (September 2003) that there will be no general right to patent software. Had the decision gone the other way, this would have stifled innovation, in particular from smaller software companies and would block future developments in the software industry. Large software producers with their extensive legal departments would, of course, be in the best position to secure patents and therefore establish a monopoly. The result would be a situation in which these only large producers decide which software can be written and implemented. Consequently, they alone would have the right to provide licences and establish standards. Such dependency on the owners of licences would be counterproductive, and might even cause small and medium-sized enterprises to abandon further development altogether.

Patents were introduced in order to protect the intellectual rights of the inventors of new products and types of technology. In today's world, the development of new software can be put on

a par with the writing of books and films since improvements and adaptations are predominantly of a functional nature, which is, arguably, not a feat of 'intellect' or of 'innovation'. This parallelism clearly emerges in the discussion about standards in the e-learning field. At present, the issues surrounding standards in e-learning may even hamper the development of learning environments as it is not clear, how to keep abreast of standards, and indeed which standards should be considered. At present, the issues surrounding standards in e-learning may even hamper development. According to Sloep [SLO, 2002], a situation where everybody adheres to a particular standard (Sloep describes a standard as intellectual propriety) may significantly prevent competition by excluding available alternatives. This seems to be the case with US-based standards such as SCORM [SCO, 2003], IMS [IMS, 2003] or LRN [LRN, 2003]. There is a European alternative known as ARIADNE [ARI, 2003], but reference to compliance with standards in Europe, primarily means compliance with US-based SCORM and IMS. An important question here is whether SCORM and IMS and their respective derivative products will remain licence-free, just as the 'learning process' itself is also free, or whether patents will be introduced which could prevent us from finding a common basis for future efforts to improve the design of e-learning provision.

4. QUALITY ASSURANCE

Unfortunately, adherence to standards does not ensure quality. Standards are focused primarily on making things work well together; they do not seek to develop specifications for best practices in any given industry [DIG, 2000]. Standards enable content to be independent of technologies, systems and devices. The value of an e-learning platform can be judged by the quality of the content that it allows to be created and managed [DYR, 2002]. In the European context efforts are increasingly being made to align practices with the ISO 9000 standards which are well established in business and industry. The University of Essen serves as a good example with its focus in research on, among other issues, standards and quality assurance in e-learning [DAU, 2002]. Demands are intensifying for a primarily pedagogic focus in the standardization of e-learning. 'Added didactic value' is the current motto. This was reflected in the announcement of the annual e-learning Congress in October of this year at the University of St Gallen in Switzerland [SCI, 2003]. "E-learning is currently experiencing a transition from the pioneering and experimental phase to a more sustainable period of implementation. Initial experience has shown that e-learning concepts will only stand the test of time if the added didactic value is tangible. This new culture of learning based on self-reliance and independent problem-solving in an environment of cooperation requires fundamental and wide-reaching changes in the attitudes of both educators and learners."

5. STANDARDS AND LEARNING OBJECTS

Virtual universities and similar institutions are interested both in depositing learning objects in repositories and in storing them for reuse. A learning object (LO) holds specific behaviour and interoperates with other learning objects. It has its own characteristics and exists in relationship with other learning objects. The metadata description of a learning object (LOM's metadata) is not fully capable of reflecting the "behavior" of a learning object, especially when it is one of a number of LOMs being considered. When selecting and reusing a learning object, either this learning object can remain intact since it fits in well with the new learning context, or the learning object will need to be adapted. In the latter and most familiar case, the problems which arise are not only technological in nature, but also instructional. The metadata descriptions seem not to be sufficient to represent the "behavioural" nature of learning objects nor the learning objectives themselves [REH, 2003]. Furthermore, the granularity of learning objects may pose a problem.

Reuse and management of learning content is one of today's challenges in e-Learning. This is where standards are potentially of great help. Unfortunately, learning object repositories do not always

conform to the LOM standards [LOM, 2003]. Some are IMS compliant (IMS [IMS, 2003] has initiated an International Conformance Program for certification purposes, which can be adapted for use world-wide), some are based on a simplification and even free interpretation of elements of the IMS Learning Resource Metadata Information, and others describe web-based multimedia teaching materials in specific domains using their own sets of metadata [REH, 2003], which do not comply with any standards. Most instructors create their learning courses on their own and modify them as they wish sidestepping the standards issue - partly because they simply do not have time to study any guidelines on standards, or because they do not need any interoperability for their learning content. So this leaves us a long way from reusability. Analysts expect the final standards to be generated in about 5 to 10 years. Furthermore, it will surely take twice as long to achieve general acceptance of these standards, as well as compliance with them.

6. MONITORING LEARNING PROGRESS – A KEY ISSUE IN E – LEARNING

In order to monitor the learning progress of course participants, regular assessment is required in the shape of tests and work on exercises. Experience from a number of courses in which participants had a variety of qualifications (IT specialists, retrained workers, IT graduates, etc) has demonstrated that reliable assessment must contain the following four elements:

1. Multiple Choice Test
2. Filling in the gaps in a given text (Cloze Text)
3. Brief, but precise retelling of content in context in learner's own words
4. A practical task which usually consists of a programming task

To prepare for the final exam it would be very useful to have an online tool which would check that this part of the assessment had been completed. The current state of affairs can be described as follows:

Multiple Choice Tests

E-learning material on the Internet includes an abundance of the first type of exercise, multiple choice. These exercises can most commonly be found in the 'mock exams' used to help students prepare for IT Specialist Certificates (Microsoft Certified Solution Developer, Sun Certified Programmer for the Java 2 Platform, Cisco Certified Network Administrator, etc). This type of exercise is generally both popular with learners and considered to be of great assistance.

Cloze Texts

The second type of exercise, the cloze text, requires the learner to insert the correct specialist term. For this purpose, it would be useful to invest time in developing a tool which would recognize the correct term and provide feedback on accuracy. Naturally this is more difficult than creating simple multiple choice exercises as the range of possible solutions is much greater and, above all, less precisely defined due to issues of spelling, word order, use of synonyms, etc. In the preparatory stages of e-learning it might be possible to use a tool which would reveal the correct answer to the learner after a given period of time.

Individual representation of content in context

The third type of exercise could also be included in an e-learning format in a similar way to the cloze text.

Practical Task

Exercise type four could be incorporated into an e-learning programme in the following way:

A complex practical programming task is divided up into individual steps for the learner to work through until the task has been completed successfully.

The widely popular “Magercises“ from the Magelang Institute [JGU, 2003], for example, usually provide an almost complete solution for the initial tasks, which the learner then has to finish and apply. The learner gradually works through further modules in which the framework of the solution is given (‘Scaffolding’), but where the degree of learner input progressively increases to a stage at which a module is completed solely by the learner without a pre-given solution framework.

Problematic issues with new content

A typical feature of IT training is the requirement to integrate state-of-the-art technology, software programmes, etc into the curriculum. It is often the case that official syllabi, at least in some areas, soon become outdated because new tools and frameworks become established on the market. These new developments may have been ignored in the syllabus development stage because their importance had not yet been realised (Example: Web Services provided by Microsoft .NET and by Java 2 Enterprise Edition). In some cases books which are didactically very good are not used or are even discontinued, and so a less satisfactory replacement has to be found. The tutor can usually find extensive information from the developers, in addition to the standardization “white papers” such as those produced by W3C [W3C, 2003]. This information is aimed at experiences developers and software architects. It therefore follows that there is an initial lack of interactive learning programmes and introductory materials, leaving the course tutor in the position of having to invest considerable time and energy in designing materials himself (let it not be forgotten that the tutor also has to first familiarise himself with the new technologies ;--). From a practical viewpoint, a course tutor urgently needs standardised learning materials which he can quickly and easily incorporated into the new learning environment.

7. VIRTUAL UNIVERSITIES IN GERMAN-SPEAKING AREAS

Virtual universities have been established in several German federal states [[VHB, 2003], [VIR, 2003], [VUB, 2003], [BPS, 2003]]. Due to the federal structure of education policy in Germany, these virtual universities predominantly take the form of an Internet portal installed at state level via which university teachers can offer seminars, lectures, etc specially prepared for the Internet. The development of e-learning materials is often financed specifically by federal state funds and therefore requires a call for tender. This material is supplemented by links to a variety of additional sources of information, e.g. public courses offered by other federal states or download archives for Open-Source software.

Apart from the common use of an Internet portal, there is no recognisable standardization of the learning content offered by these virtual universities. Courses can be accessed by any interested parties; however, the usual registration per e-mail address is required. In individual cases, the ‘virtual student’ can provide evidence of his additional qualification by collecting credits (*Scheine*) or on taking an exam.

8. THE NEW IT PROFESSIONAL TRAINING PROGRAMME IN GERMANY

Experts, both amongst employers and employees, working in cooperation with academics from the German Institute for Professional Development and with the Fraunhofer-Gesellschaft have designed a total of 35 new professional training profiles at three different qualification levels.

- **Level 1: “Strategic Professionals”**

- IT Technical Engineer (Certified IT specialist, examined according to § 46 of the Professional (Vocational) Training Law
- IT Business Engineer (Certified IT Business Engineer)
- **Level 2: “Operative Professionals”**
 - IT Systems Manager (Certified IT Developer, examined according to § 46 of the Professional (Vocational) Training Law
 - IT Business Manager
 - IT Business Consultant
 - IT Marketing Manager
- **Level 3: “Specialists”**
 - 29 specialist profiles divided into 6 groups according to function, e.g., Software Developer Coordinator (of development) Product Advisor and Customer Services Advisor, etc.

The key idea in the new programme is the concept of *operating process oriented training* [AK1, 2003], [AK2, 2003].

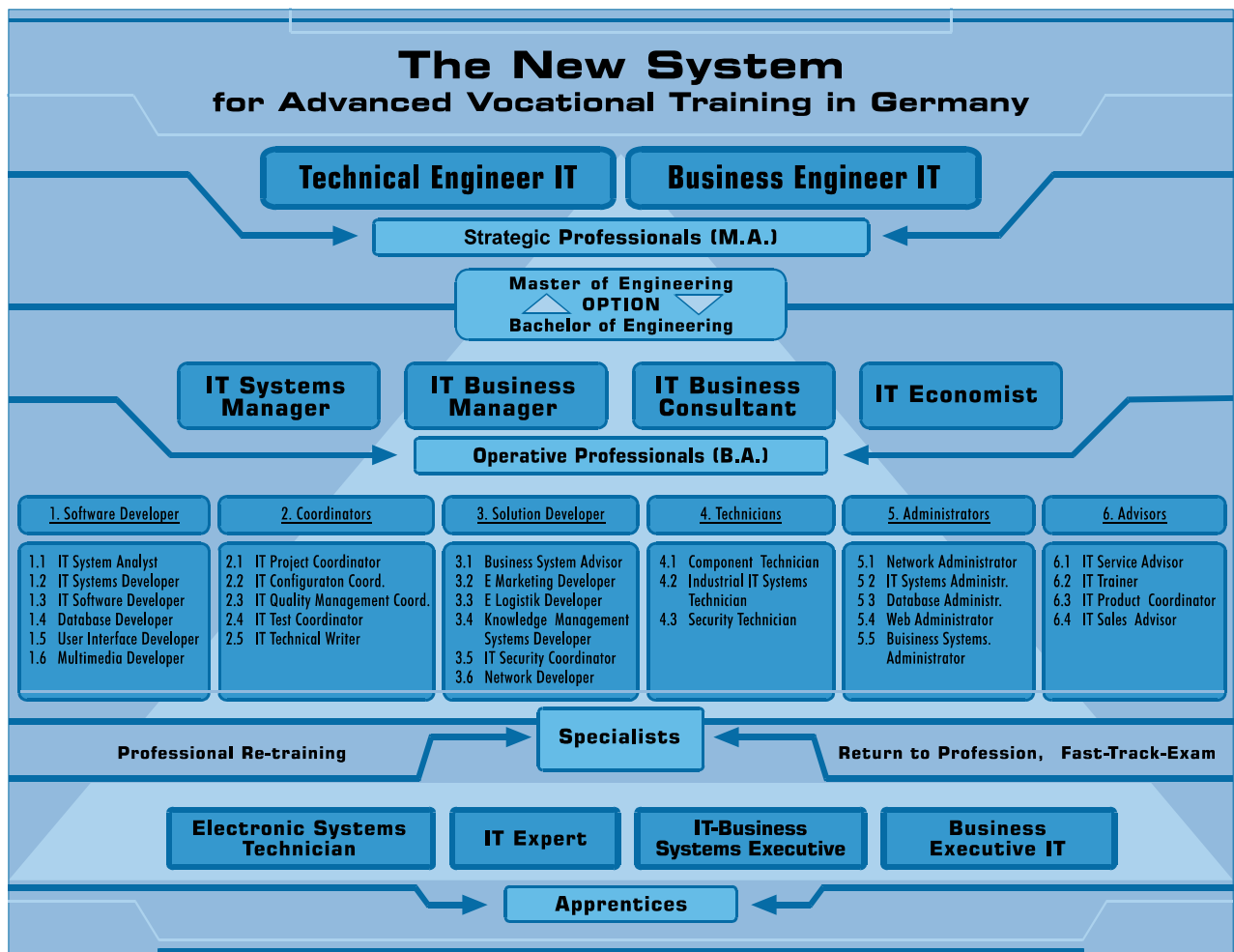


Fig. The New System for advanced Vocational Training in Germany (after Lutz & Grub AG, Germany).

It is important to note that this programme has been legally recognised since 03.05.2002 in a standard national regulation, along with the two traditional career paths of IT graduate (academically certified, examined by mainstream universities and universities of applied science), and IT specialist (professional training, examined by local Chambers of Commerce and Industry). Examination is carried out by means of personal certification by specially accredited certification bodies.

At present the entire programme is in the initial stages of development, but is enjoying increasing support from politicians, employers' groups and trade unions. The German Federal Employment Office has already adjusted their training opportunities to incorporate the new IT training programme [BGB, 2003].

Within the framework of new approaches to IT training, the particular design of the operating process oriented concept ("APO Concept", Fraunhofer Institute for Software and Systems Engineering (ISST), implemented by [AK1, 2003]) means that primary importance is necessarily given to the following quality objectives:

- Independent learning
- Individual learning content
- Project-based learning
- Operating process skills
- Project, rather than exam-based assessment

E-Learning must support this development in a sustainable fashion.

9. OUTLOOK – BEYOND FACTUAL KNOWLEDGE

Experience gathered from numerous training and coaching sessions, as well as from long-term courses points to the fact that factual knowledge is only an initial, though undeniably crucial step. In everyday working life the (new) employee must demonstrate that he can apply this knowledge within the scope of new projects, which represent uncharted territory. This requires correctly selecting and applying newly learned process stages in a particular context. In pedagogical terms, this is also known as "transferable knowledge", which is further divided into *declarative* and *procedural* transferable knowledge [EZW, 2001].

Certainly much work remains to be done to refine and extend specifications for the means which underlie effective learning interactions. In terms of standards and tools to improve these, only by supporting educators in one of their key tasks, namely in the development of new learning units which allow a complex learning process to unfold step by step, can lasting progress be made. If this is not done, most practitioners will continue to put pdf files on the Internet, rather than take the time to become acquainted with new e-learning technologies.

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