A Conceptual Framework for the Development of WBT-Guidelines

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Abstract: Guidelines represent an important instrument in the development of Web-based Trainings (WBTs). They help to create reliable, portable, and interoperable, standardized WBTs of high-quality. The development of guidelines can be considered as a key success factor regarding the effectiveness of WBTs. The effects of Guidelines can be both, favourable and restrictive. Guidelines that are too rigid and strict could have counter productive effects. Therefore an optimum at guidelines is to be aimed at, taking notice especially of producers and learners. This article discusses potentialities and restrictions of WBT Guidelines, supplies a description framework for WBTs and illustrates its realization on the basis of a case example. It can thus be of assistance in the project-specific development of guidelines.

Introduction

The education network WINFOLine is an inter-universitarian online education network. It concentrates on internet-based training in the field of business informatics through high-quality online courses. The universities of Göttingen, Kassel, Leipzig, and Saarbücken form the core team. The network has various partnerships with universities and companies. On the basis of a pool of online-courses the network can supply customized online-courses for universities, suppliers of further training courses as well as for companies. From winter term 2002/2003 onward the network will offer an accredited master program. The Educational Network WINFOLine increases the choice for other suppliers of web-based trainings. The wider range of content, even of previously inaccessible content, can also create immediate benefit for students, university graduates or employees. The basis is a network that enables profits for its partners. Through the cooperation every partner shares specific professional competence. The student profits by the competences of renowned partners (best-of-peer). The Education Network WINFOLine focuses on a vast number of clients:

- *Educational institutions* with the focus on business informatics: as completion or enlargement.
- Other *educational institutions*: as a completion of already existing trainings as well as for the creation of new courses of study.
- *Graduates*, who are interested in further training in the field of business informatics. The offer can consist in a single WBT or in a complete course of study. In addition the network offers a Master Degree Program for Information Systems. This course of study aims at working people and graduates.
- *Corporations* can obtain contents from the network for the creation of their own special trainings in the field of business informatics. The contents can be used for single training or within a Corporate University.

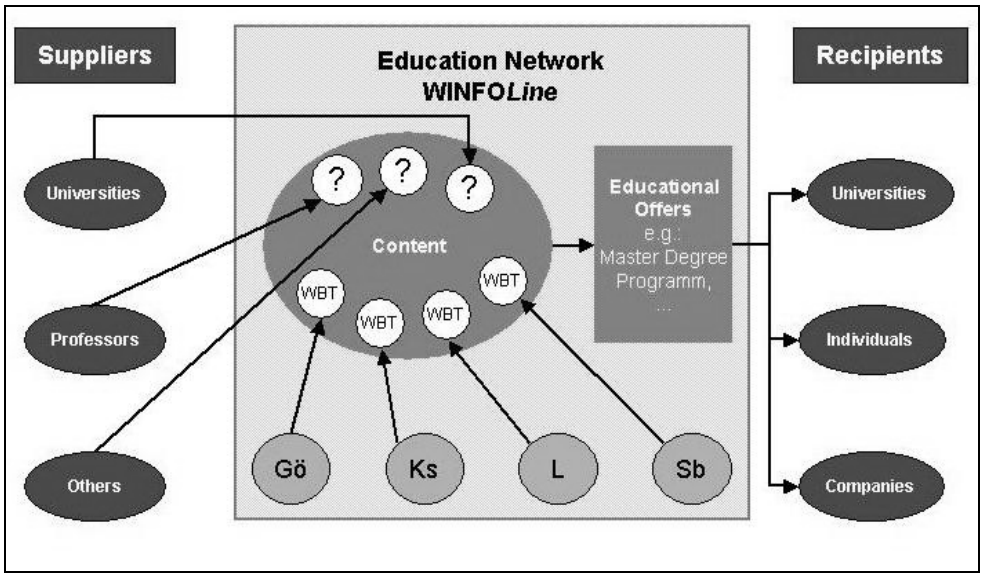

Figure 1: Structure of the Education Network WINFOLine

In order to guarantee a high quality of the online-courses it was necessary to develop a quality insurance concept on the basis of well defined guidelines for the courses of the education network WINFOLine. Two guideline catalogues have been developed for the production of WBTs. One of the catalogues contains guidelines referring to the production of online-courses within the network (produced by the core team of the network). These courses meet the high demands regarding the uniformity as well as the technical and didactical quality of the online-courses. The second catalogue defines a minimum standard concerning the technical and didactical quality of online-courses produced by external partners. Both catalogues distinguish between recommendations and compulsory guidelines.

The development of guidelines for WBTs serves to guarantee a high quality and reliability. The effective application of this control instrument can have crucial influence on the achievement of standards. The definition of guidelines is closely connected to quality assurance functions, media-didactical concepts, tutoring concepts, and the evaluation of successes in learning. Regarding these functions, guidelines can be considered as an instrument which should not be underestimated.

Different types of guidelines do not always have an obligational character. In most cases guidelines are published by institutions in order to establish or prescribe certain ways of behaviour within a small scope of discretion. In case these rules are neglected there can be sanctions. Generally, guidelines are systematically developed decision making aids with regard to appropriate methodologies in specific situations and there is still a certain scope of discretion, which allows to deviate from the rules in specific situations. However, they draw attention to noteworthy circumstances and serve users in forming a judgement. The term guideline used in this article covers the meanings of direction, instruction as well as recommendation, so the respective binding character of the guidelines has to be indicated explicitly. The approaches for developing guidelines, presented in this article, focus on producers and providers of Web based trainings (WBTs) in producer/provider networks.

Potentials and Restrictions of WBT Guidelines

Guidelines support the creation of uniform and high-quality WBTs. Even if a provider/producer network agrees on the application of a certain authoring tool, the definition of guidelines is necessary. Many guidelines, which serve the ensuring of a certain minimum quality, can not or not exclusively be guaranteed by only one authoring tool. WBTs, which are produced with the same authoring tool, often indicate a common basic characteristic. This does not mean, however, that WBTs, which are produced with the same authoring tool are uniformly structured. Flexible authoring tools permit a large and creative scope.

Guidelines aiming at a uniform Look & Feel of WBTs, require a consent of the WBT authors. It is important that all partners adhere to this consent in order to achieve a standard. On the one hand one should consider that the appointment of certain guidelines is necessary in order to obtain a uniformity regarding functionality and optics, as well as a desired quality level. On the other hand strict and too closely seized guidelines can lead to unwanted side-effects. In the process of defining guidelines different aims have to be considered carefully.

Learners, customers (e.g. enterprises or education brokers), and creators of WBTs benefit from the definition of guidelines. From the learner´s point of view a higher quality of the WBTs, an increased attractiveness of learning, a uniform appearance, a uniform structure of the WBTs, uniform functionalities within the WBTs, uniform services and simplified management avoid a cognitive overhead. The customers can take full advantage of a higher quality of the WBTs, an increased motivation on the side of the learner, a uniform appearance (Corporate Identity), the uniform structure of the WBTs, and of an increased acceptance on the part of the user. Content developers benefit from a higher quality of the WBTs, a Corporate Identity, an increase of the everyday suitability and acceptance on the part of customers and learners, more economic development, maintenance, administration of the WBTs as well as of the simplicity to handle tutoring.

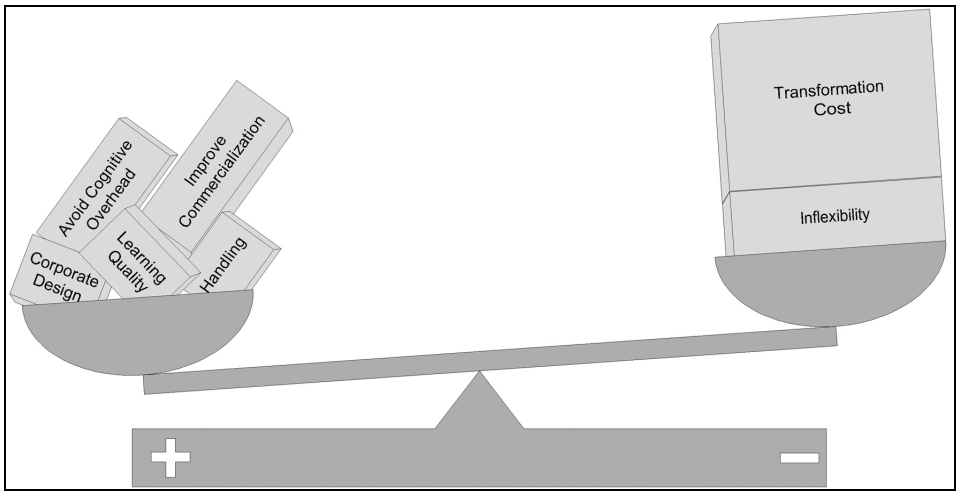

Figure 2: Advantages and Disadvantages of Guidelines

However, disadvantages or restrictions can result from too rigid guidelines. The realization of guidelines is very often problematic. Depending on production process or assigned tools certain guidelines are realizable only at very high expenditure or not realizable at all. Guidelines can form a barrier for any partner. The revision or adjustment of already existing WBTs could cause very high expenditures or not be feasible at all, since e.g. a tool is used, with which certain guidelines can not be fulfilled. The entrance barrier is even higher when already existing WBTs of other producers have to be integrated into the product portfolio of the network. A further consequence could be the incompatibility with the products of prospective customers. These could require for their part the adherence to certain guidelines, then WBTs would have to be adapted to the Corporate Design of the customer. This special adjustment of WBTs usually has high transformation costs as a consequence. Last but not least, the increased inflexibility regarding modifications in the design of WBTs, functionality extensions and technical advancement has to be considered. Because an innovation process in the production of WBTs is necessary, modifications of the guidelines must be implemented within a provider/producer network. This becomes the more difficult, when the network is large and when the production processes are varied. Modifications of the guidelines can lead to the problem that all WBTs have to be redesigned and can thus involve high expenditures. Therefore, too rigid guidelines could impede innovations in the production of WBTs.

If one regards these pros and cons, it becomes obvious that an optimum at guidelines is to be aimed at, in order to realize the advantages and avoid the disadvantages. On the one hand guidelines should guarantee the highest possible quality as well as a minimum of uniformity. On the other hand guidelines

should not have an effect that is too restrictive. The readiness of prospect providers to participate in a provider/producer network is influenced negatively by high costs of adjustment of available materials to defined guidelines. In addition guidelines should guarantee some room for prospective providers to realize their own ideas (e.g. the creation of multimedia contents). Too rigid and strict guidelines promote neither the quality of learning contents, nor do they meet the principle of the freedom of teaching. The freedom of editing WBTs should therefore not be limited unnecessarily.

A Framework for WBTs

The framework presented in this passage can be used as a basis for the definition of guidelines. It contains the following categories: construction of WBTs, production of multimedia content, design and layout, interchange of data between the WBTs and the learning management system and technique. The framework contains background information and examples.

Construction of WBTs

Guidelines of this category define the structuring of contents, the navigation concept, access structures, functionalities, support of different learning styles, orientation hints, tests, and communication services of WBTs.

- *Structuring of Contents*. Learners are used to hierarchical structures and linear sequences, hierarchies and sequences can serve a lot to structure the contents of WBTs. (Schellhase, 2001)
- *Navigation*. There should be a concept for the navigation in WBTs. Navigation aids can support the learner. In order to support the navigation process web-browsers include special functionalities such as e.g. backtracking, indication of already followed hyperlinks, history-lists, and bookmarks. WBTs can offer additional support in navigation for the acquiring of contents, examples are the possibility for achieving a quick overview (e.g. through an optional hierarchical or non-hierarchical structure, like a table of contents or site-maps), the indication of already read material (already acquired content could be marked in the table of contents or in the site-map), different types of links maybe with support by the use of visual signs and an obvious classification between the different types and different search-features like meta-information and keywords. (Moser, 1998, p.43)
- *Access Structures.* Appropriate access structures support search activities of the learners. Internal and external referential hyperlinks could be shown in a separate list. A list of figures and videos enables the learner to get direct access to any figure or video. Furthermore a list of references allows direct access to all parts of the WBT where a reference has been used.
- *Functionalities*. WBTs could provide several functionalities like e.g. full text search mechanisms, plugin-testers, administration of bookmarks, learning-account, direct addressing of content, keyboard control, glossary as well as direct access to self learning exercises. While creating new WBTs the focus has to be on aspects about the usability and the reliability.
- *Support of Different Learning Styles*. WBTs could offer configuration options that leave the choice to the learner in which way he would like to use the WBT (e.g. acoustic and/or visual). One can imagine many more configuration options and possibilities for creating a WBT that could support different learning types, learning phases, and learning situations.
- *Orientation Hints*. Orientation problems are a typical problem using hypertexts. (Schaumburg, 1996, p.109) remark that in particular beginners do not know how to handle the explorative freedom of hypertexts. Orientation problems can effect the learning process negatively and should therefore not be underestimated. (Schaumburg, 1996, p.110) The avoidance of orientation problems by means of a high quality hypertext-design represents an important point in the creation of WBTs. (Lynch, 1999, p. 43f.) For that reason WBTs should contain several options that support the orientation within the WBT. The offering of a list of milestones could be helpful.
- *Tests and Exercises*. WBTs which are used for further training require special tutoring options and services. Tutoring includes the supply with exercises that can be solved by the learner during the learning process. (Sasse, 1998) show a detailed catalogue of requirements with regard to web-

based systems for the support of tutoring and supply of exercise material. The following types of exercises could be used: multiple-choice-questions, crossword-puzzles, gap texts, open questions with sample solutions, drag and drop exercises, matching exercises, general interactive/multimedia exercises, and case studies. Types of exercises can be classified into self learning exercises and tutored exercises. (Moser, 1998, p.46) The access to the exercises can be offered through lists of exercises and within the learning content. The exercise results could be shown in a personal learning account. Furthermore the WBT should be able to interchange data with legacy systems via defined interfaces.

- *Communication Services*. Various synchronic and asynchronic communication elements can be used for the support of the learning process. Typical elements are e-mail (possibly context-related), web-based forums, and chats. Sometimes WBTs provide more complex communication elements, like e.g. video conferencing.

Production of Multimedia Content

The production of multimedia contents depends a lot on the contents of the WBTs. For example a WBT on modelling could contain animations which show each single step in the modelling process. This animation can be accompanied by short texts in written or spoken form. Other WBTs could use short videos to support certain parts of the lecture. There is a lot of room for the creation of additional learning materials. It should not be restricted by standardisation efforts.

Design and Layout

The design and layout of WBTs has great influences on the acceptance and attractiveness of WBTs. The layout should meet variety as well as constancy.

Data Interchange with the Learning Management System

The access to WBTs is often offered via learning management systems (LMS). The communication between the WBT and the learning management system should be based on established standards. An optimum data interchange between LMS and WBT is an essential basic requirement for lots of WBT-related services of the LMS. AICC and SCORM are standards that are appropriate for data interchange between the WBT and the LMS. The SCORM-standard is based on both the AICC-standard and the IMS-standard. (Cohen, 2002) One essential advantage of these two standards is the portability of contents between different LMS and the independency on the chosen learning management system. The expenditures for the adaptation of the WBTs to a certain learning management system fall. WBTs conforming to the standards offer essential advantages: they can be used on any learning management system conforming AICC/SCORM-standard, they offer authentification mechanisms and are able to interchange certain data like general user data, meta data on any learning unit as well as a multiplicity at interaction data, e.g. path choice, current position in the WBT, comments, retention times, and test results in a standardized way.

Technical Aspects

Requirements concerning hardware and software should be specified. This includes the system requirements (browsers, operating systems, and plugins). Multimedia elements that require a high bandwidth should be provided through a CD-ROM/ DVD. Complete WBTs could be offered online and offline. In this way communication costs on the side of the learner can be reduced.

Case Study: Guidelines of the Education Network WINFOLine

The above described framework served as a basis for the definition of project-specific WBT-guidelines. Many guidelines base on lists of criteria concerning the WBT-/CBT-design or on experience evaluation results gained during the project. The guideline catalogue contains 160 items on the construction of WBTs, the production of multimedia elements, and the data interchange between the WBT and the learning management system. These are completed by 31 guidelines concerning the production process and the test-phase, separate guidelines in the form of a style guide, and other guidelines concerning the definition of learning objectives and special terms. The WBT presented in the following sections is subject to the guidelines, which were set up for the internal production of WBTs. The user-interface of the WBT is divided into three frames: the top frame contains the register, the middle frame shows the content and the lower frame contains the navigation. Guidelines define the standardized creation of the register and the navigation and thus guarantee the uniformity of the WBT. The appearance of the middle frame which contains the content can differ through the use of various types of multimedia elements. In this case the guidelines only have recommendation character regarding the creation of multimedia elements and of the background. The arrangement and designation of the respective registers within the register area, their contents and their functionalities were specified. The functionalities are differentiated into obligating, recommended, and optional functionalities. The definition of the colour, optic, and functionality of the navigation bar contributes to a uniform appearance. The appointment of a uniform layout supports a uniform look & feel and is at the same time an important orientation aid for the learner. (Schellhase, 2001)

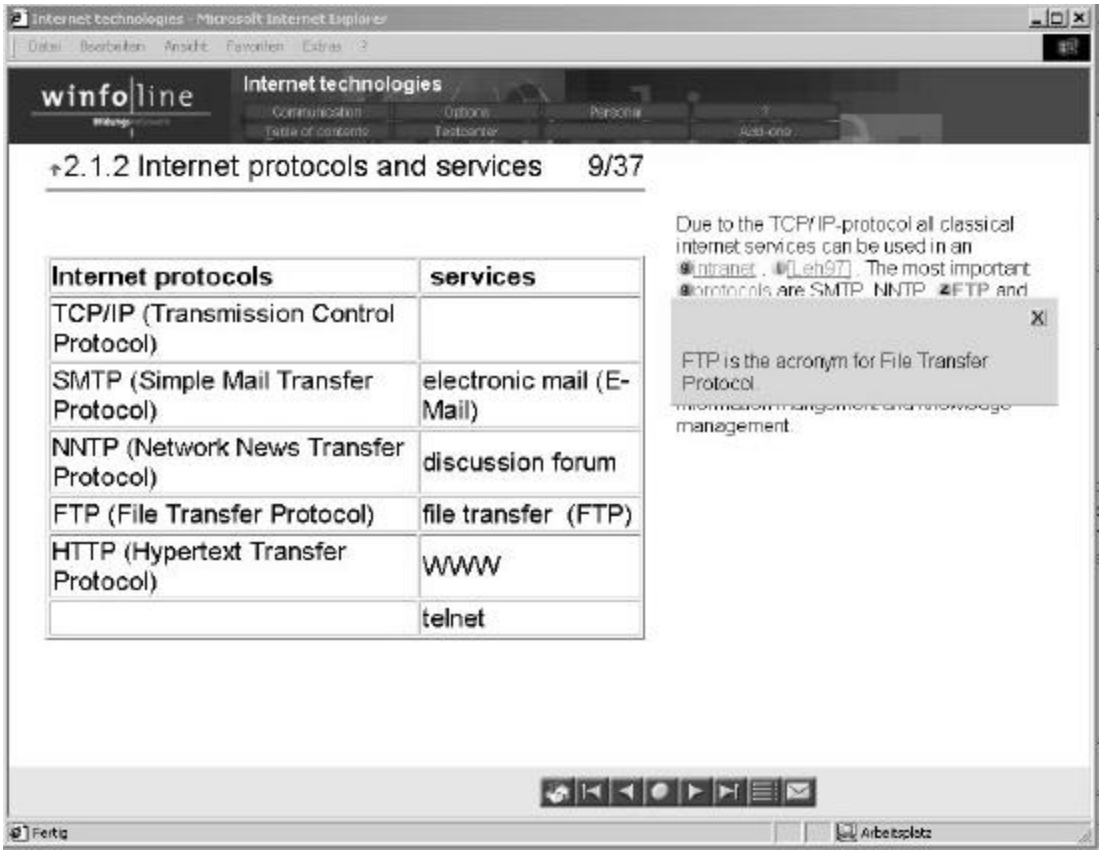

Figure 3: Screenshot of a WINFOLine-WBT

The screenshot shows that the content frame is divided into a slide-area on the left hand side and a text-area on the right hand side. The learner can choose whether he wants to look at both areas or only wants to look at the slides. An arrow beside the title symbolises that other pages of the WBT refer to this page (incoming, referential hyperlinks). The title is completed by the indication of the learning section and the section-specific numbering. Different types of hyperlinks are characterized by means of small symbols.

On a click on a semantic hyperlink a separate pop-up window is opened. The bar then appearing on the left hand side symbolizes that the learner is following an excursus, this means he leaves the sequential course structure and navigates independently. The following figure shows the production process of the WINFOLine-WBTs.

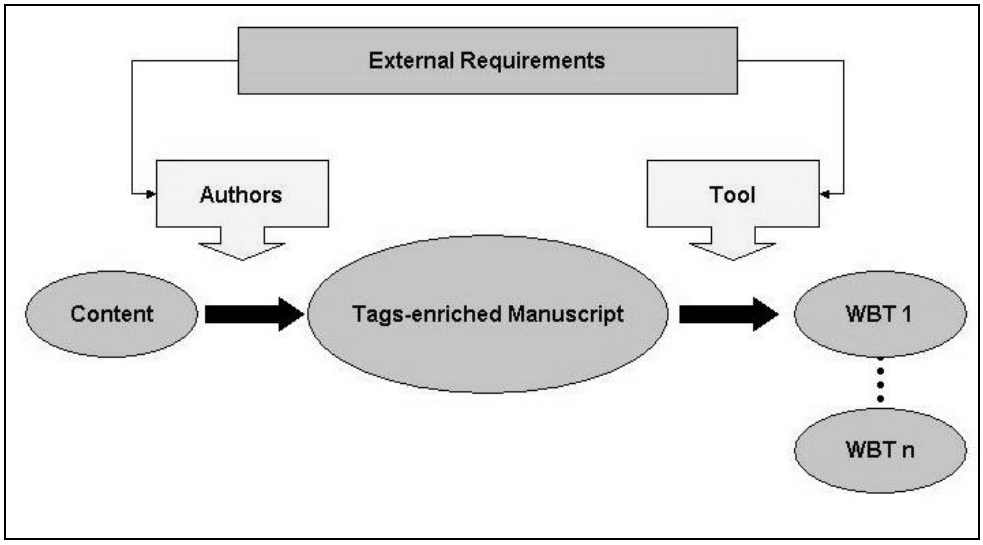

Figure 4: Production Process of WINFOLine-WBTs

For the production of a WBT the authors use WYSIWYG-editors. They have to employ some semantic tags. In this way the manuscript is automatically transformed into a WBT by a tool. This approach makes it possible to produce numerous variants of WBTs. Contents can thus be used several times (see Winand, 2002). The screenshot has shown a WBT that meets the specific guidelines of the e-learning network WINFOLine. The WBT was produced by the WBT authoring tool VLEG (see Winand, 02). The authoring tool VLEG can be used to produce flexible und configurable WBTs. The VLEG helps to reduce the development expense for WBTs significantly. In addition, the maintenance process is simplified. The WBTs automatically have many sophisticated features and are especially well suited for Web-based learning.

Conclusions

This article has shown potentials and restrictions of WBT Guidelines. From our point of view, guidelines represent an important success factor for the production of high-quality standardized WBTs. Their development can be considered as a key success factor regarding the effectiveness of WBTs.

The definition of guidelines depends on the specific situation of the producer. The framework described in this paper contains several suggestions for the development of WBTs and can be of assistance in the project-specific development of guidelines. An optimum at guidelines is to be aimed at, taking notice especially of producers and learners.

Guidelines have to be developed continuously; they have to be adapted to changing internal and external requirements. Thereby international standardisation efforts should be paid special attention.

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