

Aspects of Collaborative Authoring in WBT Systems

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Abstract: The paper discusses possibilities of constructing new training objects automatically, on-the-fly as a result of any collaborative activity within a WBT system. Such collaborative activities may include participating in discussion forums, brainstorming sessions, writing document annotations, etc. This feature might be seen as collaborative authoring of training objects in WBT systems. Technical issues, such as data structures, data formats and tools needed to support such process are discussed in details in the rest of this paper.

I. INTRODUCTION

From the users' point of view a WBT system is a system that allows distribution of educational material over the Internet, i.e., over the Web. Usually, such educational material is referred to as courseware [1].

Technically speaking, courseware is normally perceived as a collection of multimedia documents interrelated by means of computer-navigable hyperlinks. Thus, we can say that hyperlinks form a purpose-oriented navigable data structure imposed on a number of multimedia documents [1]. The model was developed for primitive WBT systems supporting a so-called "online course" training scenario. Such primitive WBT system can be seen as Web sites providing access to such courseware (i.e. to an online course) and some collaboration facilities for users working through such training course.

Modern WBT systems work with an educational content, which goes much further than well-known concept of multimedia documents and links between them [6]. In

addition to especially prepared training courses, anything that is part of the stored enterprise knowledge, such as technical documents, presentations, or the personal experiences of employees can be used as such training resources via the Internet or Intranet. Moreover, the materials are presented to learners using different structuring paradigms corresponding to a selected learning goal and training strategy. Thus one and the same chunk of information may be used as a component of a training course, accessed as a training resource matching a query, attached to a discussion thread, reused within a synchronous mentoring session, etc. Usually, such information chunks are referred to as training objects.

One of the most important aspects of WBT systems is a methodology applied for content developing. This process of development of training objects is called authoring. Usually, authoring in WBT systems follows to a bottom-up approach. First, basic elements are created in the process of so-called authoring in the small. They then become building blocks for composites that constitute main addressable training objects in the process of so-called authoring in the large.

Usually, WBT systems neither impose any restrictions, nor provide special tools for authoring of basic documents. Any authoring tools may be potentially used to author such documents. For example such well-known HTML authoring systems as MS Front Page, Netscape Composer, HotDog HTML editor, etc. as well as MS office tools (WinWord, PowerPoint, etc) may be successfully applied for authoring in the small.

On the other hand, there exist huge differences between WBT systems regarding methodologies and authoring

paradigms for authoring in the large [6]. For example, primitive WBT systems do not provide any means for structuring courseware beyond simple hyperlinks embedded into HTML documents. Modern WBT systems provide however more sophisticated structuring paradigms [6], such as logical hypermedia composites (sequences, menus, folders, etc.) [7] or semantic hypermedia composites [8, 9] (knowledge domains, topic maps, etc.). For instance, the Hyperwave eLS [3] provide wide range of different high level hypermedia constructs, such as collections of documents, clusters of documents, etc. Such data structures provide also for an easy and more flexible content and link management to say at least. Another example includes the WBT-Master system, which supports S-Collections, knowledge domains, knowledge cards and other highly sophisticated data structures for management of large numbers of basic multimedia documents.

Although such authoring paradigms allow authors to create sophisticated training objects they does not take into account rather important aspects of a typical Web-based corporate educational environment. For instance, in standard WBT systems a particular person authors an ordinary training object during an especially allocated time slot. On the other hand, modern educational content is essentially authored in collaboration [2]. Moreover, the authoring process cannot be separated from the actual use of the material. Very often, experts just contribute to existing material with their personal knowledge in a form of discussions, annotations, supplementary documents, references, etc. In that way in the collaboration with the author and other subject experts they are able to produce a courseware that satisfies certain quality standards. Moreover, experts in different educational contexts may want to flexibly reuse existing materials. [2, 4, 5]

Another very important aspect of a typical corporate educational environment is that there is not always an author available for development of courseware. For instance, an organization may have a technically skilled author responsible for the development of training objects, but he/she does not have enough knowledge on a particular subject to produce training objects of a reasonable quality. However, such organization might have a number of experts in that particular subject who obviously have enough knowledge on that topic but they are probably not technically skilled to develop courseware. [4, 5, 10]

Obviously, the WBT system must provide facilities for experts to create courseware and other training objects in a collaborative, team-oriented fashion with a high degree of simplicity and with an absence of a learning curve for authoring.

This document presents a number of content structuring, authoring and maintenance paradigms, which are suitable for modern WBT systems. The presented ideas greatly facilitate a collaborative environment that ensures constructing of new training objects automatically, on-the-fly as a result of any collaborative activity within a WBT

system. Such collaborative activities may include participating in discussion brainstorming sessions, writing document annotations, etc. Firstly, the document provides technical description of data structuring paradigms and tools utilizing such concepts on the example of the WBT-Master system - a modern WBT system that supports these novel ideas.

II. DATA STRUCTURING PARADIGMS IN WBT-MASTER: HM-DATA MODEL

The WBT-Master system works with three internal data formats for composite data structures, i.e., for different training objects:

- HM-Data Model S-Collections [7],
- SCORM packages and
- LRN packages.

WBT-Master provides an automatic conversion between the internal formats; hence, an actual authoring may be carried out using any third-party authoring component compliant with the SCORM or LRN formats. Since the LRN and SCORM formats are well known and well described formats we will not discuss these formats in this paper any further.

Composites in WBT-Master may be further divided into three groups: learning units (courseware), learning goals (training objects utilizing so-called goal oriented learning) and discussion threads. This classification does not affect the internal format of composites; it reflects different paradigms for authoring, maintenance and actual usage of the composites. All WBT-Master authoring tools operate with S-collections. Since the WBT-Master authoring in the large is based on the HM-Data model, we provide a simplified description of the model below.

Courseware, according to the HM-Data Model, consists of addressable logical composites called Structured Collections (S-collections or just collections, for short). An S-collection does nothing but encapsulates members together with some internal structure (i.e. navigational topology). This structure is in fact a link structure expressing the relationships or associations between members. A member is either a document or another S-collection. One member in an S-collection is chosen and designated by the author as its head.

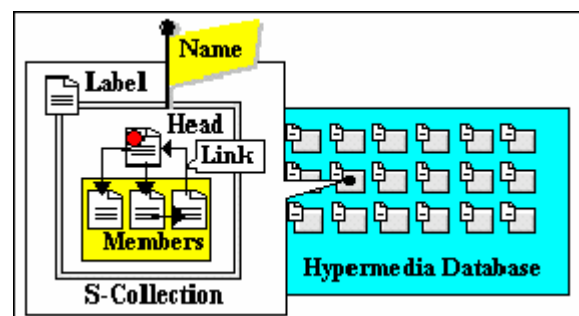


Figure 1: Internal structure of an S-Collection

Additionally, an S-collection may have an associated document called its label to provide contents synopsis. If a label is missing then the head is used instead.

We may think of an S-collection as an opaque container: if we are outside the container, its members will not be visible to us. To see what's inside it, we must enter it. Of course, we can only be inside one container - the current

container - at any given time. But once inside, we will be able to visit its members by navigating its link topology.

Note that visiting (i.e. navigating to) an S-collection does not enter it, even though its label is visualized. The point of the label, as mentioned earlier, is to present a synopsis of the collection to allow us to decide whether or not we want to enter it.

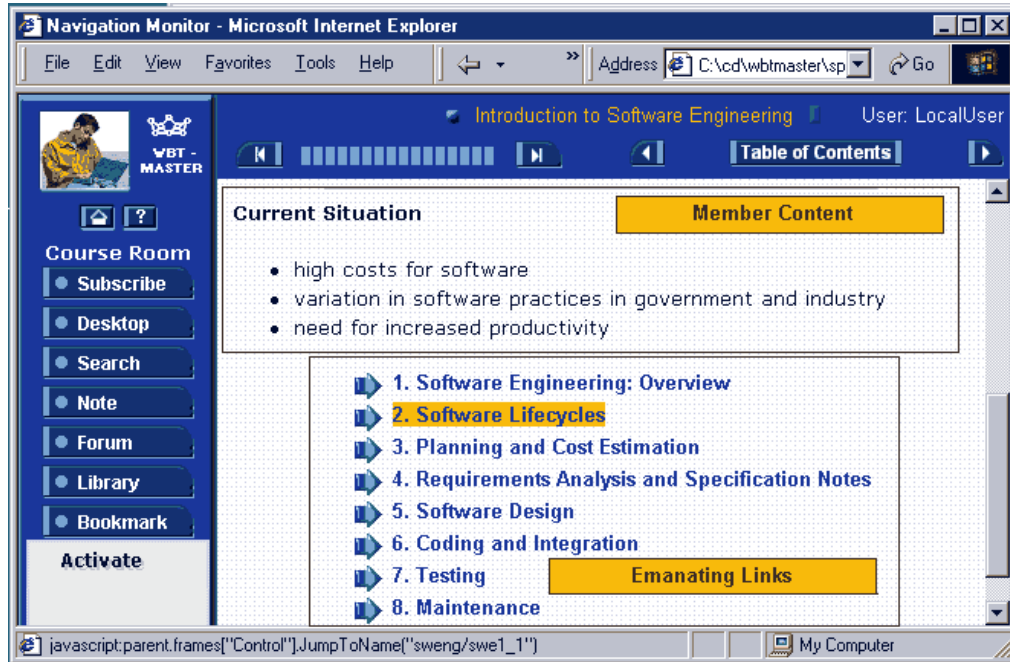


Figure 2: Visualising a current member

Note also that an S-collection may be a member of more than one other S-collection, i.e. collections may be re-used in different contexts [7].

In the HM-Data Model, a particular S-collection is an instance of one of four predefined types of S-collections:

- Folder,
- Envelope,
- Menu and
- Free-links.

Each type or data class defines a particular link topology, which constrains the way members can be linked to one another [7]. Additionally, the integrity of the links in any of these types will be automatically maintained [7].

III. APPLYING HM-DATA MODEL FOR COLLABORATIVE AUTHORIZING

To support the idea of collaborative authoring in the WBT-Master we utilized the above-mentioned fact that all training objects in WBT-Master are structured according to the HM-Data Model. That means that any discussion forum, any contribution form users of the system, i.e., annotations, document attachments, comments, etc. are

also structured according to the basic HM-Data Model. Thus, we may map such contributions to other training objects supported in the system, e.g. to courseware. This simple principle allows us to gather personal knowledge from experts visiting the system in the form of different contributions and finally to convert such knowledge in the form of courseware and make it available for all other users of the system.

This method deals with authoring metaphor of gathering personal knowledge of a number of experts on a particular topic, and presenting this knowledge in a form of a training resource. Typical example of this application would be collaborative document writing or a co-operative courseware development.

Suppose, a courseware author needs to develop a courseware but he/she does not possess sufficient knowledge on the subject. Suppose also that experts having such knowledge often visit WBT-Master server. The author can simply access the server to initiate a structured discussion forum on the problem solution. The user defines a structure of the resultant document or courseware fragment and requests the subject experts to contribute in with materials relevant to the predefined structure.

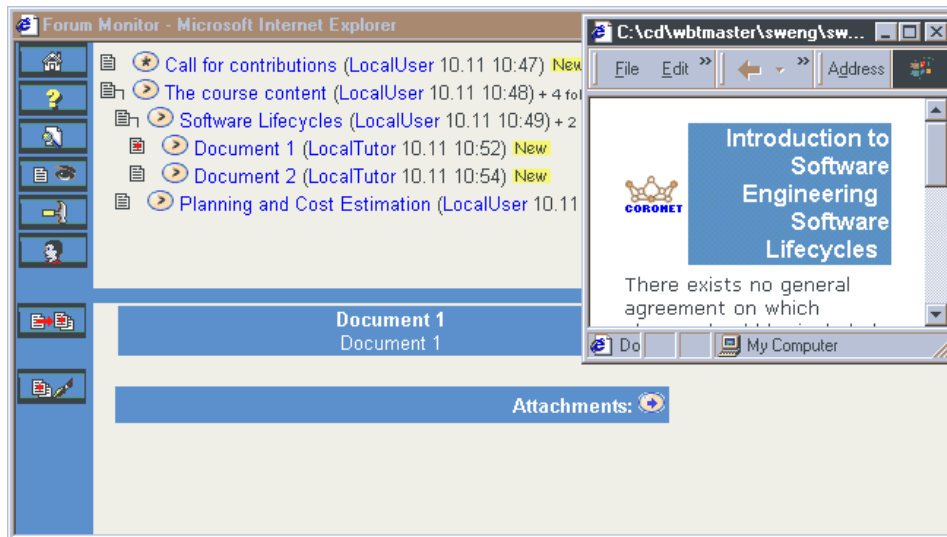


Figure 3: Structured discussion as an authoring paradigm

The subject experts write contributions, attach documents from their local drives and provide references to relevant documents available from the Internet. Finally, the author

converts the structured discussion (or selected components of the discussion) into a homogeneous HTML document or S-Collections (i.e. courseware).

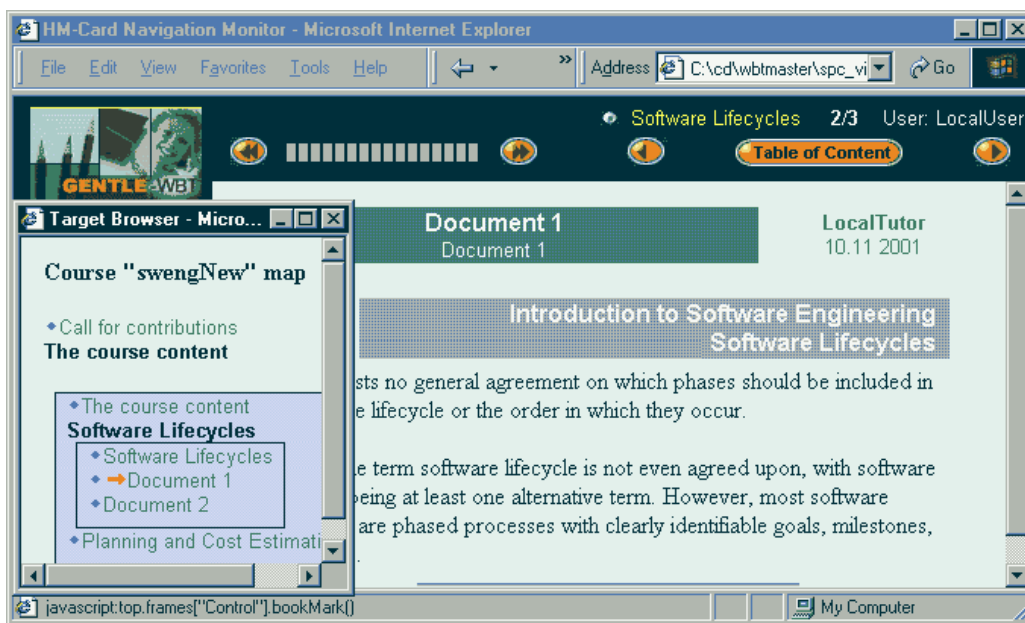


Figure 4: Viewing courseware produced as a discussion thread

Needless to say that this metaphor does not utilize the whole expressional power of HM-Data Model, courseware materials produced in this way can be considered as raw (draft) material for producing really professional content components. The obvious and very serious advantages are a natural support for collaborative, team-oriented authoring, extreme simplicity and absence of a learning curve for authors.

IV. REFINING THE STRUCTURE OF COURSEWARE

As we already mentioned, courseware created in a collaborative authoring session might be seen as raw

material (draft version) gathered from subject experts. Often such courseware needs better restructuring of refinement of educational material that it contains. Because each training object in the WBT-Master system is structured according to S-Collections paradigms authors might apply data structuring tools to update these S-Collections in any desirable way.

For instance, they may choose to restructure the discussion forums, brain storming sessions or other contributions of subject experts. At this step they may delete irrelevant contributions, add their own links or documents that are related to the subject, etc.

Moreover, once when the final courseware has been produced authors may choose to restructure that courseware. For instance, they may change order of documents in a navigable sequence, extend the course map

by adding some new documents into the courseware, etc. Obviously, the outcome of this whole authoring process is high quality courseware, which content is created by subject experts with a highly sophisticated structure.

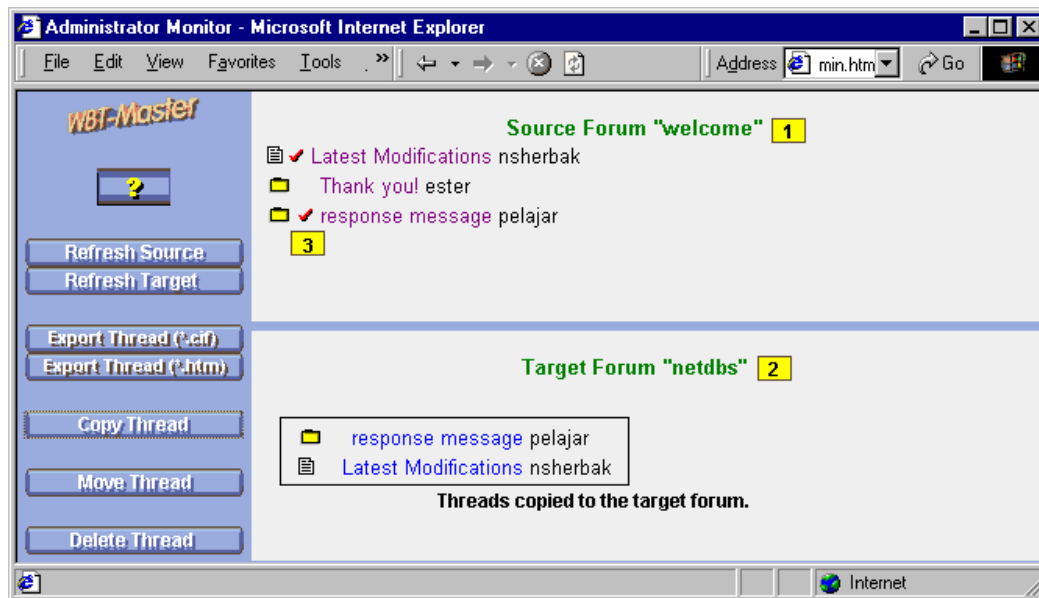


Figure 5: Forum restructuring panel

V. CONCLUSION

The authoring methodology presented in this paper represents a fundamental paradigm shift from the conventional "online course" model and its authoring paradigms. The collaborative, on-the-fly authoring paradigm tries to capture the best elements of what works in a typical corporate Web-based educational environment.

Thus, it tries to use Internet and Web technologies to transfer human knowledge in much more general sense.

Thus, the methodology bridges the gap between the initial possessors of the knowledge (which often does not exist in an electronic form) to the ultimate ability to apply that knowledge in a practical situation by a learner. In this way it encompasses the entire knowledge life cycle from capturing that knowledge from subject experts in a collaborative and team-oriented fashion while trying to keep the simplicity of authoring process and an absence of a need to learn how to work with possibly complex authoring tools. This cycle is closed through integration and delivery of gathered knowledge in the form of structured courseware.

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