Web Site Design Using a Web-Based Authoring and Publishing System*

Zhongdong Zhang
Institute of Telematics
Bahnhofstraße 30-32
D-54292 Trier
Germany

Uwe Roth
Institute of Telematics
Bahnhofstraße 30-32
D-54292 Trier
Germany

Thomas Engel
Institute of Telematics
Bahnhofstraße 30-32
D-54292 Trier
Germany

Christoph Meinel
Institute of Telematics
Bahnhofstraße 30-32
D-54292 Trier
Germany

Abstract *Web authoring and publishing has become a daily task for almost every enterprise or organization. One big question is how the Web authoring and publishing can be organized or coordinated in such a way that contents provided by qualified staffs, information architecture designed by information specialists and professional design made by specialists can be integrated together perfectly to build and to maintain a professional Web site. In order to answer the question, a Web-based authoring and publishing system will be introduced in this paper. Two finished projects will be described and some concluding remarks will be given.*

Keywords: World Wide Web; Web Site Design; Web-Based Authoring; Web-Based Publishing

1 Introduction

As a new medium, the Web has been widely accepted, not only in scientific world, but also in social life - it has been called *social hypertext* [1]. This results in immense needs for information or contents, especially for Web presentation of enterprises and organizations. Although HTML editing is not a difficult task, there are many factors which can affect the Web authoring/publishing process and the end effect of the Web presentation.

Several issues seem to be very interesting for Web authoring and publishing in enterprises and organizations. They are:

1. How can contents be provided by staffs who work in the area but don't have Web authoring and publishing experience (how to enable a reader to become an author)?

2. How can the entire Web authoring and publishing process in enterprises and organizations be effectively organized and coordinated?

3. How can software existing in the current computing environment, especially Web browsers be used for Web authoring and publishing in order to reduce the software cost and cost of user training?

4. How can a professional design be included and maintained in a Web site? How can the usability of the Web site be warranted ?

These considerations have driven us to design and implement a Web-based authoring and publishing system which allows each staff of an enterprises or an organization to perform Web authoring and publishing from his/her workplace (desktop) directly. That is, a professional Web site will be built and maintained by means of cooperation of staffs.

2 Web Authoring and Publishing in Enterprises / Organizations

There are many requirements for Web site design which will determine the quality of a Web site of an enterprise/organization. The most important requirements of a Web site are 1) high quality of document contents; 2) reasonable information architecture and navigation structure [2]; 3) professional design/layout; and 4) interactive components and components which allow further contacts/communication to be established.

These requirements can only be fulfilled by Web pages of a Web site. [3] lists the following aspects which determine the usability or the quality of a Web site[†]:

1. Page Design
2. Content Design
3. Site Design

Nielsen's discussion allows us to have a close look into Web site design process: it demands experts with qualification or knowledge from many areas - they should possess not only specialized knowledge in an area, specialized knowledge of design / layout, specialized knowledge of information and navigation structure, but all of them. Thus, cooperation is almost inevitable in order to build and maintain high quality Web sites.

The following scenario shows a way to build/maintain a Web site by cooperation of staffs:

- Web directors/information specialists design the site structure and the page structure
- Specialists design the layout of the Web site
- Staffs who possess specialized knowledge work from their desktop directly to edit documents which will be used as contents for the Web presentation
- Department directors or other content examiners control the quality of the contents
- The design/layout, site/page structure, and document contents will be brought together automatically by a system and the final Web pages will be synthesized or generated

In order to support such a Web authoring and publishing process presented in the scenario, a Web authoring and publishing strategy should firstly be worked out, which enables the separation of content design, information structure deign and layout design. Secondly, several components are needed in order to support this Web authoring and publishing strategy:

- An editing and publishing tool, which allows staffs who possess specialized knowledge but (perhaps) don't have Web authoring / publishing knowledge to perform the editing and publishing work effectively
- A workflow which allows the cooperation of different staff/user groups (roles). The workflow should support access control as well
- A component which not only supports the separated management of content design, information structure deign and layout design but can synthesize or generate professional Web pages automatically.

3 DAPHNE: Distributed Authoring and Publishing of Hypertexts in a Networked Environment

DAPHNE [4] is designed and implemented at the Institute for Telematics, Germany. The basic idea of DAPHNE system is to enable users who don't have Web authoring and publishing knowledge to perform Web editing and publishing from their workplace directly. The key features of the system can be described as below briefly:

Web-Based System

The Web has become a platform for developing various applications [5]. Therefore we have selected the Web as the platform for the implementation of DAPHNE. This means that Web browsers are main client software for DAPHNE users. Users can navigate in the system by means of Web browsers. In order to perform Web document editing, users just need to configure their Web browsers to work with (commercial) software that they usually use (for example, for text editing, MS-WinWord or FrontPage). For each document type a corresponding MIME-Type is maintained in DAPHNE and it is used for communication between DAPHNE server and Web browsers. This way, DAPHNE is platform independent at

---

[†] Additional aspects which are discussed by Nielsen 1999 include: Intranet Design; Accessibility for Users with Disabilities; International Use: Serving a Global Audience.

the client side and users can get maximal flexibility: they can use any software they are familiar with.

At the server-side DAPHNE employs a Web-Server to communicate with client software, a database for storage of Metadata, and the file system to store the documents. Recently a new additional system, the Hyperlink Management System HLM [6] has been developed. HLM can cooperate with DAPHNE and extend the DAPHNE's functionality.

Workflow with Role-Based Access Control

Within DAPHNE a workflow [7] with Role-Based Access Control (RBAC) mechanism ([8]; [9], [10]) is built in [11]. Roles, users, actions are distinguished. The following two sorts of elementary associations for RBAC have been implemented and maintained within DAPHNE:

- associations between permissions and roles, that means, permissions are authorized for roles, and
- associations between roles and users, that means, roles are authorized for users

It is assumed in DAPHNE that staffs (users) from many departments (areas) work together for the Web authoring and publishing. In DAPHNE departments or areas are presented as *subject headings*. Subject headings play several important roles: they build a hierarchical structure and act as document containers; they determine the Web site structure, and they are used for generation navigation structure and structural links as well.

A special sort of association is built in DAPHNE: associations between users and subject headings. This way, an effective access control mechanism is built. For easy management of subject headings, users/roles and the associations a Java-Applet has been implemented.

The workflow in DAPHNE not only supports the access control, but Web authoring and publishing process is coordinated and the quality assurance is realized by means of it as well.

Measurements to Ensure High Usability of Web Sites Constructed

As mentioned above, DAPHNE employs so-called subject headings for building and maintenance of a Web structure: they are used both for building the Web site structure as well as for building the page structure. Based on the hierarchy built by subject headings, generic links entered by staffs, documents edited by staffs, a Web site can be generated. This means that the navigation structure and the context for each page (page design) is maintained by DAPHNE automatically. In addition, the layout designed by specialists will also be combined into pages during the page generation (for instance, by means of templates). For maintenance of links contained in document contents, DAPHNE provides a Link-Checker.

4 Application Examples of DAPHNE

DAPHNE has been applied as a tool for Web authoring and publishing and for construction of Intranet in many projects in various enterprises and organizations.

Application One: Project Web Authoring and Publishing at a University

The aim of this application is to allow normal staffs who don't have special knowledge of Web authoring and publishing to perform Web authoring and publishing. All users work from their workplace (desktop) directly. Tab. 1 gives a brief description about the application:

Workflow	4-eye principle
Role type's	3 role type's (author, department director, system administrator)
Users	20+ (the other staffs can be connected to the system as soon as desired.)
Client software	no special
Documents	ca. 600
Document type's	all document type's supported
Multilingual documents	documents of different languages have been mixed together
Further functions	archive, interactive components such as BBS, Online-Chat integrated

Table 1. Description of application 1: Web authoring and publishing

Application Two:
Project Web Authoring and Publishing as Well as Intranet in an International Bank

The aims of the second application is to allow normal staffs who don't have special knowledge of Web authoring and publishing

- to perform Web authoring and publishing (Internet). All users work from their workplace (desktop) directly, and
- to build a corporate Intranet together

Tab. 2 gives a brief description about the application:

Workflow	for Web authoring and publishing (Internet): 6-eye principle; for Intranet: 4-eye principle
Role types	for Web authoring and publishing (Internet): 4 role types (author, department director, Web director, system administrator); for Intranet: 3 role types (author, department director, system administrator)
Users	for Web authoring and publishing (Internet): ca 30; for Intranet: all staffs of the bank have become authors (ca. 200) (Since Oct. 1999 the system has been used)
Client software	a Java-Client software has been installed at some users' workplaces (This is because users may need to take several steps, for example, to finish the editing of document)
Documents	for Web authoring and publishing (Internet): ca. 700 (Sept. 1999); documents for Internet grows every day
Document types	all document types possible
Multilingual documents	documents of different languages mixed together
Further functions	an Extranet also built

Table 2. Description of application 2: Web authoring and publishing and corporate Intranet

5 Concluding Remarks

Our work shows clearly that Web authoring and publishing systems can be built by means of

Internet/Web technology. Such systems can provide both high openness and flexibility. As shown in the two application examples, each staff - usually information consumer - can become an author, i.e. information provider. By means of a workflow the quality of information can be assured as well. An enterprise or organization can produce and maintain a high quality Web site this way.

Currently we are working on optimize the user interface and apply the system in further areas, for example for building digital libraries or Internet Portals.

6 References

[1] Erickson, T.: The World-Wide-Web as social hypertext. *Communications of the ACM*, 39(1) , 15 - 17. Jan. 1996

[2] Rosenfeld, L., and Morville, P. *Information Architecture for the World Wide Web*. Cambridge: O'Reily. 1998

[3] Nielsen, J.: *Designing Web Usability: The Practice of Simplicity*. New Riders Publishing: Indianapolis. 1999

[4] Zhang, Z., Heuer, A., Engel, T., and Meinel, Ch.: DAPHNE - A Distributed Tool for Web Authoring and Publishing. In L. Woods (ed.): *Knowledge: Creation, Organization and Use. Proceedings of the 62nd Annual Conference of American Society of Information Science, ASIS '99*. Vol. 36, 432-442. Washington D.C., Nov. 1999

[5] Girgensohn, A., Lee, A., and Schlueter, K. (1996) Experiences in developing collaborative applications using the World Wide Web "Shell". *Hypertext '96* (pp. 246-255). New York: ACM Press.

[6] Heuer, A., Haffner, E., Roth, U., Zhang, Z., Engel, T., and Meinel, Ch.: Hyperlink management system for multilingual Web-sites. *Asia Pacific Web Conference 1999: World Wide Web - Technologies and Applications for the New Millennium*. Hong Kong, Sept. 27-29, 1999

[7] Wodtke, D., Weissenfels, J., Weikum, G., and Dittrich, A.K. The Mentor Project: Steps Towards Enterprise-Wide Workflow Management. In: *IEEE International Conference on Data Engineering*. (New Orleans, 1996).

[8] Ferraiolo, D.F., Barkley, J.F., and Kuhn, D.R. A Role-Based Access Control Model and Reference Implementation within a Corporate Intranet. *ACM Transactions of Information and System Security*, 2(1) (1999), 34-64

[9] Sandhu, R. and Samarati, P. Authentication, access control, and audit. *ACM Comput. Surv.*, 28, 1, 241-243, 1996

[10] Wang, W.: Team-and-Role-Based Organational Contect and Access Control for Cooperative hypermedia Environments. In *Proceedings of Hypertext '99: Returning to our diverse roots*. Darmstadt, Germany. ACM Press, 37-46, 1999

[11] Zhang, Z., Haffner, E., Heuer, A., Engel, T., and Meinel, Ch.: Role-based Access Control in Online Authoring and Publishing Systems vs. Documentation Hierarchy. In *Proceedings of ACM SIGDOC '99*, 193-198. New Orleans, L A, Sept. 1999