WORLD WIDE WEB AS A COORDINATION TECHNOLOGY FOR KNOWLEDGE WORK

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ABSTRACT

This paper will bring some understanding of the World Wide Web as an information and coordination technology, and suggest some principles and metaphors for Web working. The suggestions will be underpinned by recent experiences from a collective Web-working project, and a transformation of a technical standard into hypertext format. Some ideas and visions for future developments based on the new medium are presented.

World Wide Web is more than a tool or a technology, it is a new medium based on a set of very simple principles that enable us to cope with a vast ocean of information and knowledge. The basics of World Wide Web and HTML (Hypertext Markup Language) will be explained.

A small-scale experiment in collective writing in Web will be reported. The task was development of the PAKT Yearbook of 1994, where a dozen of contributors worked concurrently on individual pieces around a shared Yearbook structure. This small project may in some sense resemble an engineering project, where many discipline experts are performing individual tasks around a shared goal and work breakdown structure.

The experiment was based on use of Microsoft Internet Assistant which provides a simple add-on that makes Microsoft Word a combined Web reader and writer. Using this interface to the Web, working there is as simple as traditional word-processing. This mode of working can easily be expanded with any kind of tool based on the same concepts of process linking. There is, however, no support for the work processes associated with creating the product (in our case a Yearbook), or the organization of the processes. Based on our experiences, we suggest some metaphors and practical approaches to efficient Web working.

Another experiment has been in the domain of technical standards. A couple of existing, paper-based standards from the petroleum industry have been converted to HTML, with cross-references transferred to active hyper-links. Using WWW as a one-way information server and as a shared working space will be illustrated.

We see at least three future aspects of Web development; active objects replace static information, information structures will be supplemented by knowledge processes (enterprise modelling), and the information economy will evolve based on integrated flow of transactions.

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INTRODUCTION

Peter Drucker pointed out back in 1969 that *"knowledge has already become the 'primary' industry, the industry that supplies to the economy the essential and central resource of production"* (Cawkell 1987, Drucker 1993). Since then, the production of knowledge has increased rapidly, followed by a corresponding specialization. Putting the knowledge to work in development and production projects requires coordination of highly specialized and skilled experts from a variety of disciplines, distributed across time, organizations and functional perspectives (Klein 1995).

Knowledge work is mainly concerned with information processes, collecting information and gradually transforming the state of the information body at hand. Physical work is similarly focused on transforming the state of bodies of matter by transportation, machining, assembly, etc. Application of knowledge to drive information processes has become the driving force in the knowledge economy, in a similar way that the application of power to material production processes was the driving force in development of the industrial economy.

Coordination may be defined as the management of interdependencies between actors, activities and resources in order to achieve common goals (Malone 1991). Dependencies are by their very nature relationships (i.e., they have existence only by virtue of the related items), and the relationships always reflect the dynamic behaviour of a system.

The term *technology* denotes the methods, techniques and tools applied in a process, and hence coordination technology becomes methods, techniques and tools for coordination. Coordination may be characterized along many dimensions, e.g., participants, perspectives and time (Klein 1995). Another taxonomy is constitutive and concurrent coordination, where

- *Constitutive coordination* is mainly a deterministic, work structure breakdown, execution and monitoring, as found in traditional project management and quality assurance schemes. These schemes work fine under rather stable circumstances where most interdependencies can be planned a priori and managed according to fixed procedures.
- *Concurrent coordination* is embedded in the work processes, and is visible only when it breaks down. This kind of coordination is excellently demonstrated in team sports like ice hockey or soccer, or in highly skilled team work like an emergency surgery team.

Pure knowledge work is usually rather abstract, lacking the common physical environment and objects as a framework for coordination. On the other hand, digital media provide a great potential for creating virtual playgrounds where knowledge work could be organized independent of physical items (like paper documents). A prerequisite for concurrent coordination to take place, is that the

goals and scope of work are commonly understood among the actors, and that the relevant aspects of the current situation are available for anyone to act upon.

Until recently, most coordination technologies has mainly supported the constitutive type of coordination. As the change rate of knowledge increases and the business environment becomes more dynamic, concurrent coordination has to become more prevalent. A digital hypermedia (or hyper-object) built on top of a client-server based global network may in the near future develop to a medium for concurrent coordination in virtual enterprises.

This paper will bring some basic understanding of the World Wide Web as an information and coordination technology, and suggest some principles and metaphors for Web working. The suggestions will be underpinned by recent experiences from a collective Web-working project, and the transformation of a technical standard into hypertext format. We will also present some ideas and visions for future developments based on the new medium.

WORLD WIDE WEB TECHNOLOGY

What is the World Wide Web?

The World Wide Web may be seen as a universe of information objects (often called pages or documents, due to legacy from a paper based world view). We stick to the term information object, as there is nothing in the WWW concept that restricts us to think in terms of pages. Information objects consist of one or more *information elements*. Elements may be of type text, picture, sound, animation, video etc. In addition, there may be a link from an information element to an information object. In this way, the information objects in the universe are linked together, providing a world wide hypermedia system. When a link is selected (usually by clicking on an information element like a word or a picture) an action is performed, like retrieving another information object or element. Using the metaphor of a universe, one may think of travelling through the universe following links.

Every information object in the universe has a unique identifier or address, called the URL (Uniform Resource Locator). The URL is structurally the same independently of where in the world the information object is located. Hence, navigating to an object located on Hawaii is no different from navigating to an object in Spain. The WWW can be said to have a global name space.

Information objects are represented using a language called HTML (HyperText Markup Language). HTML is a standard based on the principles of SGML (Standard Generalized Markup Language, Goldfarb 1990). The relation between SGML and HTML is that HTML is a data type definition in SGML, i.e., it is defined using the building blocks of SGML. The main feature of this is the separation of structure and layout, i.e., the information objects may be displayed differently to different users, if their viewers are configured differently.

In order to access the WWW universe, one has to have a browser like Netscape. The browser is the interface to the various information objects, allowing one to view and interact with the objects. Objects are physically located on servers geographically spread around the world.

A Brief Historical Review

The history of WWW is short and glorious. The World Wide Web project started at CERN in Switzerland in March 1989 as a project proposal. The main idea was to develop a simple hypertext system for distribution and retrieval of information internally at CERN, working across a number of platforms. The first prototype was ready in November 1990. In July 1992 came the first graphical browser (Viola), followed by the more successful NCSA Mosaic in February 1993. In March 1994, the Mosaic Communication Corporation was founded, later to be renamed Netscape. In February 1995, Microsoft released their Word Internet Assistant, making creation of simple information objects just as easy as writing plain documents in Microsoft Word for Windows.

Perspectives on WWW

WWW may be seen from at least two different perspectives, providing additional insights on the technology.

WWW as a Tool
In a tool perspective, the World Wide Web is nothing more than another way to retrieve files over the Internet, and display them appropriately. All the information objects and elements reside in files, and may be fetched just like files are fetched using the file transfer program ftp. The main differences are that access to the Web server is transparent, and that the file is displayed on arrival.

A pertinent feature of the browser tool is its ability to handle a vast variety of file formats. This is resolved by allowing the browser itself to handle the file types it recognizes (like plain text or HTML and some common picture formats), or spawn external applications for handling unknown formats, like sound, video, animation or unzipping of compressed files. In this way, the browser is extremely open and extensible, as managing new formats can be defined on the browser (receiver) side.

The WWW is based on a client server model. When an action is performed on an information object (like selecting a link), the client sends a request to the appropriate WWW server, asking for a specific file (given by the URL). The server responds by sending the file if it exists and the security mechanisms allow. Some meta information is provided along with the file, in order to tell the client what kind of file it is. The meta information follows the MIME standard. When the file is received by the client, it reads the meta information and displays the file according to this, either inside the browser or using an external helper application (as explained above).

The WWW relies on a host of communication protocols for client server communication. The main protocol is called HTTP (HyperText Transfer Protocol). In addition, communication using FTP (File Transfer Protocol), NNTP (News Transfer Protocol) and Gopher may be used, enabling the browser software to function as an integrated news reader, file transfer program, gopher reader and WWW browser.

WWW as a Medium

Another perspective on WWW is to view it as a new medium for communication. As opposed to traditional media like paper, the WWW allows for dynamic objects in the sense that information may change continuously, and may even be produced on demand (e.g., like reading a picture from a video camera and displaying it to the user). The medium is also non-sequential by nature, as links to information objects enable the reader to navigate free of the two-dimensional and sequential constraint of the paper medium. In addition, the medium incorporates several formats other than text, like pictures, video, sound etc.

Comparing WWW to other hypermedia systems, one notice that WWW is global, i.e., that information objects may be located anywhere in the world. Traditional hypermedia systems only allow navigation within some predefined organization (e.g., Lotus Notes). One may argue that the WWW also may be viewed as a "global organization", consisting of all organizations providing WWW servers on Internet, but the evolution of WWW is far more decentralized than any organization would allow, making a considerable distinction.

Inherent Constraints of WWW

Despite the many advantages of the World Wide Web, there are still a number of constraining factors for further usage. WWW as it is today is best suited for access of information, and not for exchange. Two persons working on the same information object will get into technical trouble, as each person will have their own copy of the object, and are usually restrained from updating remote objects.

A weakness on the conceptual level is that links are one way references. When the information object that is referred to is moved (i.e., renamed or removed), the link will be a dangling pointer, generating an error message for anyone who tries to follow it. This is also a problem when there is a need to modify the information architecture on the WWW server. Without special caution for objects referencing, considerable effort is required to maintain consistent information structures.

A third weakness lies in the expressability of HTML. Representation of tables and mathematical equations have just been added to the standard (HTML 3.0), but diagrams and 3D models are still cumbersome to present. The solution is to use external viewers for diagrams and models, but this requires non-standard modifications both on the client and the server side (making non-standard extensions to the MIME standard, or extensions to Microsoft OLE as proposed by Intergraph).

Finally, generating information objects is not as easy as it ought to be. Even with Microsoft Word Internet Assistant, the subset of HTML constructs that is supported is too limited to satisfy all but the most simplistic applications. This may be solved by upgrading the Internet Assistant to support more constructs. As for now, direct encoding in native HTML is required in order to take full advantage of WWW.

EXPERIENCES WITH COLLECTIVE WRITING IN WEB

The 1993 edition of the PAKT Yearbook was a paper report of activities and results. We wanted the 1994 edition of the Yearbook to be more vivid, and to utilize the new medium we was exploring: *World Wide Web.*

When developing the PAKT Yearbook of 1994, the contributors worked concurrently on individual pieces around a common Yearbook structure. This small project may in some sense resemble an engineering project, where many discipline experts are performing individual tasks around a common goal and work breakdown structure.

The Tools

During 1994 the use of World Wide Web had increased considerably in PAKT, and most of us used the NCSA Mosaic browser, while we edited our web-documents in the simple text-editor with all HTML-codes explicitly declared.

At the turn of the year, most people in PAKT changed to the *Netscape Navigator* WWW browser, mainly due to the superior speed in transfer and presentation of documents. Moreover, in the beginning of February we installed Microsoft *Internet Assistant* beta-version 0.95. The latter event was a revolution, we got the WWW available 'at our fingertips', and relieved us from the cryptic HTML-codes. All web-documents could be written, edited and saved as ordinary Word-documents. Internet Assistant also provides functionality as a Web browser, but today (June 1995) it is still too slow compared with Netscape Navigator and similar specialized browsing tools.

The local area network in PAKT comprise a dozen of PCs and a few Macintoshes, a server running the MS Windows NT network operating system, and connected to Internet via a Unix workstation as gateway.

In the weekly meetings we used a networked PC and a transview to display the yearbook on an ordinary overhead screen. This was a very useful tool for collaborative work in a group setting.

The Process

The yearbook was structured as a set of articles based on suggestions from students and other participants. A homepage (or start page) was created with authors names and links to the unfinished documents. Each article (or author) had

a catalogue in the underlying filestructure. No standards were made on filenames except the constraints imposed by the DOS name conventions (extension.htm instead of .html for HTML-documents).

Every author was responsible for his/hers work. There was a weekly progress and editing meeting, attended by all authors. Those who could not attend got updated information via electronic mail.

At the meeting the Web-Yearbook was displayed on a screen from a PC and a *transview* projector for overhead projection. A meeting reviewed the entire yearbook, or concentrated on particular elements. Though everyone participating in the meeting could comment and make suggestions, it became obvious that the person controlling the PC and the keyboard played a particular role in the discussions.

Because of the Web-approach the whole yearbook was continuously available for anybody knowing the URL (Uniform Resource Locator). Authors who did not want others to read their 'immature' versions were free to save their documents on their local disc and linking the documents to the yearbook at a later stage.

A special document named "Status" kept record of the progress of the articles. The Status-document had data about the author(s), planned deadline and the status of the article. The stages in the writing process was unfortunately not well defined in advance, so the status-part of this document did not achieve the expected attention. Anyhow, the document provided an overview for discussion in the weekly meetings.

We discussed several ways of visualizing the status of the articles. One nice metaphor we hit upon was *'flowers in a greenhouse'*. The greenhouse being the yearbook and the environment of the yearbook-process, and the flowers being the articles which evolved from a seed in the ground (idea) to a beautiful (?) grownout flower (finished article). The process of 'growing' an article and the entire yearbook is indeed seamless, and the Web technology provides a framework for collective information growing. Moreover, articles that appear to become weed or not being full-grown, could easily be transferred to a 'compost heap' from which the ideas could be recycled and used in a future process of knowledge growing.

Our yearbook-project was loosely organized because we wanted the authors to experiment with the Web as a medium, and we did not have previous experiences for making strict rules and procedures. A multi-author writing process obviously require some structuring of the process. Rules and procedures do not necessarily put any restriction on the creative processes, the problem is to find a fertile balance between collective rules and individual freedom. The Web turned out to be perfect for the kind of writings where the authors meet, discuss, agree about writing separate parts, read the fellow's writings, comment, meet again for discussion. The entire Yearbook as well as the individual articles have links to whichever parts one might want to include. Both the parts and the whole are

directly available at any time, enabling distributed and collective work, and always showing the updated content and status.

Based on experiences from the writing process, we suggest that responsibilities are assigned to certain roles:

- The *Editor* or Project Leader; having responsibility for the entire product, and managing the entire process similar to the editor of a newspaper
- The *Authors*; creators of the information content
- A *Web-Architect*; designing and developing the information architecture and the link structure
- A *Web-Artist*; supporting the authors with technical expertise in layout, graphics and art
- A *Web-Driver*; controlling the PC and keyboard during the editorial meetings
- A *System Operator*; in charge of maintaining the hardware, the software and the file structure

The roles require specialized competence and skills in various areas, but they might well be circulated among the people in a group of multi-functional experts.

Our Experiences

The collective writing in the Web provided us a medium that enabled us to maintain a continuos and consistent view of the whole Yearbook, while developing our individual parts. In this respect, WWW served as an efficient coordination tool.

The weekly meetings were used to monitor progress, to discuss and decide upon critical issues, and to obtain consensus (?) on the next steps. The Web documents might be impossible to print on paper without loosing most of the meaning. In this respect, it is required to have access to the live Web document, hence a transview projection is necessary. The projections gives all attendants read access to the information, but only the coachman of the PC has write access. Until group technology provides all with the same opportunity to write, the Web-driver role should be a support function, separated from the group of authors.

The Yearbook was completed on April 1, 1995 when all articles and the start page were finished for publication. The question was then *how to distribute the Yearbook to the intended readership?* We had no paper document to copy and distribute, only a file structure containing the Yearbook, located on our Web server. We realized that instead of distributing the Yearbook, we had to announce that it was available. Hence we announced the Yearbook (the URL) at some relevant Newsgroups, and we sent postcards to potential readers according to our contact address list within the University and industrial partners. We also offered an Adobe Acrobat version on diskettes for people without Web access, and in worst case, for people without a PC with MS Windows, a paper copy.

The Web is a continuos medium. A Yearbook distributed on paper would be frozen. No change could be made after printing and distribution. Our 1994 edition of the Yearbook can be changed at any time. Changes (due to misprintings or dangling links) may be made at any time, and made immediately available to future readers. Revised editions are out of question.

The Web is in many respects different from traditional media. Using traditional, material media, the sender of information provides the entire message, its form and content. Using the Web, the receiver is in control, she determines what to look at, and how to proceed through the information space. Hence the information provider has to consider how information will be accessed and assessed by the reader, the customer. This is a fundamental change, there is a media technology here that will destroy bureaucracy.

Prospects

We can foresee a future in media technology based on past experiences, and an understanding of the new technologies. The history of computing can be divided into four epochs, or paradigms, according to the physical storage of information:

- *Mainframes;* information storage confined to a cabinet, or a computer room; centralized
- *Minicomputers;* information distributed to several rooms; decentralized
- *Workstations;* information confined to your desktop; anarchistic
- *Local Area Networks;* information and resources distributed to logical structures; accessed locally
- *Global Networks;* information and resources distributed globally; accessed globally

MS Internet Assistant provide access to the global network of the Internet and World Wide Web. The next step we imagine is that WWW will become an integrated part of your file system, just like the local area network function today. We expect that Web-access will become an integral part of all applications, being it word processors, spreadsheets, CAD-packages or databases.

Extension of the Web object types (http, ftp, telnet, mailto, etc.) with a generic object type containing both the information content and the software environment to exploit the information seems straight forward. A Web browser like Netscape Navigator is easily configured to recognize almost any kind of object types based on the file extension (e.g., the transfer of a .ppt file may trigger a MS Powerpoint Viewer to provide you access to the information content).

Intergraph has recently launched the Jupiter Technology for building technical information structures. An OLE-extension for 3D-graphical objects has been developed and is supported by a number of major CAD-system vendors. The combination of the distributed, global network provided by WWW, and the linking and embedding of objects provided by OLE (or similar frameworks) may

in the near future bring us a fantastic powerful medium for organizing and performing knowledge work.

WWW FOR TECHNICAL STANDARDS

Another ongoing experiment is in the domain of technical standards. During the last one and a half year the Norwegian petroleum industry has developed 88 common standards within the NORSOK cooperation.

The NORSOK initiative was taken in the summer 1993 by the Norwegian Minister of Industry and Energy, Finn Christensen, to identify and provide measures to improve the competitive standing of the Norwegian petroleum industry. The first NORSOK report, presented in February 1994, identified and recommended seven areas for further work. Each area was addressed by a working group, one of these being *"Standardization"*.

The result of the working groups was presented on February 1, 1995. The standardization group had developed 88 "NORSOK standards". All standards were developed to replace in-house oil companies specifications. The standards were grouped into Design principles (9 standards), Common requirements (33 standards) and System requirements standards (46 standards).

The NORSOK-standards are now administrated by a secretariat hold by of The Norwegian Oil Industry Association and Federation of Norwegian Engineering Industries. Future and continuing work includes developments of more NORSOK-standards and internationalization of the standards.

The NORSOK-standards are distributed free of charge, and they have rapidly been accepted by the industry. The administrative work with copying and distribution of the physical items increased rapidly, and became an obstacle to further dissemination of the standards. A basic philosophy behind the NORSOK-standardization has been to make the standards easily available for the user, it was decided to make the NORSOK-standards available on the Web.

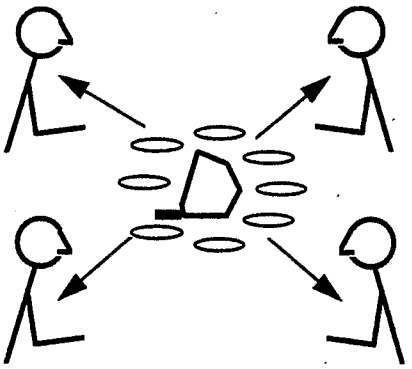
As an initial experiment, a couple of existing, paper-oriented NORSOK standards have been converted to HTML, with cross-references transferred to active hyper-links.

WWW as a One-Way Information Server

The implementation of the NORSOK-standards on the WWW is an example of using WWW as a one-way information server. In practice this implies that the information is made accessible for anyone. The users have immediate access to the information and relevant functions, such as printing, searching etc. However, if the information is printed as a paper document the information looses the links and the dynamic structures of the Web.

Using WWW as an information server has substantial advantages. The information is created once but used several times. The users are able to get the

information stored in the information server themselves and no distribution of copies are necessary. Figure 1 shows this concept.



World Wide Web as a one-way information server:
People get information from the information server.

Figure 1: A Receiver-oriented Information Architecture

The information users fetch the information from the information server themselves. This means no distribution costs for the distributor, except the cost for operation of the WWW server. The users are not restricted to the "office opening hours", but can freely choose their 'shopping hours'. The global time differences do no longer exist, and the 'standard shop' produces copy after copy at virtually no cost for the supplier.

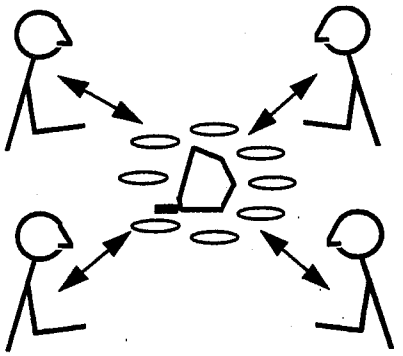
Another fundamental issue is the dynamic structure of digital information. The information customer is able to follow the history and the links of the information. A standard may, for instance, include an explanation of *why* a particular regulation has been included, hence not only stating the rule, but also the rationale for that rule. Moreover, people may be included, by providing email-adresses (mailto:) to the experts that have developed the standard. The engineer using the standard is given the opportunity to ask an expert about how a particular rule might apply to her particular problem.

Commercial use and payment

The NORSOK-standards are free of charge. Standardization bodies usually get about 1/3 of their income from sale of the physical standards (i.e., books made of physical matter like paper, diskettes or CD-ROMs). There is a considerable effort put into the making of a standard, and it is natural to ask *how to get paid for that effort?* There are many issues related to the legal and commercial aspects of the information marketplace. Of particular interest are the questions of *when to pay*, and *how to pay?*

The time of payment must be distributed at different levels. An analogy might be found in the visiting of a book store. You will not pay anything for entering and looking around, but if you want to bring a book with you, you have to pay. The WWW as an information server is almost similar.

Using WWW as a common working space for preparation and revisions of information all information is created once and available for the others in the group immediately. This means that all the information is available for all members in the working group without any delay for making updates of information or comments on separate documents. Figure 2 shows the WWW as an shared working place for a group world wide located.



World Wide Web as a shared working space: The group use the World Wide Web as a place for information sharing and information production.

Figure 2: Shared Working Space

To get full effect of using WWW as a working place, new work processes and formal procedures serving the WWW-medium must be established. This is the main challenge for the use of WWW in the years to come. It is also important to understand and use WWW as a medium for world-wide communication. This includes less communications costs, for example by reducing the need for meetings etc., and faster transfer and access to the information. The WWW will speed up the process of communications and the processes of creating and processing of information. Paper is prepared and travel at the speed of matter. Digital information travels at the speed of light.

FUTURE DIRECTIONS

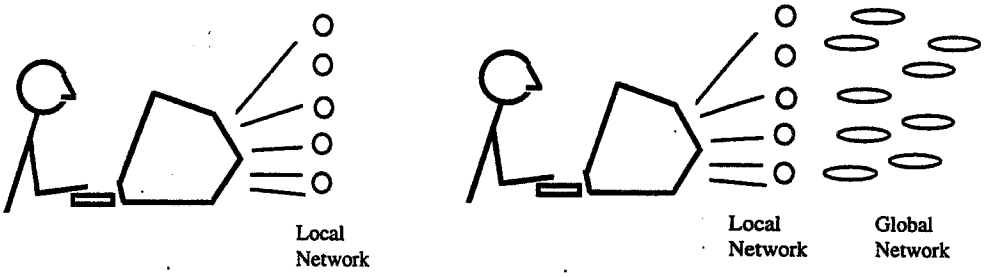
It is fifty years since Vannevar Bush described the problem of information overload, and suggested a solution based on hypertext. The Memex was intended as an individual tool (Bush 45). World Wide Web has made his dreams of a global hypertext come true, but even more: We have a global and shared Memex at hand. Almost for free!.

Compared to most other information technologies the development and growth of WWW has been beyond expectations and statistical measures, in this part we want to speculate in what the future in WWW will be.

In 1945 Vannevar Bush complained about the enormous amount of scientific articles, papers, reports, results and discoveries which were published each day. The chance of the world missing some important discovery was definitely there. Today the publication rate has exceeded Vannevar Bush's nightmares by a factor

of thousands. World Wide Web provides some means to search for and make available information to the privileged connected to the net.

If you look at the Filemanager in Windows: today your whole local area network (LAN) is transparent for the user. Filemanager treats the LAN as your harddrive. WWW will make the global network available in the same way.

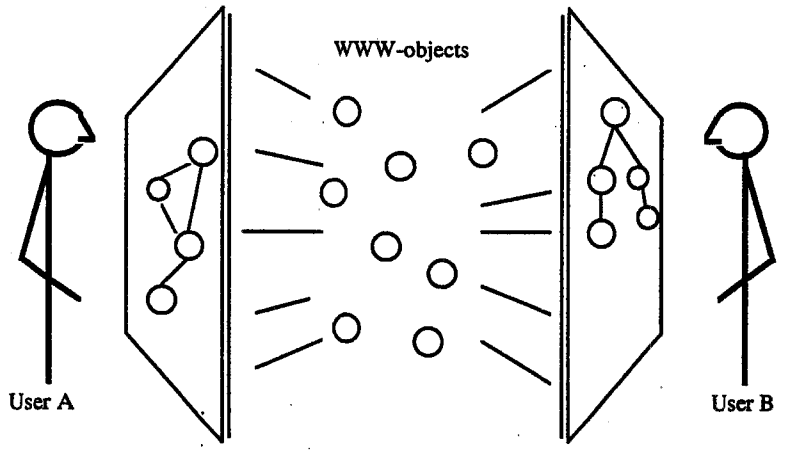


Filestructure today: Your local network is mounted on your personal computer and you access files on the LAN as if they were on your own harddisk.

Filestructure tomorrow: You can reach available files all over the world through world wide web.

Figure 3: Your 'File System' Embraces the World of Information

One major feature is that each user can create his/hers own structure directly on the WWW-objects in the web. The contents of the objects are the same, but we have different needs and views, and WWW gives us the opportunity to construct our personal structures of information, and our own paths of information (subjects) in the web.



The flexibility of WWW: The WWW-objects are the same but the users can construct their own structure at wish.

Figure 4: Personalize Your View of the World

The ISO standards may be used as an example. ISO have a homepage for general information. You are free to visit the ISO homepage searching for information but not able take anything with you or use the information actively.

Different levels of payment for using ISO-standards may be applied when the user

- wants a paper copy of a standard (paying for the physical item)
- wants to use the active links inside the standard or as references to other standards, experts etc.

However, the ISO-standards are not yet included on the WWW ISO-information server, but they hopefully will very soon.

Commercial use of WWW requires some kind of payment facilities. At present this is an obstacle for commercial use of the WWW. The information marketplace present such a huge potential for profit, that these kind of problems will be resolved. Actors as Netscape, Microsoft, VISA, MasterCard and Bank of America are actively participating in developing the transaction mechanisms. There is good reason to assume that a solution for copyright and economic compensation will evolve rather soon.

WWW as a Shared Working Space

Until recently, WWW has mainly been regarded as an information server. Another and more interesting option, is to use WWW as a world wide working space. The main difference in using WWW as an information server and a working place is in bringing both read and write access to the information. This requires some kind of control of user access to the information, for example limited to a project group.

Standardization work often includes people from various nations, resulting in many meetings, big travel expenses, high distribution costs and slow procedures for consensus and approval. The development of standards could have tremendous effects by applying the WWW technology to create shared working environments. Consider for instance:

- Documents for information, like meeting agendas, minutes of meeting, ISO-meeting etc., might just be available at the WWW immediately. The committee members just get an e-mail with an URL-address when documents are available on the WWW instead of receiving paper copies by snailmail.
- Documents in revision, for example preparation of new standards, must be handled another way. Here the committee members also must have a writeable access to the documents and the documents must have a status as a "working documents". The working document might be established at a national level and an international level. The members of a national working group comment on the "working document" created for the national level. The national secretary is responsible to include the comments of the national committee in the "working document" on the international level.

New York Times reported on April 20, 1995 that *"Eight large newspaper companies representing 123 U.S. newspapers have formed an alliance called New Century Network in order to develop a single nationwide system for offering their news and other information services over World Wide Web sites. The eight founding partners are: Advance Publications, Cox Newspapers, the Gannett Company, the Hearst Corporation, Knight-Ridder, the Times Mirror Company, and the Washington Post Company. It will be up to individual local papers to set costs for subscription and advertising"*

On May 8, Wall Street Journal reported that *"The New York Times Co. is teaming up with eight other large newspaper publishers in an online venture that will link their online news services into a national network. The New Century Network will consolidate the nine companies' online services and put them on the World Wide Web, allowing readers to easily jump from service to service. The Network is expected to be operational later this year"*.

Here we experience that big bucks are hunting for the big bangs. They may fail, but this kind of multi-billion dollars effort will nevertheless change the world. The world of publishing, the world of standardization, the world of engineering, and the world of education.

We should start to prepare ourselves to meet this new (brave?) world!

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