Usability Evaluation of a Structured Document Archive

Airi Salminen, Pasi Tiitinen, Virpi Lyytikäinen
Master's Program in Digital Media, University of Jyväskylä, Finland
(airi@cs.jyu.fi, pti@cc.jyu.fi, lyviav@cc.jyu.fi)

Abstract
The paper describes usability evaluation of a prototype archive in a project where SGML-based solutions for the Finnish Parliament and ministries have been developed and studied. The archive consisted of three types of parliamentary documents in SGML format. A usability inspection was preceded by an extensive analysis of the document management in the Finnish legislative and budgetary work. The analysis covered the documents, their use, user roles, tasks, and needs. The inspection method was tailored from an earlier design-oriented evaluation method to be used especially for the evaluation of structured document archives. A grammar-based layered model was used to facilitate the detailed analysis of the application. In the paper we discuss implications of the study to the future design, implementation and evaluation of structured document archive application.

1. Introduction

A structured document archive is a software application with a repository of structured documents. In the structured documents the information structures are indicated such that the users are able to utilize the structures in information access. SGML (Standard Generalized Markup Language; [7]) is an international standard for defining information structures by Document Type Definitions (DTDs), and for indicating the structure in documents by descriptive markup. HTML is an SGML application for Internet publishing. XML (eXtensible Markup Language; [3]) is a subset of SGML intended for information distribution in the Internet, such that the information structures available to the readers were not restricted to the layout oriented structures like in the current HTML.

The activities on the SGML/XML standardization and in the development of SGML/XML-compliant software predict a significant growth in the use of structured Web archives in the near future (see e.g. [10]). In the new applications it is possible to combine features of hypermedia applications, structured document databases, and intelligent agents, and thus offer powerful and complex information access capabilities.

The development of structured document archives and the selection of the software used for them in enterprises is often part of larger document standardization efforts. Standardization means agreement upon rules which define the way information is represented in documents, and implementation of the standards. The implementation of the standards causes changes both in the authoring and reading environments. A framework and methods are needed to evaluate different choices for structured document archives and to identify problems, challenges and opportunities in the new types of systems and applications.

The paper describes a method for evaluating the usability of structured Web archives, and an application of the method in a standardization project called RASKE. The term RASKE comes from the Finnish words “Rakenteisten AsiakirjaStandardien KEhittäminen” meaning the development of standards for structured documents. The project has analyzed the document management in the legislative and budgetary work in the Finnish Parliament and ministries, designed preliminary SGML standards, and studied and developed methods to be used in the standardization. A prototype archive (called RASKE archive in the rest of the paper) consisting of three types of documents – government bills, committee reports, and Parliament replies – was implemented by a publishing house. There were two major goals in the implementation: 1) to demonstrate the idea about the future electronic archive of parliamentary documents to the people in the legislative work, and 2) to support the development of effective and usable structured Web archive solutions by the evaluation of the prototype.

Hypermedia applications have been under extensive usability study (e.g. [1, 4, 9, 11, 16, 23]). The studies include usability inspections where evaluators inspect or examine usability-related aspects of a product (e.g [6, 13]). The evaluators can be usability specialists, end users with content or task knowledge, or other types of professionals [15]. In usability inspection, the evaluation of the product is based on the considered judgement of the inspectors. The inspection methods vary as how this judge-
ment is derived. Usability inspections are often accompanied with usability testing, in which the product is studied under real-world or controlled conditions, with evaluators gathering data on problems that arise during its use. In the case project, a usability inspection was preceded by an analysis of user needs and followed by a small-scale usability testing.

In the case the evaluators were document management researchers and the inspection method used was tailored from the method of Garzotto, Mainetti & Paolini [6] where the evaluation of the application by general usability criteria is coupled with a systematic analysis of the application. In the design-oriented evaluation of [6] the primary concern was the internal strength of the design of an Art Gallery CD-ROM, not how the application relates to a domain or specific user needs. In a standardization framework however, the needs of different types of users are important. The case evaluation was preceded by an extensive analysis of the document management in the Finnish legislative and budgetary work. The usability was evaluated from the point of view of the potential readers of the future electronic archive of parliamentary documents, and from the point of view of the Finnish Parliament as the service provider and the major producer of the documents. Suitability of the archive to the people working in Parliament and ministries was studied in respect to the needs identified in the earlier analysis.

Section 2 describes the users and their needs in the case project. The framework for evaluating structured text archives is introduced in Sections 3 and 4. Section 5 describes the case archive using the model introduced in the framework. The usability of the sample archive is examined in Section 6. The implications from the study are discussed in Section 7.

2. The users and their needs in the case environment

We associate the term usability to the used-by relationship between two objects (see Figure 1). The object to be used is called a product and the object using the product is a user. The user is an organization or a person having a role in a domain and some needs concerning the product. For example, if we consider a government bill as a product in the domain of national legislative work, then Parliament, ministry, member of Parliament, assistant in a ministry, committee councilor, library, and library client are roles. The role specifies the tasks of the person or organization in the domain. In the used-by relationship usability represents the extent to which the product meets the needs of the users in a specified context of use.

![Figure 1. The used-by relationship](image)

Our term usability covers also utility or usefulness which are sometimes separated from the usability (e.g., [8, 17]). The evaluation of system usability has often been limited to the aspects related to the user interface. The success of document standardization work however, requires the system to fit within the use context. The underlying aspects of the structured archive, like DTD, greatly affect the functionality and usefulness of the system, and thus the usability of the system in the work tasks of people. The evaluation requires information about the user needs in different contexts and tasks. This information is acquired in the analysis phase of the standardization project preceding the usability inspection. Similar, broad, functionality-oriented view to the concept of usability is also favored e.g. by Bevan & Macleod [2], Dillon & McKnight [5], and Karat [12].

Usability can be evaluated by defining a set of attributes or criteria to the used-by-relationship. The type of product, the type of users and user roles, and the evaluation method to be used determines the suitable criteria. A product may have quite different types of users with dissimilar needs and usability criteria. For example, the criteria of the end-users of a software system differ from the criteria of the company purchasing and using the software.

During 1995-1998 four domains were analyzed in the RASKE project: the enquiry process, national legislative work, Finnish participation in the EU legislative work, and national budgetary work. The archive of parliamentary documents is used on all of these domains. The analysis methods developed and used in the project have been described in [19, 20]. The analysis covered documents, their use and users, current systems, work processes, and user needs. Data was collected with multiple methods: by interviews of domain experts familiar with the document management on one or more domains, by the study of reports of earlier projects and working groups, and by discussions in the meetings of the document council. The needs of person users of documents and related systems were collected by interviews based on questionnaires. Nearly 100 people were interviewed. On each domain, document users were divided into roles. For example, on the domain of national legislative work 38 user roles were
identified. Examples of user roles and needs are listed in Table 1.

Different user roles have greatly diverse needs. A need for summaries was often mentioned in the interviews. Because e.g. members of Parliament receive dozens of documents daily, they often have very limited time to read the information. And because there are two official languages in Finland - Finnish and Swedish - the legislative documents must also be available immediately in both languages. Users have sometimes also needs for very complex queries, which cannot be easily fulfilled by current information systems.

In addition to the needs of individual persons, the organizations have also their own needs and demands for the usability of a product. Parliament has a strong need for compatibility, which can be supported by application independent information formats. Parliament has a need for reliability and long-term deposit, all documents must be reliably available for decades. Archive must also support Parliament's new workers, who are often unfamiliar with legislative documents and processes.

### 3. The analysis dimensions

Standardization work requires strong collaboration between people from different organizations with different expertise and background. They should be able to discuss the effects of standardization solutions and evaluate prototype implementations together. The evaluations of systems should produce an analysis and clear description of the system, in addition to the usability evaluation. Hence we regarded the approach used by Garzotto et al. [6] suitable for our purposes. In [6] the application was first analyzed according to five analysis dimensions: content, structure, presentation, dynamics, and interaction. The notions used in the analysis were taken from the Hypermedia Design Model. A structured document archive is a special kind of hypertext application. There the hierarchic structure defined for documents strongly affects other components. A special grammar-based layered hypermedia model has been defined for such applications in Salminen, Tague-Sutcliffe & McClellan [21] and Salminen & Watters [22]. The dimensions and notions used in our framework follow the grammar-based model. We used four analysis dimensions:

### Table 1. Examples of user roles and needs

<table>
<thead>
<tr>
<th>User Role</th>
<th>Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant in a ministry</td>
<td>Helps the presenting officials e.g. by typing, reading and editing the final pages of government bills.</td>
</tr>
<tr>
<td>Committee council</td>
<td>Names of the experts are needed from old committee reports</td>
</tr>
<tr>
<td>Department secretary of a committee</td>
<td>Parts of the government bill are needed while a committee report is prepared</td>
</tr>
<tr>
<td>Member of Parliament</td>
<td>Keywords in government bills are important while trying to find an older bill</td>
</tr>
<tr>
<td>Presenting official in a ministry</td>
<td>Notes: committee reports are important source of information; especially interesting are the changes made by the Parliament and names of the experts; it would be useful to know how consent the committee was; it should be easy to find out what are the valid arguments in a law.</td>
</tr>
<tr>
<td>Translator</td>
<td>Notes: Finnish and Swedish documents are needed parallel in the translation</td>
</tr>
</tbody>
</table>
Content and hierarchic structure. A structured document archive consists of documents whose structure can be defined by a grammar. In case of SGML, the grammar is expressed by a DTD. Some of the documents are regarded as primary documents, some as secondary documents supporting the use and understanding of the primary documents. Secondary documents are, for example, user instructions or classifications, or HTML documents dynamically created for representing the information in the primary documents. The content of an archive is organized as a hierarchy of parts. A part can be, for example, a collection of SGML documents, an SGML document, or an SGML document element. In many archives the words in the documents are indexed at the time of document storage. The index is usable to the readers as metadata in information access.

Hypertext structure. In the hypertext structure of a structured text archive links connect parts. A set of links having some common characteristics and special navigation capabilities is called an access structure. Examples of often used access structures are history lists or hierarchic linkings starting from the table of contents and linking sibling parts pairwise to each other. Some of the access structures as, for example, history lists are created dynamically during the archive reading by a Web browser.

Dynamics. Essential access functions in a structured document archive are text search and navigation. An important feature is the capability to find and refer to specific document parts defined in the grammar. More advanced access capabilities may include intelligent agents retrieving automatically information about new documents on a specific area, or summarization techniques collecting from a set of documents specified parts. Similarly to database systems, a structured document archive could allow the definition of different views to different groups of users. Other examples for functions are printing or annotation capabilities.

Presentation. Presentation means the way archive content, access structures, and functions are shown to the users.

4. The usability criteria

A Web archive has always at least two important user types: the readers of the archive and the organization providing the service for the readers. Different kinds of criteria, such as "speak the user's language" [13] or "clearly marked exists" [17] have been defined to assist in the evaluation of the usability. These criteria, which are often known as heuristics, are usually closely related to the evaluation of the user interface. Instead we wanted to define more general criteria to be used in evaluating also other aspects of the archive besides the user interface, in context of its use by different persons and organizations. We wanted to define criteria to be especially used to evaluate structured document archives, their different dimensions and their features, e.g., DTDs, access structures and text indexing. In Garzotto et al. [6] seven evaluation criteria were used: richness, ease, consistency, predictability, self-evidence, readability, and reuse. In a standardization framework, the use of SGML/XML supports richness, consistency, and reuse of information in general. Considering these criteria in the application level is important both for the readers and the service provider.

The other criteria of Garzotto et al. [6] were regarded suitable for evaluating the usability of the application for the readers. We however considered predictability as part of self-evidence, because the concepts are so closely related. We also considered readability as part of ease and added general suitability to the criteria. We used the concept of suitability to evaluate how well the overall system supports the real tasks of the users. Suitability can be regarded both from the point of view of readers and the service provider.

For the service provider the richness expresses the system’s capability to serve different types of readers: readers in different roles, readers with different levels of expertise, and readers with different physical capabilities. For a reader richness expresses the abundance of information items and ways to reach and use them. The SGML and XML standards support the richness by allowing the definition and denoting of rich hierarchic structures, and by allowing the inclusion of extra semantic information by attributes. In hypertextual structured text both the abundance of information items and ways to reach them is supported by the existence of two structural layers: hierarchic structure and hypertext structure. The layered implementation also adds the richness: the capabilities of the WWW browsers are always added to the capabilities implemented in the application itself. By providing documents in multiple languages richness of the content of the archive can be increased. Richness in dynamics means, for example, that there are different search methods. In the presentation richness can be increased by allowing possibilities for the users either to tailor the application outlook as they prefer or to choose from a set of predefined outlooks. On the other hand, richness in presentation and dynamics can make the use of the application difficult.

Reuse of information is supported in SGML/XML by the application independent format of information structures. In a structured document archive reuse can be considered especially in the DTDs and functions. In the DTDs reuse can be achieved by entities. The functions could allow the specification of different views and different external representations to the same data in the logical
structure of documents, and easy copying of the data for other purposes.

Consistency is usually considered as one of the most important evaluation criteria [9, 17]. Similar objects should be treated with similar principles. In structured text archives, consistency can be violated in every dimension. In the hierarchic structure, a DTD may include inconsistencies of different types, for example, in the naming of elements or attributes, or in the level of granularity. For the service provider consistency in the DTDs is an important means to support the correctness of the content. Inconsistencies in the DTDs are potential causes of errors in document authoring. One reason for the consistency violations can be the layered implementation of a Web archive. A well-known problem is the creation of consistent hypertextual fragments from a text which is originally divided into parts of variable length [19]. Consistency in dynamics means that an action always has the same result. Presentational consistency can be achieved by using the same presentational elements in every occasion. An electronic text archive can also be consistent in regard to paper documents.

Ease measures information accessibility and how easy to grasp operations are. It can be used as a criterion both in dynamics and presentation dimensions. In structured text archive queries and navigation are the most important functions. Since the archive can be used by a very large variety of users from private citizens to experts in legislative work, different functions should be designed in a way which makes the use of the archive easy for every user group. Easy query templates should be designed for different purposes and different users. However, experts should be able to make versatile searches. It should be simple to limit the search to certain structural parts of an archive. It should be also easy to make a hard copy of the whole document or some part of it. Ease in presentation means readability: it should be easy to read the texts of the archive.

Self-evidence expresses how well the users are able to guess the meaning and purpose of elements of the archive. Self-evidence makes learning and remembering of functions easier. Content and hierarchic structure are self-evident if, for example, the names of the documents and elements in them are familiar to the users from their previous experience. Following a link in a hypertext structure should not lead to unexpected results. Functions of the archive can also be evaluated by the self-evidence criterion. For example, it should be self-evident for the user how the archive has been indexed. In the presentation dimension symbols in the buttons should indicate their function.

Suitability expresses how well the application suits for the tasks it was designed. A structured text archive may be intended for very special kinds of users. For example, the technical manual of a paper machine should assist the installation, use, and service of the paper machine. An archive of law case documents should assist lawyers to solve their problems. Suitability of the archive’s content depends on the collection of documents chosen to the archive. A suitable DTD allows the identification and retrieval of the specific document parts needed in the specific tasks. Hypertext structure can be made more suitable for its users by choosing appropriate sizes for the parts and by defining links between documents and parts considered important by the users. By implementing functions that users need, for example, printing possibilities and special queries, dynamics of the archive will become more suitable for its users. An electronic archive application suitable to a service provider has to be suitable to the intended clients. Compatibility is an important criterion for any organization developing document standardization. The reliability is especially important in the area of legislative documents.

5. Description of the RASKE archive

The description below starts from the presentation in the same way as the reader or evaluator starts learning the features of an application.

5.1. Presentation

The archive is used by a WWW browser. Figure 2 shows a sample window while the user is reading the RASKE archive with frames by Netscape® Communicator 4.03. When the frames are on, the Netscape window is divided into four areas: the upper part of the window contains the Netscape menus, the Directory Frame on the left, the Document Frame showing the content of a document on the right, and the Query Frame on the bottom including navigation buttons, an edit field for a text query, and a menu to choose a document collection. By choosing the Query Template button on the Query Frame, the user can replace the content of the Document Frame by a query template. The documents in the RASKE archive are made to look very much the same as the original paper versions. The texts that are in two columns in paper versions are shown in two columns also in the RASKE archive.

5.2. Content and hierarchic structure

ing house. There are no other attributes in the DTDs except some element identifiers.

The secondary documents of the archive include HTML documents Home Page, Main Page, Instruction Pages, Query Frame, Query Template Frame, and Document Frame. RASKE archive’s index contains words and some special characters taken from the archive’s SGML documents as index terms. Words are defined as sequences of numbers and alphabets. The stop word list is included for allowing the exclusion of the most common words or some special characters from the index terms.

5.3. Hypertext structure

The reader of the RASKE archive may use five kinds of hypertextual access structures:

Collection selection allows the user to choose one of the six collections of legislative documents as the current collection. The access structure connects the items of a collection menu in the Query Frame as well as the collection names in the Main Page to the corresponding collections.

Hierarchic access structure connects the title elements of the Directory Frame to the corresponding elements in the documents of the current collection, and the corresponding elements to each other according to the hierarchic structure of the titles in the directory.

Occurrence list is created as a result of a text search. A text search specifies a set of parts called search hits. They are either SGML elements of a given type, or index terms occurring in the beginning of the phrases matching the search expression. After a text search, the directory elements of the Directory Frame consist of the title elements in the components having search hits. The occurrence list connects the Next Search Hit button to the first hit, and the first hits in successive components to each other in both directions.

Associative linking connects a cross-reference in a document to another document. The RASKE archive contains associative links between committee reports and government bills.

History list is provided by the WWW browser. Different browsers offer different kind of lists, but in principle, history lists include links between the browser pages.

Figure 2. Netscape interface to the RASKE archive
5.4. Dynamics

The browser chosen for reading has influence on the functions available. For example, there are different kinds of possibilities for aiding navigation, defining the details of the presentation of the documents and printing them. The navigation is facilitated by the access structures described above.

A text search can be directed either to every collection or to one selected collection. For supporting the text search, the documents in the archive are indexed. The search is used to find elements or text phrases matching the specified search expression. The search expression can be given directly, or by filling a template. By search templates the search is restricted to the elements indicated in the template.

6. Usability of the RASKE archive

The grammar-based model helped us analyzing the archive and forced to study it in detail. Several implementation errors were identified during the evaluation. The errors were reported to the implementor. In the following we discuss some of the usability aspects encountered. The detailed evaluation report is written in Finnish [14].

6.1. Presentation

Parliamentary documents should have a consistent and in a certain way dignified layout also in the online format. In the archive the documents have a consistent presentation but the archive could have a more sophisticated outlook.

The template-based search mechanism lacks richness. Templates give a possibility to restrict the query to some major element types. The criterion for the content of the element types has to be given by an ordinary query expression.

Locating the elements specified by a text search was not always easy because elements as search hits were not indicated in any way in the Document Frame whereas the phrases as search hits were shown by a special colour. According to the user requirements analysis, department secretaries of the committees would have liked the statements of dissent to differ from rest of the text in the committee reports. In RASKE archive the specification of this kind of presentational views was not possible.

6.2. Content and hierarchic structure

From the point of view of the Parliament, DTDs were too complicated and typography-oriented. They could not be used as a basis for the reengineering of document production in the Parliament and ministries. The reuse of the documents by different writers was not easy.

Since the case archive was a prototype with a very limited repository, it was clear that there was lack of richness in the collections. An archive suitable, for example, to people in legislative work should include a larger variety of documents related to each other. Parallel use of Swedish and Finnish texts was important at least to translators and Swedish speaking Parliament members. There was also lack of richness in the metadata. The user interviews had revealed that in the current archive glossaries and keywords were a very popular way of searching information. However, nothing like that was implemented in the RASKE archive. Nor was there any description of the legislative process which would be most essential if ordinary citizens were able to use the archive. The terminology of the archive was adopted from DynaText and is not suitable for everyday legislative work.

A major problem in the use of the application was the difficulty to understand and utilize the information structures in the documents. There were no descriptions of the information structures. The DTDs clearly were not suitable for the people to whom the application was intended. The repository of the prototype consisted of documents earlier tagged for printing purposes, which lacked some semantically important elements.

6.3. Hypertext structure

Collection selection and associative linking were self-evident as access structures. Hierarchic access structure, occurrence list, and history list, however, were not self-evident and thus not easy to use. The size of the components displayed in the Document Frame varied greatly and was partly dependent on the previously visited component. The hierarchic linking was not consistent within documents of a type. It was not always clear before selecting the title of the document in the Directory Frame, what would appear to the Document Frame.

In the occurrence list the user would expect that the links connect successive match points. The matching phrases contained in a component were indicated in the Document Frame by a special color and font, but there was not a linking between the phrases. Problems with the history list occurred when the application was used by the Netscape® Communicator 4.03. The associative linking lacked richness, thus suitability also was decreased. Only links between committee reports and government bills were implemented. The Parliament replies often referred both to government bills and committee reports in the repository but they were not linked to each other.
6.4. Dynamics

The archive does not adequately support the preparation of the legislative documents in the Parliament, because it is not easy to reuse information from the archive when preparing a new document. It is also an insufficient tool for document distribution in the Parliament because the documents cannot be easily printed from the archive. The reliability of the archive became also questionable because of great amount of technical errors during the evaluation. For the demanding parliamentary work this is not acceptable.

The result of a text search was not always self-evident. The stop word list was not available for the user, nor could the user know anything about indexing of the special characters. There were inconsistencies in text indexing. If the search clause contained other characters than numbers and alphabets, it was not quite clear, what the result of the search would be. For example, a search for the name Marja-Liisa provided two matches in the collection of committee reports 1996, but the search by Marja+Liisa found 20 matches, which all were typed as Marja-Liisa in the text. It is quite common that Finnish names have a hyphen in the middle, and therefore hyphen may often occur in search expressions.

The navigation buttons behaved inconsistently. The Next and Previous Document Part buttons both on the top and bottom of the Document Frame look alike, but their functions are different. This difference in functions is not explained in the user instructions.

Considering the potential opportunities offered by structured text, the dynamics of the application lacks richness. There is no capability to define different views to documents, neither different external representations, nor a capability to collect pieces from different documents.

For the members of the Parliament summaries of texts are important, because of the huge amount of information they need to deal with. By development of automated functions which summarize the documents the suitability of the archive could be increased.

7. Implications from the study

The case evaluation was successful in finding a number of problems in the application. The coupling of the usability evaluation with a careful analysis of the application was an important means for finding clear notions to describe the application and to communicate with representatives of the publishing house and Parliament. Many of the problems were fixed by the publishing house before demonstrating the archive to the users. A small scale user testing was arranged after the correction of errors. In the following we discuss implications of the research to the future design, implementation and evaluation of structured document archive applications.

Many of the problems related to the ease of use, consistency, and self-evidence in the case application were originated from the multilayered solution. The notions, data structuring, and functions were partly derived from DynaText and DynaBase, partly from the specific WWW browser used by the reader. These kinds of problems are hard to avoid unless the browsers are able to support the information structures defined in the document repository. The XML standardization is expected to lead to this direction: information structures indicated by XML can be utilized directly in the XML-compliant WWW browsers. These browsers are an important area of future usability studies.

A common problem in text retrieval systems is the lack of precise description of text indexing. The readers either have to learn the effects of indexing by the trial-and-error method, or accept the fuzzy approach to the text retrieval. In most retrieval cases the user needs not to know the precise specification but especially for expert users willing to formulate specialized queries clear user instructions concerning text retrieval should be available. Writing clear user instructions would also force the implementers clearly consider different choices and the effects of the choices to the retrieval results.

One of the most severe problems in the application was the complication of the DTDs and the lack of structure description in the user interface. A structured document archive should always offer to the readers a way to learn the structures used for the documents. The structure cannot be effectively utilized unless it is known. The expert users might need and be willing to formulate their own structure queries but it is possible only if the names of SGML elements are known to them. Graphical structure descriptions have been found useful in many SGML systems.

In the case application only some of the potential opportunities of structured documents have been utilized; there was lack of richness and lack of reuse. Only simple query templates were implemented, no view definition mechanism was included. The analysis in the RASKE project showed that users needing legislative information act in very different roles and need the information in different tasks. The information is needed sometimes by new workers unfamiliar with the notions and documents in the domain, sometimes by very experienced users having strong expertise in the domain. The interest and knowledge concerning information technology varies greatly.

SGML/XML supports the reuse and richness of information. The future systems should better utilize this by rich information access choices, support for the reuse of
once written information without retyping, and also support for highly automated information access. Even a limited support to the structured approach is however useful in electronic archives. Compared to the current systems clear benefits were seen in the case archive by the subjects in the small-scale user testing.

In the case evaluation coupling the usability evaluation with a careful analysis of the system was important both for finding errors and for being able to discuss the system in the evaluation context. The first evaluation of the functionality of the archive took by two researchers two hours. Understanding the different layers of the application, document structures, details in the text search, and the relationship of the hierarchic structure and the hypertext structure took however a long time. Reporting the results according to the framework forced the researchers to test details which otherwise had remained unnoticed. The new tests often also revealed new problems. This kind of evaluation work should be done more by software designers. It could then lead to more consistent and well-specified solutions and less need to explicit user instructions. It would also make the design and evaluation of the applications easier. The evaluation could be more concentrated on the usability issues than on understanding the system. Clear specification of the system and clear user instructions should be demanded by the clients considering the acquisition of a new system.

The RASKE project has clearly shown that the SGML standardization in a network of organizations is a long process causing significant changes in the document production and also causing high costs in the reorganizing phase. The standardization work often faces a chicken-egg problem: the DTD design requires testing and demonstration of the structured approach in the domain but the demonstration also requires a DTD suitable for the domain. Easy definition and testing of prototype DTDs and prototype document repositories needs support in the future systems.

8. Conclusion

Activities in the SGML/XML standardization predict growth in the repositories of structured documents. The specification of the internationally accepted open metalanguages like SGML and XML for structured documents supports the use of rich information structures, inclusion of extra semantic information in documents, and reuse of the information in different applications, in different forms, and by different media. The structured document approach cannot however succeed unless applications are able effectively utilize standard form value-added documents. The applications for retrieving information from structured documents are new kinds of applications, which may be both powerful and complex. The usability of different features, and combinations of features coming from hypertextual applications and structured text database applications, have not been much investigated. In the development of rich information access capabilities the richness of the users should also be recognized.

In the paper we introduced a framework for analyzing structured text archives and for evaluating their usability, and a case evaluation in the context of Finnish legislative work. The usability inspection made by document management experts was preceded by extensive analysis of the domain, documents in the domain, their use, user roles, tasks, and needs. The inspection was followed by a small-scale user testing showing strong interest in the case application.

The development of more powerful applications and investigating their usability is an interesting area of the future research. Several implementation projects have followed the work of the RASKE project. The Ministry of Justice has implemented an SGML archive of laws and statutes available in the Internet to all citizens since Fall 1997. The Parliament has started the implementation of SGML standards for the parliamentary documents created in the Parliament. Also the Ministry of Finance has used SGML in preparation of the budget proposal for year 1999.

The research of the RASKE project continues in the EULEGIS (European User Views to Legislative Information in Structured Form) project. The project will design and implement a distributed prototype structured archive including legislative documents from EU and member states. The user needs will be studied and the system will be evaluated applying the methods discussed in the paper. The potential future users of the system will be people all over the Europe speaking different languages, accessing information from documents written in different languages. The multilingual, heterogeneous, distributed environment offers many new challenges to the research.

Acknowledgements. The financial support of the Finnish Parliament, Ministry of Finance, Academy of Finland, Technology Development Center of Finland, and Telematics Application Programme of the European Commission is gratefully acknowledged.

References


