

## User needs for electronic document management in public administration: a study of two cases

Pasi Tiitinen\*, Virpi Lyytikäinen\*, Tero Päivärinta\*\*, Airi Salminen\*

University of Jyväskylä

\*Department of Computer Science and Information Systems

\*\*Information Technology Research Institute

P.O. Box 35

FIN-40351 JYVÄSKYLÄ, FINLAND

**Abstract-** Development of new practices for managing documents in their electronic form in public administration requires extensive knowledge about the domain, its processes, documents, and the needs of both organisations and individual people. The paper introduces two cases where the needs concerning electronic document management are studied. The first case concerns the creation of the state budget in Finland, and the second one concerns the Finnish participation in EU legislative work. In both of the cases the study revealed many needs related to different aspects of electronic document management: documents, information technology, and work with documents. The study is part of the research related to SGML standardisation in the Finnish Parliament and ministries.

### I. INTRODUCTION

A great number of organisations and people are involved in processes in which the European legislation and state budgets are created. The work in these processes consists, to a great extent, of work with documents. The documents record information important to European societies. Flexibility of the work as well as accessibility to the information in these societies are closely related to the effectiveness in the use of information technology (IT) in document management. In *electronic document management* (EDM), documents are in a digital form and IT applications are used for the production, storage, distribution, processing, retrieval, and disposition of documents and information in them.

In improving EDM, the major goal is to create environments where people are willing and able to use information technology effectively in their work. The needs of the organisations as well as the needs of individual people should be considered when planning new solutions. Our earlier studies have shown that in organisations involved in the legislative and budgetary work in Finland, the following are important needs in relation to EDM [1]:

- long-term accessibility of information in documents,
- application independence of the storage format, and
- capability for flexible reuse of information in documents.

These needs have guided many organisations to consider SGML (Standard Generalized Markup Language) as the future format for documents [2].

SGML standardisation processes have proved to be both complicated and demanding. They may take several years incurring sometimes tremendous costs (e.g. [3, 4]). Before

starting SGML implementation in an organisation or in a group of organisations it is important to know and understand the needs of individuals either working with documents in the organisations or using those documents outside the organisations. The needs may be related to the ways documents are structured, presented, or organised, to the EDM technology, or to the ways in which work on documents is organised. The paper introduces a study of two cases where the needs of people have been investigated. The first case concerns EDM in the creation of the state budget in Finland, and the second one concerns EDM in the Finnish participation in EU legislative work. The study is part of the research related to the SGML standardisation in the Finnish Parliament and ministries. The major research question which the study explores with the help of these two cases is: What are the needs of people concerning the EDM and how can SGML standardisation address those needs?

The rest of the paper is organised as follows. Section II discusses the background of the study and introduces the RASKE project in which the study was carried out. Section III describes the methods used in the study. Sections IV and V discuss the two cases in detail. In Section VI implications of the study for SGML standardisation efforts are discussed.

### II. BACKGROUND

#### *The RASKE project*

The two cases discussed in this paper are a part of a major collaborative research project in which document management in the Finnish Parliament and ministries was studied, and methods for document analysis and standardisation were developed. This project, known as RASKE, took place during the years 1994-1998 [1, 4, 5, 6, 7]. The term RASKE comes from the Finnish words "Rakenteisten AsiakirjaStandardien Kehittäminen" meaning the development of standards for structured documents. The project was started by the Finnish Parliament and a software company in co-operation with researchers at the University of Jyväskylä. The Ministry of Foreign Affairs, Ministry of Finance, Prime Minister's Office, and a publishing house also participated in some phases of the project.

The initiation of the project was motivated by document management problems in the Finnish Parliament and government. For example, the following problems concerning document management were identified [1]:

1. Incompatibilities of the systems used created the need for repeated typing of the same piece of text, which, in turn, was a potential source of inconsistencies in documents.
2. Inconsistencies in document naming and document identifiers caused problems and extra work.
3. Lack of information management coordination between the ministries, and between the government and Parliament.
4. In spite of the fact that almost all of the documents were digital, documents were mostly distributed in a paper form.
5. The retrieval techniques of different systems were heterogeneous.
6. The retrieval techniques of the electronic archiving system and the tracking system of Parliament were not satisfactory.
7. Uncertainty concerning the future usability of the information in the archived digital documents.

During the first phase of the collaborative project in 1994, alternatives for the future document standard format were considered. The problems identified and organisational goals together with the availability of different technologies supported the selection of SGML for the future format. SGML is an international standard for defining document structures [2]. A subset of SGML called XML (eXtended Markup Language) has been developed especially for Web information systems [8]. SGML and XML have been increasingly utilised in the development of EDM in many organisations.

In the RASKE project, the SGML standardisation in the Finnish Parliament and ministries was closely connected to the development and investigation of methods needed in document standardisation. The standardisation begins with *document analysis*. In such an analysis, current documents and document management practices are studied and described, and new document structures and document management practices are proposed.

#### A generic method for document analysis

Fig. 1 depicts the document analysis method which was constructed in the RASKE project. The analysis starts with *specifying the domain* to be analysed. The phase includes the identification of a goal-oriented activity whose document management the analysis will concern, and the identification of the major organisational actors of the activity. The domain can be, for example, Creation of the State Budget or National Legislative Process.

After the specification of a domain, three phases are started in parallel: process modelling, document modelling, and role modelling. Fig. 1 does not explicitly show iteration in the analysis. However, once the domain has been defined, any of the subsequent phases may reveal a need to correct or extend previously created models and descriptions. Thus, basically all of the activities may proceed, to some extent, in parallel until the report of the analysis has been completed. *Process*

*modelling* is used as a means to identify smaller activities and their interrelationships within the domain, the organisations responsible for those activities, and the documents created or used. *Document modelling* covers the description of document types, their lifecycles, contents, and relationships to each other. In *role modelling*, the key users of the documents are identified and their document management activities are described. The modelling methods and techniques covering the first four phases of document analysis are described in detail in [1, 4, 5 and 6].

*User needs analysis* studies the problems in current document management and the needs for the future as identified by document users. *Collecting the analysis report* takes place at the end of the analysis. The report is collected on the basis of the descriptions and models produced in the earlier phases. The report includes suggestions and specifications for EDM of the future.

This paper focuses on the results of the user needs analysis in two target domains of the RASKE project. In the subsequent sections we will first describe the data gathering and analysis methods for explicating user needs for EDM, and then how the methods were applied and what were the findings in the target domains.

### III. METHODS FOR ANALYSING USER NEEDS

A user needs analysis can be regarded as a case study (e.g. [9]) in which several primary and secondary data sources are used. This section declares the methods used for collecting and analysing the user needs data in the target domains.

As illustrated in the previous section, the user needs analysis is an integrated part of the larger document analysis process. In fact, the models resulting in the first four phases of document analysis form a crucial basis for reaching a collec-

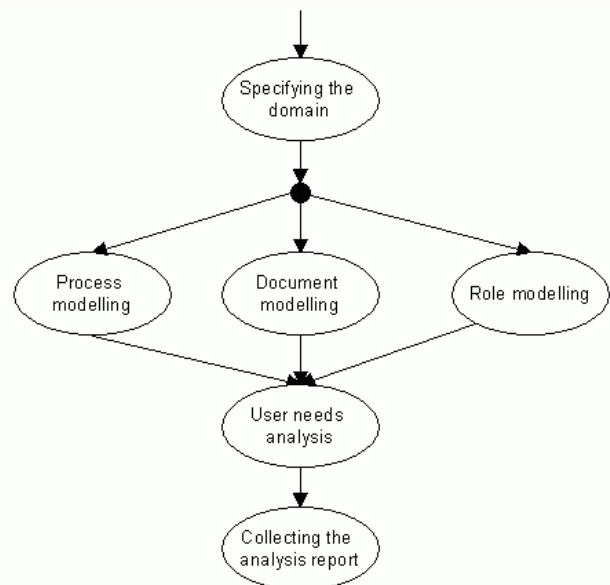


Fig. 1. The document analysis process.

tive understanding of the domain in question among the project stakeholders. This is necessary, furthermore, in identifying the relevant users of documents in the domain, as well as in elaborating effective means for gathering valid information about their needs. The primary sources of data to construct the models of the target domains were (1) frequent collaboration and discussions between the researchers and the project intermediaries representing both parliamentary and governmental organisations, (2) notes from informal discussions and interviews of some three to five domain experts pointed out by the intermediaries, and (3) actual document instances from the domain in question. In addition to these primary sources, secondary documented data was collected also: reports of earlier working groups and projects, existing written rules and standards concerning documents, systems manuals and instructions, and general literature describing the domain. Meetings of the domain project council served also as a source of information in addition to its communicative role during the whole document analysis process.

After the researchers and intermediaries had reached a satisfactory understanding of the domain in question (including its processes, user roles and documents) a comprehensive user needs analysis began. Based on the role modelling phase, the intermediaries identified the most important roles to be included in the interviews. One criterion used in the selection for the interviewees was to choose people who would know about the needs of those roles not directly represented in the interviews. For instance, the ministers were not interviewed since they do not produce nor retrieve many documents *by themselves* whereas the information specialists are actively retrieving and refining information for the ministers thus being included in the group of relevant roles. Moreover, we interviewed more people in roles where the differences in work tasks were large within that role. During the interviews, the interviewees recognised some two to three essential additional roles not pointed out by the intermediaries. Interviews concerning these roles were added to the agenda afterwards.

The interviews were conducted with structured questionnaires tailored for each domain. The design of the questionnaires was based on the sense-making theory [10] and Jacobson's notion of use cases [11]. The basic idea was to first draw attention to the users' work tasks in the domain in question, after which the needs for documents and document management were connected to these tasks (also [12]).

The questionnaire included futuristic examples of possible queries to be implemented in a future system for structured document management. These questions were intended to help the interviewee to envision the possibilities of SGML-based applications and his or her needs with regard to the possibilities. For example, one of the sample queries concerning the creation of the state budget was "How do the expenses differ between the budget proposal and the final budget classified by ministries and items?". The subjects were asked whether they found the types of queries useful or not. The tailored questionnaires were piloted in a couple of inter-

views and slightly revised according to the experiences to improve their validity and clarity for the domain in question.

Each interviewee was first contacted by phone. Before each interview, a letter was sent to the interviewee. The letter declared the purpose of the interview and it was accompanied by a graphical process model of the domain under analysis (constructed in the process modelling phase) so that the interviewee could orient him- or herself to relevant matters from the viewpoint of this inquiry. The initial user interviews were conducted by a pair of researchers in order to unify the researchers' ways to document the information expressed. Since there were many interviews within a rather a tight schedule, highly structured questionnaires and unified documentation practices were considered as a means to reach consistency in the gathering process. The researchers made separate notes about the initial interviews which were compared later on. After the researchers had achieved a unified writing style the interviews were conducted by only one researcher at a time. Only in those interviews where there were more than one interviewee present at a time two researchers were present also. This reduced the overall calendar time needed for gathering the interview data.

The user needs were analysed according to different actor roles and categorised into the needs concerning documents, information technologies, and work activities related to documents. The needs concerning documents were further categorised into the needs concerning the content, structure, layout and metadata. The needs related to work activities were categorised into production, storage, distribution, processing, retrieval, and disposition of documents.

The results were collected and published in reports which were disseminated to every interviewee [13, 14]. The dissemination aimed at sharing knowledge about different views of the current situation and also about the ideas how the situation should be changed. It was regarded as advantageous in the target domains which included a great number of relatively independent organisational units and user roles. For the same reasons the reports included direct quotations, which were placed in tables that were arranged according to the user roles.

#### IV. CASE 1: CREATION OF THE STATE BUDGET

Creation of the state budget is a central task of the Parliament and government in Finland. The state budget is created once a year, but it can be revised several times with supplementary budgets. The process of creating the budget has been quite constant for decades, and reflected in the structure and layout of the documents involved.

The creation of the state budget begins in state offices and institutions, when they send their own proposals for the budget to the ministry governing them. The ministry then collects the proposals together as a budget proposal of that ministry. Proposals from each of the ministries are then sent to the Ministry of Finance.

The Ministry of Finance organises negotiations with other ministries in order to reach a decision over the final content

of the budget proposal. After negotiations, the budget proposal is approved by the whole government and the President of the Republic, and forwarded then to the Parliament.

After the preliminary debate at the Parliament the budget proposal is sent to the Finance Committee, which examines the document thoroughly and prepares a Finance Committee Report discussing the desired changes to the proposal. The petitions made by the members of the Parliament along with the Statements prepared by other parliamentary committees are also discussed in the sessions of the Finance Committee and included in the report.

The Finance Committee Report is discussed in the plenary session of the Parliament in a single reading, which may last for several days and include hundreds of votes. The result of this reading is called the Communication of Parliament, which includes the final budget.

### *Interviews*

Altogether 40 actor roles were identified within the "Creation of the Finnish State Budget" domain. Of the roles, 18 were considered especially important with regard to document management. A total of 47 persons were interviewed by three researchers. The three largest groups of the interviewees included members of the Parliament, officials drafting the budget proposals, and their assistants. The number of subjects in these groups were 10, 7, and 7, respectively. Other 15 roles had one or two representatives each.

In the following, we discuss the results of the interviews concerning documents, information technology, and work with documents.

### *Results*

#### *Documents*

The subjects were very familiar with the documents involved in the creation of state budget. They, however, knew that inexperienced users such as new civil servants or ordinary citizens find it often difficult to find information from documents. Therefore, indexes and keywords were suggested as a way to improve the situation. In general, adding meta-data, e.g. concerning authors, contact persons or geographical coverage of the appropriations, was regarded an important means to increase the usability of documents.

The level of details in the content of documents raised some comments. During the recent years information in the budget proposal and therefore also in Finance Committee Report and Communication of the Parliament has been in more general level than before. Assistants and officials drafting the budget proposal considered this kind of trend as a desired one, because it makes the drafting easier and clearer. The opinions of the members of the Parliament were divided: some liked the current situation, some thought that the direction to generality transfers political power from Parliament to ministries.

#### *Information technology*

The subjects would have preferred to have more information related to the creation of the state budget available in

electronic form. Especially in the beginning of the preparation of the budget proposal in ministries and state offices, the need for more effective utilisation of IT in document management was clearly stated, provided that the security in every phase could be maintained. On the other hand, many of them expressed the opinion that since there was no time to learn to use new systems, the IT should not be complicated to use. Some of the subjects expressed quite negative attitudes towards IT. This could be partly a result of the old system used for creating the state budget. The system was difficult to use and incompatible with other information systems. Because of these limitations the old system was not used in every organisation, which led to the transfer of information on paper between organisations. This caused rewriting of documents.

#### *Work with documents*

During the document *production* most problems were caused by tight schedules. Because the budget proposal for the following year must be prepared on the basis of the last accepted state budget, the templates and instructions for filling in the figures are not available early enough, causing the need for corrections. Since the budget proposal should be delivered to the Parliament at the beginning of September each year, there is seldom enough time to check the language of both Finnish and Swedish versions of budget.

Many subjects complained that it was impossible to *distribute* parts of the state budget and its preparatory works in electronic form. This led to excessive printing and copying on paper. If parts could be easily extracted, many users could receive only the parts they were interested in. People in the translation office especially would benefit greatly if the Finnish documents could be translated into Swedish in smaller parts already during their preparation.

An important task of information specialists in ministries and the Parliament is the distribution of information related to budget preparation to the interest groups, including media and ordinary citizens. For this purpose the text in the documents should be de-jargonised and summarised. The most essential factor in distribution of budget information to the public is that the information is easily available to all who need it, either in paper format or via Internet.

*Archiving* of the budget documentation has not been systematic especially pertaining to the first memorandums concerning the state offices' and ministries' proposals. These documents are, however, needed in the Parliament, in translation office and during the follow-up work of the budget. Electronic document management should also allow annotations and version control, both of which were considered highly necessary.

Personal contacts e.g. to colleagues were very important information *retrieval* methods for a large portion of the subjects. Especially officials in ministries emphasised the importance of personal contacts and relations in acquiring documents and information. The futuristic examples revealed, however, that automatically generated reports and calcula-

tions were considered valuable in computer-supported information retrieval.

## V. CASE 2: FINNISH PARTICIPATION IN EU LEGISLATIVE WORK

Ministries are responsible in Finland for monitoring and preparing matters concerning the legislative work of the European Union and for determining Finland's position on such matters. Finland's position regarding an issue is defined together with Parliament.

When EU begins to prepare a legislative issue which requires a Finnish position, the discussions of the committees and working groups of the EU organisations are summarised by Finnish participants in Meeting Reports. The most important facts concerning the issue are gathered to a document called *Perusmuistio*, 'Basic Memo', whose structure has been co-operatively designed by ministries and Parliament. Basic Memo is distributed to organisations which may take part to the drafting of the position. When the drafting of the legislative issue advances, the Basic Memo should be updated to reflect the changes. Basic Memos contain confidential information, whose dissemination is restricted. Information originating from Basic Memo is used also in other documents.

The EU matters are discussed in the Finnish government by the Cabinet European Union Committee and the Committee for EU Matters, whose 36 sections include representatives of ministries and other interest groups. The decisions and opinions of these bodies are entered in the Minutes, which are disseminated to many involved organisations. The Council of State brings all EU matters requiring Parliament's approval to the attention of Parliament and keeps it up to date on other matters under discussion in the EU. Information originating from Basic Memo is used in the document that forms the basis of the discussion in Parliament.

The legislative process of the EU creates demanding challenges for the Finnish decision-making. Time for determining Finland's position may often be very short and it requires the discussion and complex co-operation of stakeholders in ministries and Parliament and in other organisations as well. The amount of information related to an issue is often immense also. The domain presents many challenges for document management. The situation in the domain was quite different from the budget domain, since the document types and work processes were not yet stabilised after Finland had joined the European Union at the beginning of 1995.

Documents of the domain can be classified in two basic categories according to their origin; documents created by the organisations of the European Union and documents created by the Finnish organisations. In the user needs analysis we focused on the Finnish documents, since the project could not control the production of the other ones. In principle, a common structure for the most important Finnish document types had been agreed.

## *Interviews*

Altogether 50 actor roles were identified in the domain. Of these 14 were considered as highly important with regard to document management. The roles included members of the Parliament (8 interviewees), information experts from ministries and Parliament (5 interviewees), officials of the Permanent Representation of Finland to the European Union (5 interviewees), ministry officials in charge of the Finnish position (12 interviewees) and an official from the Office of Chancellor of Justice. Altogether 47 interviews were carried out by three researchers.

In the following, we discuss the results of the interviews concerning documents, information technology, and work with documents.

## *Results*

### *Documents*

The subjects clearly had conflicting opinions about the structure of the documents, especially about the structure of the Basic Memo. The order of the elements disturbed some subjects. They regarded the structure as designed to fit the needs of the officials who participated in the negotiations in the European Council, not for other users. The officials of one ministry disagreed so strongly about the suitability of the Basic Memo, that they used their own version of the document with slightly different structure.

The subjects found the authoring instructions often obscure. Some writers complained that they didn't know enough for whom they were writing and therefore couldn't know how and what to write. Many regarded this as a great problem, since the differences in content and structure hampered and slowed down the use of documents.

Flexibility in document structures and capability to reorder parts was regarded important by several subjects. The need for summarised information was also repeatedly expressed. People in some roles need mostly general-level information, in some others detailed information, and sometimes history information is important. The Basic Memos, in particular, often contained information that could be used in informing the general public, but since the separation of public and confidential information was not flexible the documents could not be easily published e.g. on the Internet. In one ministry the public relations department sometimes covered the confidential parts of the documents and then made copies by using a copy machine. These copies were then disseminated.

### *Information technology*

Most of the subjects wanted to increase electronic distribution as well as electronic archiving of the documents. Present information systems, however, were criticised, because they were considered unreliable, unfriendly and slow. Incompatibility of different systems raised many comments. The incompatibility problems often led to faxing of documents to other organisations and re-typing of information. Sometimes documents were sent by e-mail but their attachments followed on paper by ordinary mail. The present systems did not

usually aid or force the authors to write according to common document structure, which was one reason for incoherence.

#### *Work with documents*

Some subjects participating in the authoring of Basic Memos wanted to have more detailed instructions to help them in the *production* of documents. The instructions were expected to give information about what should be included in the Basic Memo in a certain phase of the process, about the people reading the document, and about issues those people were mostly interested in. Some of the users of the Basic Memo complained that a document regarding e.g. a legislative issue is sometimes created too late. Some also complained that the decisions were not always written down, which prevents dissemination of information about the latest situation.

*Distribution* of the documents was problematic. At the time of the study, documents were still distributed primarily by paper or by fax partly because of the incompatible e-mail systems and application-specific file formats. A member of a Parliament Committee complained that a pile of new documents distributed before an important meeting can be more than ten centimetres thick.

*Archiving* of the documents was unsystematic. Many organisations had no official decisions or standard practices concerning the archiving. This was often the case with the documents distributed by paper as well as those distributed in electronic form. Many people compensated for this by keeping their own personal archives. However, the immense amount of distributed material seriously hampered the archival.

In *information retrieval*, personal contacts e.g. with colleagues were of utmost importance for many subjects. The ministry officials especially emphasised the personal contacts and relations in acquiring documents and information. A phone call to an expert could provide valuable information quicker than a long search using a computer. People were generally very satisfied also with the services of information experts, whose task in the ministries and the Parliament is to help people to find information about almost all possible matters. Information experts were very interested in improvements in information retrieval as were also the members of the Parliament, who must often create their opinions quickly. Comprehensive hyperlinking and advanced index search capabilities were thought necessary in an electronic retrieval system.

The futuristic examples revealed the need for computer-supported information retrieval concerning, for example, summaries included in the documents. Especially the Finnish EU secretariat considered this kind of aid in their work as crucial.

## VI. IMPLICATIONS

The two cases studied had many similarities, besides the fact that the organisations were Finnish ministries and the Parliament. The public had interest in the issues handled in

both the domains, documents' structure had already been predefined, and there was no integrated EDM system available. In both cases there were a wide variety of user roles and work tasks in which documents were manipulated or used. Therefore the needs of the people were quite different within the domains. With few exceptions the attitude towards EDM development was positive and people were very interested in discussing the current problems and possible solutions.

The cases had also many significant differences. The "Creation of the State Budget" as a domain had become established, while the "Finnish Participation in EU Legislative Work" domain had emerged quite recently. In addition, the amounts of documents involved differed greatly: budget documentation is a complex collection of documents created, in principle, once a year, while several hundreds of Basic Memos informing about EU legislative issues are written each year. The active lifetime of budget documentation is about two years: during the first year the budget is prepared and accepted, the rest is follow-up work. The lifetime of the documents in the second case is not that constant: sometimes the issues described in the Basic Memo can be handled very quickly, sometimes the work may take several years.

In spite of the fact that the cases and the needs of people differed significantly, the studies clearly revealed that the deployment of structured documents could offer notable benefits for the work in the domains. People were not at all interested in SGML technology but they were interested in the capabilities the technology offers. In the following we will discuss the implications of the study concerning SGML standardisation and its relationship to the three components of EDM: documents, information technology, and work with documents.

#### *Documents*

The use of document standards can largely eliminate the incoherence in documents, which was a problem especially in the domain of EU legislation. The structure definition can guide the author with the aid of the software to write the documents according to the commonly agreed structure. Since decisions must often be made in a very short time, incoherence is a great hindrance for users.

One of our main targets in user needs analysis was to get information to support the design of the SGML Document Type Definitions (DTDs). However, the user requirements analysis did not lead to many changes in the preliminary DTDs, which were designed after the discussions with the domain experts. One reason for this, in the case of State Budget, was the stability of the document structure, which was due to the years of use. Another reason was the wide knowledge of the domain experts who helped us to define the first versions of the DTDs.

#### *Information technology*

The results emphasised the importance of usability, since its lack decreased significantly the use of present information

technology. This reduced the electronic dissemination and archival of documents and led to the preference of using paper for dissemination of information. In both domains the differences in computer skills between users were large. The differences can be decreased by building the systems more flexible and user-friendly.

#### *Work with documents*

Structured documents can benefit the work with documents in many ways. Standardised documents can greatly reduce the problems of the incompatible application-specific formats and thus minimise the distribution on paper or by fax. When documents are saved to a common structured archive the information can become better available for all involved organisations, which greatly reduces the need for separate organisational or personal archives. Structured documents allow the information to be observed through different views, which may support the users with different needs. For example, parts of a document can be ordered according to user's requirements when the document is viewed on the screen or printed. Excessive printing can also be decreased when documents or parts of them can be printed on demand. SGML/XML documents are easily converted to HTML, which advances publishing on Intranets or on the Internet. Confidential parts can be automatically hidden, if they are marked up when the document is authored. In the future, SGML/XML structures may also support the automatic summarisation at least to some extent.

The formal SGML/XML definition of the document structure enables advanced queries to the structured document archive. Queries can be limited, for example, to certain parts of the document, which can enhance the accuracy of retrieval. The use of SGML/XML will also facilitate the definition of hyperlinks between the documents and their parts, which can greatly improve the retrieval of related documents. Although the delivery of documents via electronic information systems can partially decrease the need for personal contacts, the systems cannot replace them entirely.

The use of structured documents can enhance the work process, especially when combined with a workflow system. A document management system that supports versioning can save information about the history of the process. The information related to the first phases of the drafting of the budget especially had so far remained largely in the originating organisations, although it sometimes could be used to enhance the decision making in further phases of the process.

The user requirements analysis revealed that the lack of knowledge about the tasks and needs of the other user roles decreased the quality of documentation. This was especially evident in the domain of EU legislation, where work practices were still being formed. Increased information about the domain can also support the non-domain experts in their search for information.

SGML/XML enables definition of metadata that can be used to enhance knowledge about the domain. Such metadata can be e.g. information about the process (e.g. Creation of the

State Budget), organisations participating in the process, or information about the document types. The EULEGIS (European User Views to Legislative Information in Structured Form) project funded by the Telematics Applications Programme of the European Commission has been studying the use of graphical models as a user interface for large document repositories with very encouraging results [15, 16, 17]. These models can give important information about roles and processes in a visual way.

In order to proceed with standardisation, the participating organisations need to agree about document standards and also about supporting activities, such as archiving of documents. The study revealed a potential problem related to the willingness of people in different roles in a political environment to find agreements about new EDM rules. It clearly came out in the discussions with domain experts that changes in document management might change power relationships in the domain. Better availability of information related to the drafting of decisions can lead to the shift of power from drafters to other stakeholders, who may want to participate in making of decisions. This may lead to resistance to change the present conditions and thus to failures in the implementation of new solutions.

As a whole, the user needs analysis gave valuable information about the problems and challenges related to the SGML standardisation efforts in the two important inter-organisational processes. The reports written during the study can also give valuable information about the opinions and views of the other organisations and individuals for those who are involved in the processes.

## VII. CONCLUSION

The amount of information flowing between organisations that co-operate in a business process as well as the number and diversity of user roles in the process can be significant. This creates challenges for the electronic document management. Commonly defined document standards are a practical necessity for the electronic exchange of information contained in documents. Definition of these standards requires, however, extensive knowledge about the domain, about its processes, documents and user roles and their needs. In the paper two cases have been described, where user needs for electronic document management in public organisations have been studied. The user needs study in both cases was a part of a larger project in which document management in the Finnish Parliament and ministries was studied. The method used in both of the cases was successful in revealing deficiencies in the organisations' current practices, although the domain in the first case had been constant for a long time while in the second case the domain was quite new. The needs of the users were categorised to concern three issues: documents, information systems, and work with documents. Efficient use of standards for structured documents and electronic document management systems could solve many of the problems raised.

After the user needs analysis the use of structured documents has been advancing rather rapidly in Finnish public administration. The state budget is now created in an SGML form, which has also lead to its publication on the Internet. The Budget can be found at <http://www.vn.fi/vm/budjetti/index.html> (in Finnish). The implementation of SGML has also started in Parliament in the domain of Finnish legislation.

#### ACKNOWLEDGMENT

The helpful cooperation and extensive knowledge of experts in the Finnish Parliament and ministries as well as in many other organisations has been extremely valuable.

#### REFERENCES

- [1] A. Salminen, K. Kauppinen, and M. Lehtovaara, "Towards a methodology for document analysis," *JASIS*, vol. 48, pp. 644-655, July 1997.
- [2] C.F. Goldfarb, *The SGML Handbook*, Oxford: Oxford University Press, 1990.
- [3] S. Fahrenholz-Mann, "SGML for electronic publishing at a technical society – Expectations meets reality," *Markup Languages: Theory and Practice*, vol. 1, pp. 1-30, Spring 1999.
- [4] A. Salminen, M. Lehtovaara, and K. Kauppinen, "Standardisation of digital legislative documents, a case study," *Proc. of the 29th Annual Hawaii International Conf. on System Sciences*, IEEE Computer Society Press, pp. 72-81, 1996.
- [5] A. Salminen, P. Tiitinen, and V. Lyytikäinen, "Usability evaluation of a structured document archive," *Proc. of the 32nd Annual Hawaii International Conf. on System Sciences*, IEEE Computer Society Press, 1999.
- [6] A. Salminen, "Methodology for document analysis," in *Encyclopedia of Library and Information Science*, A. Kent, Ed. New York: Marcel Dekker, Inc., in press.
- [7] A. Salminen, V. Lyytikäinen, and P. Tiitinen, "Putting documents into their work context in document analysis," *Information Processing & Management*, in press.
- [8] T. Bray, J. Paoli, and C.M. Sperberg-McQueen, Extensible Markup Language (XML) 1.0. W3C Recommendation 10-February-1998. <http://www.w3.org/TR/REC-xml>.
- [9] R.K. Yin, *Case Study Research: Design and Methods*, 2<sup>nd</sup> ed., Newbury Park: Sage Publications, 1994.
- [10] B. Dervin, "From the mind's eye of the user: The sense-making qualitative-quantitative methodology," In *Qualitative Research in Information Management*, J.D. Glazier and R.R. Powell, Eds. Englewood: Libraries Unlimited, 1992, pp. 61-84.
- [11] I. Jacobson, M. Ericsson, and A. Jacobson, *The Object Advantage: Business Process Reengineering with Object Technology*. Addison-Wesley, 1994.
- [12] E. Mumford, *Effective Systems Design and Requirements Analysis*, Chippenham: Macmillan, 1995.
- [13] P. Tiitinen, T. Päivärinta, A. Salminen, and V. Lyytikäinen, *Suomalaisten EU-lainsäädäntöasiakirjojen rakenteistaminen*, a report from the RASKE project, Tietohallinnon selvityksiä, Ulkoasiainministeriö, Tietohallintolinja, 1997. (in Finnish)
- [14] V. Lyytikäinen, T. Päivärinta, A. Salminen, and P. Tiitinen, *Valtion talousarvioon liittyvien asiakirjojen rakenteistaminen*, Parliament of Finland, 1997. (in Finnish)
- [15] V. Lyytikäinen, P. Tiitinen, and A. Salminen, "Challenges for European legal information retrieval," *Proc. of the IFIP 8.5 Working Conf. on Advances in Electronic Government*, Seminario de Informática y Derecho, Universidad de Zaragoza, pp. 121-132, 2000.
- [16] V. Lyytikäinen, P. Tiitinen, A. Salminen, L. Mercier, and J-L. Vidick, "Visualizing legal systems for information retrieval," *Proc. of the IRMA 2000*, IRMA & Idea Group Publishing, in press.
- [17] V. Lyytikäinen, P. Tiitinen, and A. Salminen, "Graphical information models as interfaces for Web document repositories," *Proc. of the AVI2000*, ACM Press, in press.