



# Visualizing legal systems for information retrieval

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## ABSTRACT

*The need for legal information from foreign countries and the various levels of legislation in Europe is greater than ever before. Due to the increase in legal information repositories on the Internet this information is also widely available in digital form. In spite of this, users of European legal information encounter multitude of problems in information retrieval. The information is scattered in numerous databases where documents are structured, organized and classified in different ways. These differences are related to differences in legal systems. The retrieval and utilization of European legal documents entails knowledge of these legal systems. In the paper we introduce a method for supporting legal information retrieval by graphical data models showing the documents in the context of their legal system in the user interface. The visualization of the metadata is intended to help users of European legal information to cope with the complexity of the legal domain in Europe, to better understand the differences in legal systems, and to better locate information from correct sources. We also introduce an XML document type definition for specifying the metadata.*

## 1. INTRODUCTION

Internationalization and the expansion of the European Union have created a situation where the need for legal information from foreign countries and from different legislative levels is greater than ever before. This information is increasingly becoming available in digital form around the world due to the increase in legal information repositories on the Internet. The retrieval of European legal information, however, causes problems even for experts, because the information is scattered in numerous databases in which documents are structured, organized and classified in different ways, and their contents are written in different languages. Moreover the differences in legal systems greatly hinder the use of European legal information. Not even the capability to access relevant documents necessarily helps in satisfying information needs. The utilization of documents is difficult without sufficient knowledge of the related legal system.

The problems related to the retrieval of legal information in Europe have been studied in a project called EULEGIS (European User Views to Legislative Information in Structured Form) belonging to the Telematics Application Programme of the European Commission. In the project a consortium aims to develop new means for the retrieval of legal information. The main purpose is to offer a consistent user interface to retrieve legal information created in different legal systems and at different levels – the European Union, a member state, a region, or a municipality. In the EULEGIS interface, information about the context of legal documents is given to users by graphical data models. These models offer information about the context through four viewpoints: legal system relationships, actor, legal information source, and process. These views not only show the metadata to users but also aid users in choosing appropriate EULEGIS search forms for retrieving documents from distributed databases. The graphical data models originate in a method developed earlier for document analysis (Salminen, Lehtovaara & Kauppinen, 1996; Salminen, Kauppinen & Lehtovaara, 1997; Salminen, 2000; Salminen, Lyytikäinen & Tiitinen, 2000).

The rest of the paper is organized as follows. First, some of the challenges facing the retrieval of European legal information are discussed in Section 2. Sections 3 and 4 introduce the EULEGIS interface for finding information about different legal systems and for accessing documents from distributed databases. In Section 5 an XML-based specification method is presented as a means to implement the graphical views.

## 2. CHALLENGES FOR EUROPEAN LEGAL INFORMATION RETRIEVAL

Many of the problems and challenges concerning the retrieval of European legal information are related to issues of complexity and heterogeneity in three areas: legal systems, digital legal information sources, and the users of the legal information. Below we will discuss these problem areas.

### Legal Systems

In spite of the fact that the statutes and other legal rules created in Europe are all documented, acquiring knowledge of the legal rules concerning a person or an organization is far from simple. The set of legal rules governing an entity is known as a *legal system* or *legal order*. The entity in question can be, for example, a state, a group of states, an international organization, a region, or a city. In any of the EU states the citizens will be subjects to several coexisting and interacting legal systems.

All legal systems will be different in detail, although they may bear some resemblance to each other. When the legislation and the role of the courts is examined in different countries, two main families of legal system can be distinguished: a common law system and a civil law system (see e.g. Gallagher, Laver & Mair, 1995). Within Europe, the United Kingdom and Ireland have a common law system. Most European countries belong to the civil law tradition, where the role of case law has much less significance.

Another major difference in the legal systems of different countries is in the role of regions. In some countries (e.g., Ger-

many, Austria and Belgium), legislative power has been decentralized so that several power centres have their own legal systems. On the other hand, there are countries, such as Finland, which only have minor legislative power at regional level. Certain amount of regulative power has often also been left with, e.g., provinces or municipalities.

### Legal Information Sources

The various types of legal information sources and their significance depend greatly on the individual legal system. However, three major groups of legal documents can be identified in all legal systems: normative documents including acts and decrees, preparatory works, and court judgements. The types of documents, their structures, and the languages used in them are, however, different in different systems. Even if the same language were used in two different legal systems, the terminology could vary considerably.

The number of legal information providers on the Internet has been growing rapidly. National legal documents are in many countries disseminated free-of-charge on the Internet (e.g. in Finland <http://finlex.edita.fi>, Sweden <http://www.riksdagen.se/debatt/> or Norway <http://www.lovdato.no>). The dissemination of normative and preparative documents on the Internet free-of-charge has become policy in many countries. In addition, many fee-based services offer national legal information. Legal information concerning the European Union is also available at many Web sites, for example, CELEX (<http://www.europa.eu.int/celex>).

Legal Web sites in Europe usually contain documents from one legal system only. Some databases specialize in one or more subject areas or contain only selected types of legal rules. Also, temporal coverage may vary among databases; some contain only recently published rules, while others may include legal norms dating back to the 18<sup>th</sup> century.

A Web site can offer several ways of accessing the legal information it contains. Legal rules may be accessed by date of publication, type of document, the organization which originated the document, or subject. However, subject classification methods differ between Web sites. Also the functionality and presentation offered to the users of these databases vary, and even the most frequently used functions may have been implemented in different ways. Moreover different fonts, colors, and layout make the casual use of multiple databases problematic.

### Users of Legal Information in Europe

All people need legal information but there are several particular user groups to whom foreign and EU legal information seems to be especially important. A problem in designing retrieval capabilities is that the experience and expertise of the users varies widely. User needs interviews related to legal information were carried out as part of the EULEGIS project and its Finnish predecessor RASKE during 1996-1999. RASKE was a project in which SGML-based document standards were developed for use in the production of documents in the Finnish Parliament and ministries (Salminen, et al., 1996; Salminen et al., 1997; Salminen, 2000; Salminen et al., 2000). In-depth interviews were arranged in Finland and revealed that several groups of people regarded the accessibility of foreign legal information and EU legal information as important. Examples of these groups are people involved in national legislative processes, working in international and large companies, law firms, small and medium sized companies doing business with foreign partners, law institutions, and the mass media, as well as researchers and public administrators in general. The groups include both those highly expert in legal information retrieval as well as laymen. Legal information is also becoming

more and more important for ordinary citizens who may, e.g., be changing their country of residence or buying property or goods from another EU state.

In spite of the differences in the interviewed user groups, in several of them similar needs were identified. The differences in various legal systems of Europe were mentioned as a major problem by the interviewed people. These differences often hindered both the search and the use of foreign legal information. Even where the access to the relevant documents had been gained, the utilization of the documents was difficult without sufficient knowledge of the particular legal system. This was a common problem especially for information specialists working in libraries and other public services whose clients regularly ask about legal situations in various European countries.

## 3. THE EULEGIS APPROACH TO THE RETRIEVAL OF LEGAL INFORMATION

The main purpose behind the EULEGIS project has been to design a consistent interface and consistent retrieval techniques for retrieving European legal information created in different countries and at different levels of legislation. In order to make the system usable also for layman users and to effectively assist expert users the project has decided to follow an *enriched metadata* approach to information retrieval. Metadata will be collected concerning legal databases' searchable fields and logical operators, legal systems in Europe, legal information sources and the actors and processes involved in creation of the sources. By visualizing this information in a graphical interface, the aim is to help European users cope with the complexity of the differing legal systems and to better understand differences in the legal domain. The graphical interface will also aid users in choosing appropriate EULEGIS search forms for retrieving documents.

Information visualization is an emerging discipline, which aims at transforming data, information and knowledge into visual form to exploit humans' natural visual capabilities (Gershon, Eick & Card 1998). Visualization of organizational structures, processes and the information created and used in them is common in many areas. Graphical models are familiar tools, for example, in software engineering (e.g. UML; Booch, Rumbaugh & Jacobson, 1999) and in business process redesign (Abeyasinghe & Phalp 1997), where the visualizations are used by the experts who are doing the design work. In office information systems, workflow management systems (Ellis 1983), and computer supported cooperative work systems (Sarin, Abbott & McCarthy, 1991) graphical models are used in the user interfaces, which in turn are used in everyday work tasks. Such has also been the case in the visualization of organizational processes and roles for use e.g., in organizational learning (Käkölä 1995) and for the management of multiple roles and related documents in the workplace (Plaisant & Shneiderman 1995). Dourish, Bentley, Jones and MacLean (1999) have discussed the visualization of the history of one document instance within the workflow description.

In the EULEGIS project graphical models have been used in two different ways. In the beginning of the project, graphical models were used to describe the complex domain under study. The modelling techniques developed earlier for document analysis were applied to describe legislative processes, organizational frameworks for the processes, and document production in the processes (Salminen, et al., 1996; Salminen et al., 1997; Salminen, 2000; Salminen et al., 2000). Later, in designing the EULEGIS user interface and retrieval capabilities, the same models were used to help users in information retrieval. Four views were designed to show information related to a legal system: the *actor view* de-

scribes the most significant actors in the legal system, the *legal source view* shows the different kinds of legal documents and their relationships, the *process view* describes activities related to the legislative process, and as an umbrella to the other views the *related legal system view* presents the network of legal systems from one legal system's perspective.

Views can describe, for example, the legal systems of

- the European Union,
- a single member state (e.g. Finland, Sweden, United Kingdom or France),
- a single region (e.g. the German state of Bavaria), or
- a single municipality.

If users require information concerning the legal system of a certain European country, for example Belgium, they first receive a graph, in which the legal system of Belgium is presented as a circle in the middle of the page (Figure 1). Related legal systems are shown as circles radiating from it. Clicking the central circle causes the appearance of a page with a concise description of the Belgian legal system containing links to the other views of the same system. Users also have a possibility to directly search for Belgian legal information. Figure 1 demonstrates a related legal system view. The other three views will be introduced in the following section.

#### 4. THREE VIEWS OF A LEGAL SYSTEM

##### Actor View

The actor view describes the most significant actors that create the legal sources in a given domain of a legal system. The actors are shown in graphical form, and their roles are concisely described. The circle in the middle of the actor view graph represents the domain whose legal sources are created by these actors. The actors in turn are depicted by rectangles connected by arrows to the domain circle. Actors can be put into subgroups, which are shown graphically by nested rectangles.

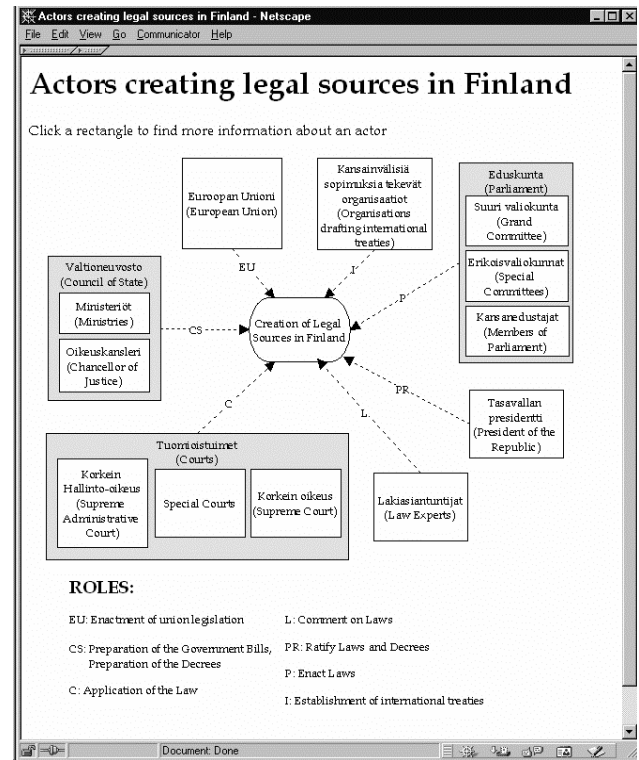
The actors belonging to an actor group may be part of a larger organization (e.g. Parliament) or may otherwise have similar roles in the creation of the legal sources in question (e.g. different courts). The broken arrows are labelled by identifiers with phrases in the bottom part briefly describing the tasks of the actors or actor groups of the graph. An example of an actor view is shown in Figure 2.

By clicking the name of an actor the user can obtain more information about the role of that actor. From this additional information a link leads to a search form by which the user can search

Figure 1. Graphical presentation of the Belgian legal system



Figure 2. The actor view to the Finnish legal system



for the documents that originate from the selected actor (Figure 3).

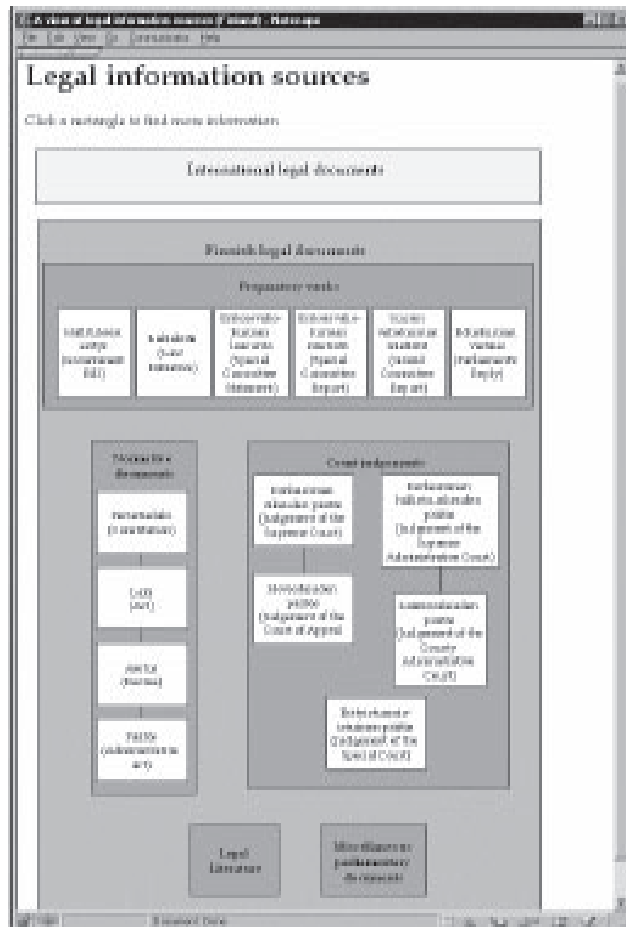
##### Legal Information Source View

The legal information source view shows the most significant legal information sources in a legal system and also their relationships with each other. The graphical representation of the view is composed of document types (i.e., legal information sources), document type groups and hierarchy connectors.

Figure 4 describes the sources of legal information of the Finnish legal system as an example. National legal documents are categorized into five categories that exist in almost every country: preparatory works, normative documents, court judgements, legal literature, and miscellaneous parliamentary documents, including, for example, parliamentary questions and minutes of plenary sessions. The hierarchical relations of the constitution, act, decree,

Figure 3. Information about Supreme Court

Figure 4. Legal information source view of Finland



and administrative act are represented by their vertical relation to each other and by the line connecting them. As a reminder to the user the significance of the related international legal documents is emphasized by placing them in a separate box above the national legal documents.

As in the actor view additional information about the document types can be offered to users. From the information page related to a document type a hypertext link leads to a search form allowing the user to target to the selected document type.

**Process View**

The process view gives a graphical overview of the most significant activities related to the creation of legal sources in a given legal system. It contains information about the order of activities, the actors responsible for performing the activities and the documents created by those activities. The form and semantics of the graph are similar to those of Information Control Nets ICNs (Ellis, 1979). The difference between our process models and ICNs is in the notion of control flow. We regard the control flow between successive activities A and B as *weak*, meaning that activity B begins after A has begun (Salminen et al., 2000). In our descriptive models there has been no need to constrain the relationship between the ending and beginning of successive activities. As an example of the process view the Finnish national legal system is presented in Figure 5.

The main activities of the modelled process are depicted by circles. Each circle shows both the name(s) of the activity and the actor(s) performing that activity. The actors in the view should be

the same as those presented in the actor view. The order of activities is expressed by unbroken arrows. The direction of the arrow refers to the order in which the activities start. Thus, several activities can actually be performed in parallel. A black dot preceding two or more activities indicates that the activities may start at the same time or in any order. Alternative control flows are indicated by a hollow dot.

As with the other views, additional information can be linked to the components of the process view. When the user clicks an activity symbol in the graph, more information about that activity will appear. That information will provide a link to a search form by which the documents created by that activity can be queried.

**5. SPECIFICATION OF THE VIEWS BY XML**

For the dynamic generation of graphical views the data pertaining to those views has to be formally defined. For this purpose we used the subset of SGML called XML (Extensible Markup Language), which has been developed especially for specifying document standards for use in Web information systems (Bray, Paoli & Sperberg-McQueen, 1998). We have designed an XML document type definition by which legal systems and the different views of them can be described. The document type definition for defining the data is presented in Figure 6 in a graphical form created by Near & Far Designer 3.0.

With this DTD all three separate views of a legal system – actor view, legal information source view, and process view - can be described. In the DTD, the data sources, documents, actors, and processes of certain legal system are defined together with their relationships to each other. The DTD is also designed in a

Figure 5. Process view of the Finnish national legal system

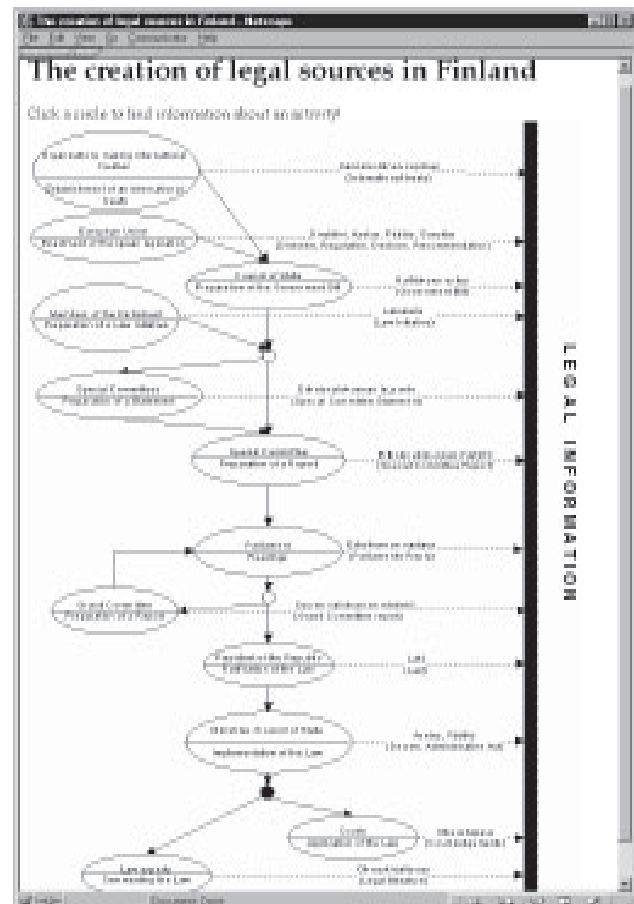
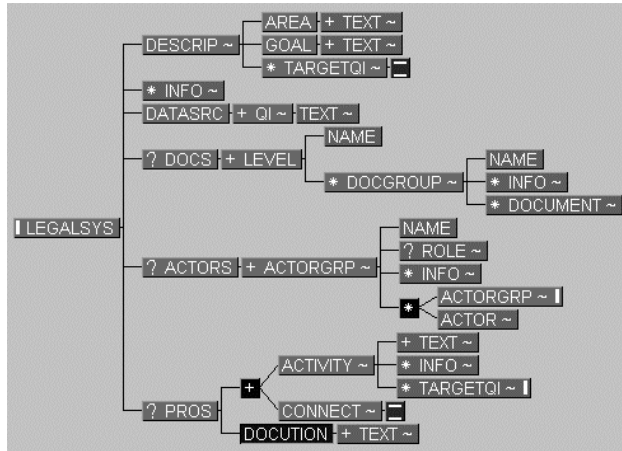


Figure 6. Graphical representation of the XML DTD for describing one legal system



way that enables the models to be described in many languages.

The first elements in the DTD describe the legal system in general terms. The legal system covers some *area* (e.g. Finland), and it has some *goal* (e.g. creation of the legal sources in Finland). Both area and goal can be described in several languages. The *targetqi* element allows query interfaces to be linked to the general description of a legal system. The same element is used in connecting both documents and actors to appropriate query interfaces. With the *info* element more detailed textual description about the legal system can be inserted.

The data sources of the legal system are defined as query interfaces (*qis*). Each query interface needs to have at least a *name* and some identification, which is defined as an attribute. *Docs*, *actors*, and *pros* elements are each used to describe the corresponding views.

The advantages of an XML solution are its capabilities of being source to multiple models in multiple languages. Since slightly different versions of models are needed, conversion from one basic model is useful. XML files are also easy to transfer in the network environment since XML solutions are system and vendor independent. This also enables long term archiving of the data.

## 6. CONCLUSION

The main aim of the EULEGIS project has been to design a consistent interface and consistent retrieval techniques for retrieving European legal information from the already existing databases on the Web. To aid the users to effectively utilize such information, a graphical interface for describing the legal processes, actors and legal information sources in any given legal system was designed. The visualizations give users background information about the legal system in question and aid them in making effective queries among the myriad of legal databases in Europe. An XML document type definition was developed for formally specifying legal systems and views of them in an application-independent way. Prototype versions of the different views have been presented to the EULEGIS user groups who have given a very positive feedback. Usability studies with the user groups will be organized in order to find out the effects of the proposed user interface to the work tasks especially when retrieving information from databases representing foreign legal systems.

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## REFERENCES

- Abeysinghe, G. & Phalp, K. (1997). Combining process modeling methods. *Information and Software Technology*, 39, 107-124.
- Booch, G., Rumbaugh, J., & Jacobson, I. (1999). *The Unified Modeling Language User Guide*. Reading (MA): Addison-Wesley.
- Bray, T., Paoli, J., & Sperberg-McQueen, C. M. (1998). Extensible Markup Language (XML) 1.0. W3C Recommendation 10-February-1998. URL: <http://www.w3.org/TR/REC-xml> (Retrieved March 31, 1999).
- Dourish, P., Bentley, R., Jones, R., & MacLean, A. (1999). Getting some perspective: Using process descriptions to index document history. *Proceedings of the International ACM SIGGROUP Conference on Supporting Group Work*, 375-384.
- Ellis, C. A. (1979). Information Control Nets: A mathematical model of office information flow. *Proceedings of the Conference on Simulation, Measurement and Modeling of Computer Systems, ACM SIGMETRICS Performance Evaluation Review*, 8 (3), 225-238.
- Ellis, C. A. (1983). Formal and informal models of office activity. *Proceedings of the IFIP 9th World Computer Congress, Paris, France, September 19-23*. North-Holland: Elsevier Science Publishers B.V.
- Gallagher, M., Laver, M., & Mair, P. (1995). *Representative Government in Modern Europe*. New York: McGraw-Hill.
- Gershon, N., Eick, S. G., & Card, S. (1998). Information visualization. *Interactions*, 5 (2), 9-15
- Käkölä, T. (1995). Fostering organizational learning with embedded application systems: the XTEND2 prototype. *Proceedings of the 28th Annual Hawaii International Conference on System Sciences*, 199-208.
- Plaisant, C. & Shneiderman, B. (1995). Organization overviews and role management: inspiration for future desktop environments. *IEEE Proc. 4th Workshop on Enabling Technologies: Infrastructure for Collaborative Enterprises, Berkeley Springs, WV, April 20-22*, 14-22.
- Salminen, A. (2000). Methodology for document analysis, to appear in A. Kent (Ed.), *Encyclopedia of Library and Information Science*. New York: Marcel Dekker, Inc.
- Salminen, A., Kauppinen, K., & Lehtovaara, M. (1997). Towards a methodology for document analysis. *Journal of the American Society for Information Science*, 48 (7), 644-655.
- Salminen, A., Lehtovaara, M., & Kauppinen, K. (1996). Standardization of digital legislative documents, a case study. *Proceedings of the 29th Annual Hawaii International Conference on System Sciences*, 72-81.
- Salminen, A., Lyytikäinen, V., & Tiitinen, P. (2000). Putting documents into their work context in document analysis. To appear in *Information Processing & Management*.
- Sarin, S. K., Abbott, K. R., & McCarthy, D. R. (1991). A process model and system for supporting collaborative work. *Conference on Organizational Computing Systems, SIGOIS Bulletin*, 12 (2,3), 213-224.

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