ARTICLE:

LEXECUTE: VISUALISATION AND REPRESENTATION OF LEGAL PROCEDURES[1]

WRITTEN BY: **JÖRN FREIHEIT, MARC LUUK, SUSANNE MÜNCH, GROZDANA SIJANSKI AND FABRICE ZANGL**

This paper aims to present a concept that represents legal procedures in such a way as to make them more comprehensible. Approved process modelling methods were used to design an enhanced representation that improves the transparency by visualising judicial workflows, and thus helps to promote mutual trust between individuals and authorities who are subordinated to different legal orders. This concept has been implemented into a demonstrator called Lexecute. Two steps were taken to formulate an adequate workflow model. The first step was to interview practitioners and consult legal texts. This step enabled the creation of semi-formal models in preparation for the second step, which was to verify the findings and formalise the process. The workflow models resulting from this work provide new perspectives into justice, and reveal new potentials for modelling methods in the field of justice.

Introduction

The gradual integration of European countries within the European Union implies that lawyers are faced with new tasks. Legal procedures relating to trans-border aspects will increase in importance. Often it becomes imperative to negotiate a way through unfamiliar legal systems and rules of procedure. The concept developed in the context of eJustice, supports interested and involved citizens as well as lawyers in meeting this challenge, and provides them with the necessary legal and procedural-organisational information of the procedures presented in the model.

The new approach of representing legal procedures has been developed by means of business process modelling methods. As an example, the German order for payment procedure has been chosen because of its complexity and significance, and the need to meet the requirements of legal practitioners. This procedure is very similar to the European order for payment procedure, proposed by the European Commission.[2] The modelling techniques, which have proven to be of great value for the modelling of business processes, were partially adapted to meet the specific requirements of legal procedures. Moreover, during the development of the concept, additional attributes and functionalities were deemed necessary, so that the common modelling techniques were also amended. This paper describes Lexecute, a web-based demonstration model. The purpose of this tool is to enable a comprehensible representation and visualisation of legal procedures. Due to the fact that it is an adaptive method, it can be directly applied to represent any legal procedure. Supplemented by interactive components that allow for an easy navigation within the model, Lexecute demonstrates that workflow modelling methods, known from other areas, can also be of use in the judicial domain.

Although the objectives of a commercial business may not be congruent with those of justice, it is considered that justice could benefit from the application of business process modelling methods.

[1] *This work has been carried out within the integrated project eJustice, which is supported by the Commission of the European Communities (Directorate-General Information Society) in the 6th framework programme, Contract Number: 001567, Full title: "Towards a global security and visibility framework for Justice in Europe", www.ejustice.eu.com.*

[2] *"Proposal for a Regulation of the European Parliament and of the Council creating a European order for payment procedure", http://europa.eu.int/eur-lex/en/com/pdf/2004/com2004_0173en03.pdf.*

Consulting with practitioners is also a very important and indispensable part of the process.

Basically there are four distinguishable functions in the field of business process modelling: describing, analysing, simulating and configuring. Only the configuration function is used as a basis for the automation of business processes. The describing function aims at improving transparency and communication in complex processes, whereas the analysing and simulating function of a model support the optimisation of business processes. An enhancement of the describing function may improve the transparency on the one hand and facilitates the communication between justice administrations and citizens, as well as between different authorities, on the other hand. In addition, representations that are able to visualise legal processes in an understandable way for non-experts, make an important contribution to the improvement of the citizens' confidence in the legal system. Communication between judicial authorities often causes errors and delays, and can lead to ineffective procedures. Such a lack of communication can be because of missing knowledge about the workflow and the distribution of, for instance, organisational competences within other authorities. This problem is intensified if cross-border procedures are included.

In order to realistically represent the order for payment procedure by a workflow model, relevant judicial information is just one form of information that needs to be extracted from respective legal bases. Procedural organisational aspects also play a decisive role that often cannot be learned solely from a legal text. Consulting with practitioners is also a very important and indispensable part of the process. Our method of representing procedures aims to meet the requirements regarding transparency and visibility of legal procedures. With the method outlined in this paper, legal procedures can be represented in detail. Very extensive and complex legal procedures can be represented in a more comprehensible way by abstraction and modularisation. Basically, a workflow model is used to illustrate the representation of legal procedures, and this model is further enriched by additional information. Thus it is, for example, possible to obtain access to relevant legal texts exactly where they are of importance within the procedure. For the language problem, which inevitably occurs with the representation of technical (legal) terminology in a foreign language, a practical solution was found by using a multilingual glossary. Furthermore, time limits and the costs of the procedure were taken into account, because they were considered to be essential information in respect of all procedures in the judicial domain.

At present, Lexecute is not a workflow management, document management or case management system enabling the processing of cases and data. As a result, procedural time limits do not have an influence on the course of the processing (but just have informative value) in the present version. The semi-formal workflow model is one of the major elements of the concept, and it provides the basis for the creation of completely formal Petri net models.[3] These provide for a verification that is essential regarding the potential implementation of an executable end-user software for a workflow support in the very last step, as outlined in the diagram below.

The approach: Workflow models plus additional context relevant information

In the eJustice project, judicial processes were modelled using Event-Driven Process Chains (EPC) and the Architecture of Integrated Information Systems

[3] *Petri nets were developed by Carl Adam Petri, Kommunikation mit Automaten, (University Bonn, 1962). Introductions into Petri net theories are given in T. Murata, Petri Nets: Properties, Analysis and Applications, Proceedings of the IEEE, Vol. 77, No 4, April, 1989, pp 541-580, and in J. L. Peterson, Petri Net Theory and the Modeling of Systems, (Prentice-Hall, N.J., 1981). See also http://www.informatik.uni-hamburg.de/TGI/PetriNets.*

(ARIS) framework.[4] EPCs are widely accepted for workflow modelling and the ARIS methodology is commercially successful. EPCs are used because of their intuitive understanding, its adaptability in terms of methods and enhancement of information as well as for its tool support (ARIS toolset). The EPC serves to represent business process, and processes from other application areas. However, as discussed in section Verification below, EPCs suffer from not having a widely accepted set of formal semantics. To overcome this problem, EPCs were transformed into a formal method, such as Petri nets. Petri nets have both a formal mathematical definition and an intuitive graphical representation. The abundance of analysis techniques for Petri nets can be used to explore the dynamic behaviour of the model and to prove properties automatically. The results provided by Petri net analysis of process correctness are then used to validate the process model.

Figure 1 shows the overall methodology applied in the eJustice project.

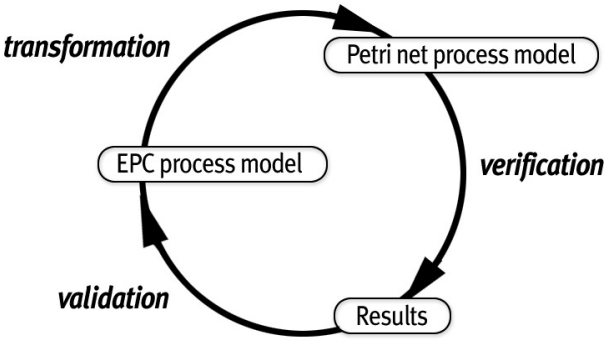

Figure 1: Methodology of transforming semi-formal EPCs into PNs, verifying their correctness and validating the EPCs

What is not feasible and thus not intended is the automated verification of the legal correctness of decisions or processes (e.g. by comparison with the legal text they are based on). Legal texts are ambiguous and open to interpretation, which prohibits a machine-based interpretation.

In order to decrease the complexity, the information is reduced to the needs of one procedure or case.[5] The information is gathered along a workflow to enable a case and the procedure to be properly used. As the required information is still too complex to be displayed within the graphical representation, the workflow model is enriched with additional attributes. These attributes are not shown in the graphical representation but are underlying the objects that represent a single step (function) of the business process. The values of the attributes can be extracted automatically and are represented in a separate 'info-box' available to the user.

To reduce complexity, two main methodical mechanisms have been developed in the main workflow modelling methods: hierarchy and modularisation. A hierarchy allows the refinement of the workflows and their functions, and is represented by a tree structure.[6] A workflow is composed of several functions executed in a time-logical sequence, and each function is supported by a workflow (except for the lowest function in the hierarchy). However, to avoid confusion, a hierarchy of ten levels should not be exceeded. For all legal procedures modelled so far within the Lexecute framework, up to six levels of abstraction were defined. Each level gives a higher degree of detail.

The complexity is reduced by fading out details of description in higher levels. A user might, for instance, only want to see the major steps of a workflow and will only be interested in the main functions and the sequence in which they are handled in the workflow. If users then need further information on a function, they can consult the refined workflow underlying that function. 'Internal' viewers of the process, e.g. a new employee of a judicial authority, could look at the elementary constituents of workflows to determine exactly what steps they have to follow according to internal or legal regulations.

Another way to reduce the complexity of a workflow model is to form information into modules. Modules are parts of a workflow and have a defined input and output, and can be used many times. They can be handled more flexibly, either by representing them in a strictly logical sequence, or by defining a set of modules for a specific domain or usage.[7] The definition of modules can be based on the same rules as for hierarchies of workflows. The advantage of modularisation is that they are reusable (in this case it

[4] *See Scheer, A.W., ARIS Modellierungsmethoden, Metamodelle, Anwendungen. (Springer, Berlin, 2001).*

[5] *Becker, J., Rosemann, M., Schütte, R., Grundsätze ordnungsmäßiger Modellierung, (Wirtschaftsinformatik, 1995) 435–445.*

[6] *Scheer, A.W., ARIS Modellierungsmethoden, Metamodelle, Anwendungen. (Springer, Berlin 2001); Scheer, A.W., Thomas, O., Wagner, D.: Verfahren und Werkzeuge zur Unternehmensmodellierung. In Bullinger, H.J., Warnecke, H., Westkämper, E., eds., Neue Organisationsformen im Unternehmen : ein Handbuch für das moderne Management, (Springer, Berlin 2002) 740–760.*

[7] *Grieble, O., Klein, R., Scheer, A.W.: Modellbasiertes Dienstleistungsmanagement. In Scheer, A.W., ed.: Veröffentlichungen des Instituts für Wirtschaftsinformatik Nr. 171. (2002) 22–24.*

is sufficient to model a module only once, even if it is used several times in a workflow), for example, the sending and receiving of documents, which usually occurs several times in a legal procedure.

Considering cross-border legal practice, language is one crucial obstacle that lawyers face. Although other languages may contain corresponding terms, they may often have very different meanings. Thus, a pure, literal interpretation of all terms does not produce the desired result of an easy-to-understand model. That is why it was decided to retain the legal terminology of the corresponding original language in the model, but offer possible translations for these terms.

The multi-lingual version of the demonstrator displays the legal term in inverted commas in German (e.g. 'Mahnverfahren') followed by a corresponding translation in brackets (here: order for payment procedure). This way the content will remain, and the user can either rely on the pre-selected translation or undertake further research regarding the meaning of the foreign term.

Verification

An important task in providing tool-based support for legal experts is to ensure the tool works and is secure. Thus, the legal procedures to be processed have to be 'proved' for accuracy. There are several properties to be satisfied that comprise accuracy, for instance the user does not get stuck within the process, documents must not get lost, and a user who applies for an order for payment gets notice of the application. An analysis and verification procedure has been carried out within the eJustice project to provide for the correctness of the process models.

Event-driven process chains are not suitable for verification due to ambiguous semantics. The main reason for this ambiguity is the non-locality of the OR and XOR join operators.[8] Although there are several approaches to define the semantics for EPCs,[9] none of them is widely accepted, and tool support is not really available. Hence, the use of formal methods, as opposed to semi-formal EPCs, is necessary. In the eJustice project, Petri nets are used as the formal modelling and analysis technique.[10] Besides their mathematical foundation, Petri nets outperform semi-formal methods because of the abundance of analysis techniques and their tool support.[11]

An EPC model must be transformed into a Petri net model (or another formal method) to offer formal analysis. The main idea of this transformation is that events are transformed to 'places' and functions to 'transitions', while the arcs of the EPC can be mapped directly to the arcs of the Petri net. Using formal techniques, such as Petri nets, provide several advantages compared to EPCs:

1. Structural properties of the models can be analysed, such as the absence of deadlocks.
2. Performance properties can be evaluated, such as the workload of resources involved in the process.
3. The models can be executed.
4. All required analysis, evaluation and simulation algorithms are implemented in Petri nets tools, such as CPN Tools,[12] which are used in the eJustice project.

Coloured Petri Nets

Since legal procedures are complex, the use of high-level Petri nets,[13] such as Coloured Petri nets,[14] provides much more compact models than using low-level Petri nets. In Coloured Petri nets, tokens can be distinguished due to their colour (type), as opposed to low-level Petri nets, where all tokens are identical (black dots). Coloured Petri nets have already been used for the modelling of business processes, and common elementary business process 'patterns' have been identified and modelled. The eJustice example of a legal procedure contains simple patterns only.[15]

Hierarchy

A main advantage of Coloured Petri nets is their hierarchical structure. Transitions can be refined and, because of the modular approach taken, the EPC model used for this project can be appropriately modelled

[8] *Aalst, W., Desel, J., Kindler, E., On the Semantics of EPCs: A Vicious Circle. In Nüttgens, M., Rump, F., eds.: Proceedings of the EPK 2002: Business Process Management using EPCs, (Trier, Germany, Gesellschaft für Informatik, Bonn, 2002) 71–80; Kindler, E., On the semantics of EPCs: A framework for resolving the vicious circle. In Desel, J., Pernici, B., Weske, M., eds.: Second International Conference on Business Process Management (BPM 2004). Volume 3080 of Lecture Notes on Computer Science, (Potsdam, Germany, Springer, 2004) 82–97.*

[9] *Nüttgens, M., Rump, F., Syntax und Semantik Ereignisgesteuerter Prozessketten (EPK). In: PROMISE 2002, Prozessorientierte Methoden und Werkzeuge für die Entwicklung von Informationssystemen. Volume P-21 of GI Lecture Notes in Informatics., Gesellschaft für Informatik (2002) 64–77.*

[10] *Murata, T., Petri Nets: Properties, Analysis and Applications. Proceedings of the IEEE 77 (1989) 541–580.*

[11] *Aalst, W., Hee, K.: Workflow Management: Models, Methods, and Systems, (MIT Press, Cambridge, MA 2002).*

[12] *For CPN Tools see http://wiki.daimi.au.dk/cpntools/cpntools.wiki.*

[13] *ISO/IEC, Software and Systems Engineering – High-level Petri Nets – Part 1: Concepts, Definition and Graphical Notation (2004) Published Standard.*

[14] *Jensen, K., Coloured Petri Nets, Volume 1-3. EATCS Monographs on Theoretical Computer Science, (Springer-Verlag 1997).*

[15] *Mulyar, N., Aalst, W.: Patterns in Colored Petri Nets. BETA Working Paper Series WP 139, Eindhoven University of Technology (2005).*

Coloured Petri nets have already been used for the modelling of business processes, and common elementary business process 'patterns' have been identified and modelled.

using Coloured Petri nets. Figure 2 shows the refined sub-model of the procedure "Vollstreckungsbescheid" (an enforcement order).

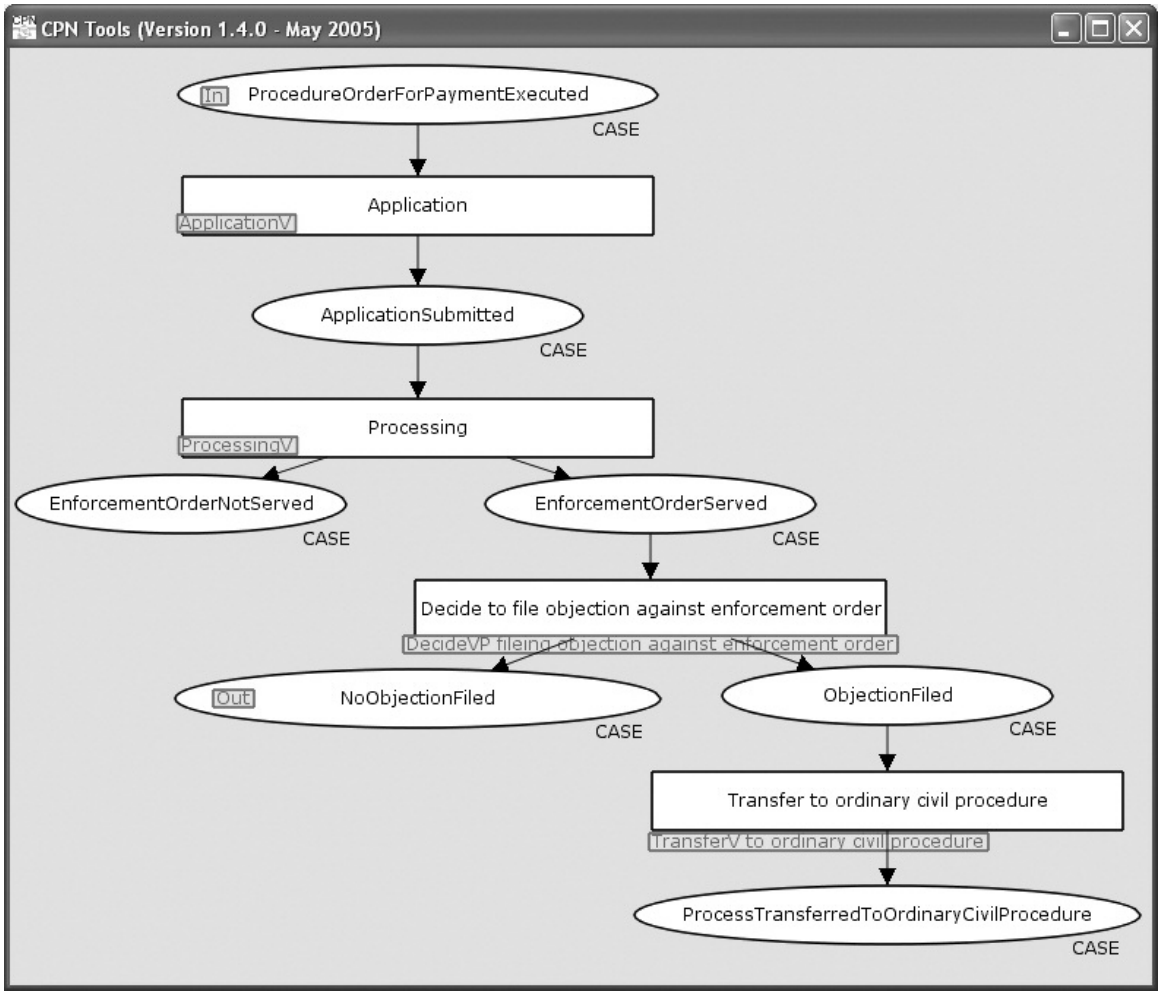

Figure 2: Refined sub-model of the procedure "Vollstreckungsbescheid" (enforcement order)

Modelling periods of time and fixed dates is essential for the modelling of legal procedures, since the progress of the procedure often depends on these time constraints.

Execution by simulation

There are several tools that support the modelling, simulation and analysis of Petri nets. In the eJustice project CPN Tools were used,[16] as well as a Petri net tool developed at the University Aarhus, Denmark. Simulating a model offers insight into the dynamic behaviour of the modelled process. In simulation, each firing of a transition and the change of the model's state is displayed. That is, every time a transition takes place, the change is displayed in the model. The simulation component enables the process to be visualised. If the Petri net tool is connected with the process by sensors, the simulation component can be used to monitor and control the process. It does this by highlighting the transitions that are enabled, and thus the next tasks to be processed.

Trigger events and timing

The importance of periods of time and fixed dates is a main characteristic of the judicial process.[17] In the judicial context, a period of time is a determined time frame in which a certain event or action has to occur. A fixed date is a determined point in time at which a certain effect (with legal consequences) becomes effective. Periods of time ensure that certain claims and rights do not exist infinitely. They also accelerate the progress of legal procedures. There are several types of periods of time, such as periods for notification, for filing an action, for entering an opposition (e.g. objection), for terminating a contract. If one party fails to observe the prescribed periods of time and associated deadlines, it is possible that they may suffer a loss of rights. The computation of periods of time is, in most cases, clearly defined in legal texts. The calculation of procedural rules comprises start, end, duration and possible extensions. For example, the German Civil Code (Bürgerliches Gesetzbuch – BGB, §187)[18] defines the start of a period of time as follows:

- If a period begins to run from an event or a point of time occurring during the course of a day, then in computing the period the day in which the event or the point of time occurs is not counted.
- If the beginning of a day is the point of time from which a period begins to run, then this day is counted in computing the period. The same rule applies to the day of birth in the computing of age.

Modelling periods of time and fixed dates is essential for the modelling of legal procedures, since the progress of the procedure often depends on these time constraints. However, it has to be considered that there are several events in legal procedure where the duration is not exactly definable. In many cases these events result from judicial terms that are subject to interpretation, for example 'immediate' service, or loyalty and good faith.

In judicial processes, as in usual business processes, events can be specified in different ways. Their types can be distinguished by considering the requirements that must be satisfied to enable the event. Therefore an event can occur:

1. if all its pre-conditions are satisfied, and
2. if additional external events have occurred that provide data required for the event, and
3. if a certain time has elapsed to enable the event, and
4. if a certain time line has not yet exceeded.

In contrast to timed events, the occurrence of usual events requires pre-conditions that must be satisfied, as mentioned in the first point above. These events are modelled in the EPC model with 'arcs' from functions to the event only. If a function additionally requires

[16] *CPN Tools web site: http://wiki.daimi.au.dk/cpntools/cpntools.wiki; see also http://www.daimi.au.dk/designCPN and http://www.fmeurope.org/manasite/mas/fme/toolsitem/5693.html.*

[17] *Combi, C., Pozzi, G., Architectures for a temporal workflow management system, in Haddad, H., ed., Proceedings of the 2004 ACM symposium on Applied computing, (ACM Press, 2004) 659–666.*

[18] *The German Civil Code has been issued in translation with an introduction by Jan S. Forrester, Goren & Ilgen: The German Civil Code as amended to January 1 1975, Rothman, South Hackensack, N.Y., USA/North-Holland Publ. Comp., Amsterdam, NL. 1976; for an excerpt see: http://www.hull.ac.uk/php/lastcb/bgbengl.htm.*

Timed Coloured Petri nets offer the performance analysis of the modelled process, which can be achieved by simulation using CPN Tools.

external data, then there is also an arc from a folder-like symbol to the event, meaning that the data has to be provided to enable the event. Thus, external data is modelled as an additional pre-condition. However, the external function that gives way to the data is not modelled, since it is not part of the process. This can be explained in more detail using an example. Assume that a function, in order to occur, requires a document that is sent by mail. The sending and receiving of the function is not included in the model because it is not explicitly part of the process, as opposed to the document itself.

It is not difficult to devise a model for the duration of a function, whether EPCs or Petri nets are used. A duration is supported by the ARIS tool set for EPCs, and in many other tools used to model time, or stochastic Petri nets can be used.[19] However, deadlines are not explicitly supported by modelling tools. Although there is no concept of a deadline for EPCs, a known class of Petri nets are Time Petri nets,[20] where a time interval is associated with each transition. The lower bound of the interval indicates the earliest firing time of the transition related to the time the transition become marking enabled. The upper bound of the interval indicates the latest firing time. For example, if the interval [1,5] is associated with a transition, the transition may fire not before one time unit after it is enabled, but has to fire 5 time units after enabling at the latest. It may fire at all points in time between 1 and 5 time units after enabling. If the upper bound of the interval is reached, the transition has to fire. This does not correspond to the concept of deadlines where it must be possible that a deadline is exceeded and a corresponding procedure is triggered.

In the eJustice project, legal procedures are modelled by using Coloured Petri nets extended by time stamps. However, the automatic transformation of EPCs to timed Coloured Petri nets is impossible, since EPCs lack time stamps, and only support durations. Hence, time stamps must be integrated in Coloured Petri nets manually. Timed Coloured Petri nets offer the performance analysis of the modelled process, which can be achieved by simulation using CPN Tools. Performance measures, such as the maximum and minimum duration of the process, workload of staff members and length a document waits in a queue at certain points, can be derived from automatic performance analysis and provide knowledge about possible bottlenecks.

Lexecute

The concept can be visualised in the Lexecute Demonstrator. The demonstrator includes those functions that are most relevant to the objectives of the project. The models designed using the ARIS toolset were extracted for the web (using the WebPublisher functionality) and configured with a script (in PHP). Figure 3 shows the result of these steps.

[19] *See http://www.aaas.org/science/spn/; Design CPN: http://www.daimi.au.dk/designCPN/ (last access May 2005); Zimmermann, A., Freiheit, J., German, R., Hommel, G.: Petri net modelling and performability evaluation with TimeNET 3.0. In: Proc. 11th Int. Conf. on Modelling Techniques and Tools for Computer Performance Evaluation, (Chicago, USA, 2000) 188–202.*

[20] *Berthomieu, B., Diaz, M.: Modeling and verification of time dependent systems using time Petri nets. IEEE Transactions on Software Engineering 17 (1991) 259– 273; Merlin, P.: A Study of the Recoverability of Communication Protocols. Phd thesis, University of California (1974).*

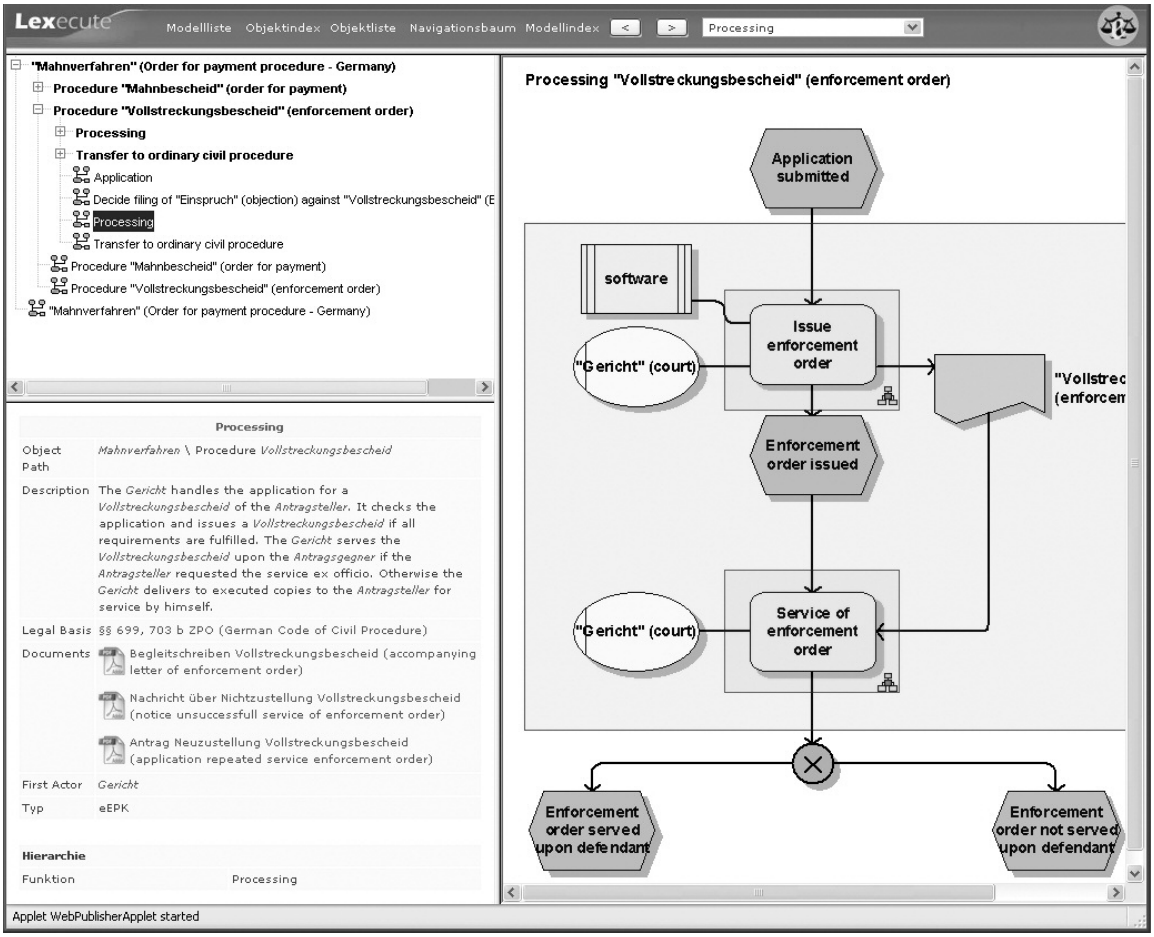

Figure 3: Screenshot of Lexecute

The right-hand side of the display shows the workflow model. The upper left-hand side shows the navigation tree, and the lower left-hand side shows the additional context information. By clicking on an element in the workflow model, the information in the lower left side changes to that of the object marked. This 'info-box' is the most important interface for the user. The information it contains is adapted to the requirements of judicial practitioners.

The attributes of the models match the needs of the users and contain the legal bases of an element (functions or activities, documents, organisational units, etc.), a short description, navigational information, deadlines and costs. The information is taken from the relevant legal texts and interviews with practitioners. The short description explains the mode of operation of the function, while the costs attribute gives an overview on the costs for a procedure and its dependencies. The deadline attribute is presently included only for background information on the time constraints for the execution of the procedure.

Lawyers use resources such as standard forms for written submissions, for instance a statement of a claim and commentaries, to determine the required information, which is needed to prepare a case. However, dealing with complex and unfamiliar proceedings is very exhausting. In this regard, the approach set out in this project can save lawyers a great deal of effort, because the information they require is included in the system. On the one hand the forms are deposited as a file, on the other hand all relevant legal texts have been lodged intelligibly (transparently) for single process steps. Technically, the lodging has been realised by linking legal texts and documents that are already available in digital format. The links have been established as attribute values for the individual object within the model.

Currently, only relevant legal texts, in the original language, are lodged in the demonstrator. Not only single, relevant paragraphs (articles) are displayed, but they are also shown in their context. So the user can see the regulation bound in its context without further

With this set of information, citizens, foreign authorities and institutions are able to obtain easy and fast access to information about the specific procedure they require in their domain of interest.

research. Documents have been integrated in the same way as legal texts. At the moment, the forms are only available to read and print, and are used mainly for the purposes of illustration. In the future, interactive forms are also possible.

The use of a link structure within the attributes belonging to an object turned out to be a very effective way to embed external information into the system. It provides a simple but effective interface. It is imaginable that (commercial) service providers (e.g. Juris-Germany, RIS-Austria, Legifrance-France) will use such an interface to include their own products. This would be a valuable acquisition to the model, and would make it even more attractive to end-users. With this set of information, citizens, foreign authorities and institutions are able to obtain easy and fast access to information about the specific procedure they require in their domain of interest.

According to the language concept discussed in section *The approach: Workflow models plus additional context relevant information*, legal terms in the attributes are left in the original. By moving the mouse over the highlighted terms, a translation appears.

The full demonstrator is available at http://rechtsinformatik.jura.uni-sb.de/ejustice/lexecute.

Use of the demonstrator

How Lexecute is used, is briefly described below in order to encourage prospective users to try out the tool, and to describe the possible steps a clerk might follow to obtain required information about the procedure. The instructions given below lead to documents that are required to fill in for the processing of an enforcement order.

- The front page of Lexecute can be started in any a web-browser. It contains two links; one of them provides a short description of Lexecute *(how does Lexecute work?)* and the other one starts Lexecute *(Start Lexecute)*.
- After starting Lexecute, it is necessary to confirm the security certificate *(Yes)* in order to get the graphical user interface described above. By clicking on the *plus-sign* in front of the *"Mahnverfahren" (order for payment procedure – Germany)*, a row expands the navigation tree.
- After double-clicking on the lower line in the navigation tree *"Mahnverfahren" (order for payment procedure – Germany)* the model and the yellow Info-box appear.
- By clicking on the green function symbol *Procedure "Vollstreckungsbescheid" (enforcement order)* in the model window; the content of the Info-box changes, now describing the details of this particular function.
- A click on the small icon next to this function (three small green functions with a red event in the middle) opens a model that describes this function in more detail (sub-model of the *Procedure "Vollstreckungsbescheid" (enforcement order)*.
- After clicking on the function *Processing* the Info-box shows all the relevant information about the processing part of the enforcement order, and provides all the required documents that need to be filled in this step.
- It is not yet possible to fill in the documents. However, clicking on the names of the documents or on the pdf-icons can open the documents.
- It is also possible to be informed about the legal basis of this step by clicking on the *Legal Basis* line in the Info-box. In future, these links will lead to a legal text database. Moreover, for the German terms that are left in original in the *Description* line of the 'Info-box', a suggested translation is available by moving the mouse over these terms.

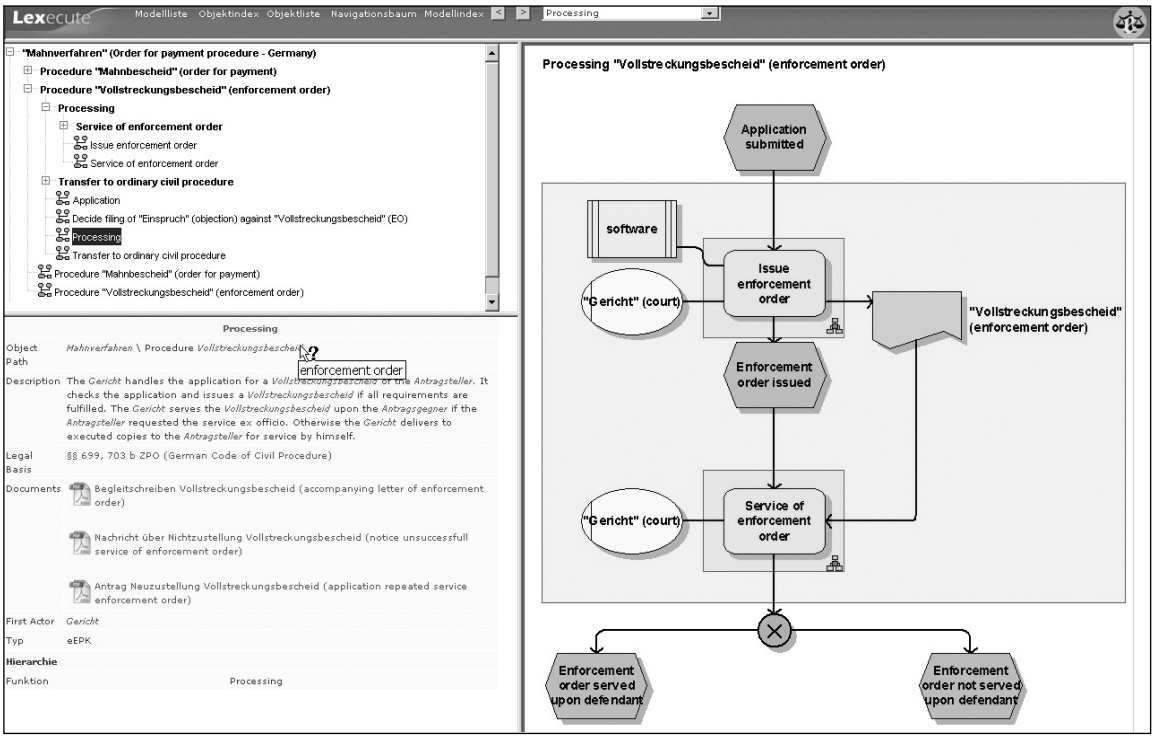

Figure 4: Use of the demonstrator

Conclusion and future work

In this paper, we have shown how it is possible to bridge the gap between the requirements of judicial practitioners, as non-experts in modelling, and methods and tools used in business process modelling. We have provided a model-based interface that guides a user through a legal process. Hence, it is easier to obtain access to knowledge of the legal procedures of foreign countries. This is one of the major aims of the project. The model set out in this paper is enriched by links to legal text databases, organisational structures, documents and such like. This additional information is used to provide information in the Info-box automatically. The models are also hierarchically structured to enhance the representation of the process. Thus, the models give an adequate overview of the processes. They are implemented by using a widely accepted commercial tool. However, since ARIS does not provide sufficient analysis of the modelled processes, the transformation into formal models became necessary. Using Petri nets, an abundance of analysis techniques support the verification of correctness, offers the validation of the semi-formal models and enhances the trust of the user.

In the future, we will focus on further extensions of the model by including information required by judicial users. Some of the desirable functionalities could be a detailed search for objects within the model or the creation of lists of the model's elements (e.g. display all deadlines within a process). An organisational dependent view will be implemented applying the swim-lane methodology.[21] The concept and demonstrator will be evaluated according to the user requirements, which will be evaluated in a Usability Lab in which practitioners will take part. Currently, the concept can be adopted and validated within other legal domains, such as criminal law matters.

[21] *Schulz, K.A., Orlowska, M.E.: Facilitating cross-organisational workflows with a workflow view approach (Data Knowl. Eng. 51, 2004) 109–147.*

Dr.-Ing. Jörn Freiheit graduated in Computer science at the Humboldt-University Berlin, Germany. After he received his PhD from the Technical University Berlin he worked at the Computer Systems Engineering Centre, Adelaide, in Australia for two years. He is currently working at the Max-Planck Institute for Informatics. His research focuses on formal methods for the verification and analysis of business processes.

freiheit@mpi-sb.mpg.de

Marc Luuk graduated in law at the Saarland University in 2001. Since 1999 he has been working for the Institute for law and informatics (IFRI) at the Saarland University. He has been involved in many EU funded projects, including IKARUS, SEEKS, and eJustice.

m.luuk@mx.uni-saarland.de

Ref. jur. Susanne Münch holds a D.E.U.G. (mention droit) and graduated in law in 2004. She is a research assistant at the Chair for Civil Law, Law of Civil Procedure and Legal Philosophy with Professor Dr Helmut Rüßmann at the Saarland University, and worked on the EU-project eJustice as a legal consultant.

s.muench@mx.uni-saarland.de

Ass. jur. Grozdana Sijanski graduated in law in 2001 and passed the second state examination in 2003. She is a research assistant at the Chair for Civil Law, Law of Civil Procedure and Legal Philosophy of Professor Dr Helmut Rüßmann at the Saarland University, and worked on the EU-project eJustice as a legal consultant.

g.sijanski@mx.uni-saarland.de

Dipl.-Kfm. Fabrice Zangl, M.Sc. graduated in Management at EM Lyon in 2000 and at Saarland University in 2002. He is researcher at the Institute for Information Systems (DFKI GmbH) and works on the EU-project eJustice. His research activities include BPM and Business Integration in the automotive industry and public administration.

zangl@iwi.uni-sb.de