ESTRELLA

IST–4-027655

European project for Standardized Transparent Representations in order to Extend LegaL Accessibility

Specific Targeted Research or Innovation Project

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	Dissemination Level	
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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List of participants

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Total Costs

Project Cost: 3,7 million euro

Commission funding

Project Funding: 2,6 million euro

Summary

The Estrella project brought together a core group of researchers in the field of artificial intelligence and law (AI&Law). These researchers all have a long track record in working on actual and complex legal reasoning problems. Next to these researchers we managed to include vendors that provide tools that support their clients with their legal knowledge based problems. Furthermore, different client organizations helped us to create an open standards based solution that would help them to better succeed in providing their employees and their customers with knowledge systems.

The ambition of the Estrella team was to provide an open standards based solution covering all important constituents of a knowledge system. We foresaw that such solution would require standards for documentary knowledge sources, a standard for describing (legal) knowledge, and a standard for the reasoning part. Since our aim was to have the vendors participating in the project to take responsibility for the take up after the project, we not only created a reference operational environment that could guide these vendors in their future innovation process (Carneades), but we also made translators between the vendors current tools using the legal knowledge interchange format (LKIF). LKIF is one of the important achievements of the Estrella project. In order to better connect the legal knowledge models expressed in LKIF with the documentary knowledge sources expressed in CEN MetaLex, we developed and additional standard called Legal Meta data Interchange Format (LMIF). Last but not least a fully Semantic Web compliant reasoning environment was developed which helped us to explore the strengths and weaknesses of the standard knowledge representation languages developed in the W3C consortium when applied in the legal domain. This environment called Harness was not foreseen at the beginning of the project and this achievement is complementary to the Carneades framework and could be integrated within that framework in the future.

The Estrella project has successfully completed the tasks set at the beginning. All deliverables that were foreseen have been delivered and the client partners have been provided with solutions for their problems stated at the first phase of the project. Working together with academics and vendors has helped them to prepare for the future. The vendors have learned from applying state of the art technological solutions in realistic complex settings which helps them to set the agenda for their future innovation programs and for developing their market strategies.

The Estrella project has resulted in many scientific publications. The Estrella project has successfully created awareness in the scientific community for the problem domain, while it helped the institutes to further develop their future research agenda.

Last but not least the outcomes of Estrella were input to two standardization initiatives, CEN MetaLex and OWL 2 DL (W3C). The findings of the researchers in Estrella have been adopted by these communities and the new standard proposals contain solutions proposed by our researchers.

While running a complex project consisting of fifteen partners over five countries has its management challenges, the cooperation between the partners worked rather smoothly. Frequent virtual and face to face meetings were organized to adjust the tasks and to exchange ideas and solutions between partners. An electronic collaboration system was available on a 24/7 basis.
We experienced that bridging language barriers and cultural differences wasn't a big problem, since all participants were very motivated to work on the issues at hand. The short periods of co-working at one location also helped to create the required cohesion in the Estrella team.

However, two problems should also be mentioned. First, involving partners outside of the consortium appeared to be very difficult. Dissemination of the project results was easier via the many symposia, scientific conferences and face to face meeting with potential clients than via the planned Observatory Board. We originally thought to use this board for the purpose of creating awareness, having some early adopters while further developing the Estrella solutions. We experienced that people have too little time to attend such meetings and the fact that we couldn't fully compensate the costs of attending the Observatory Board meetings wasn't helpful either. The second problem has to do with sustainability of the project's results. Both CEN MetaLex and LKIF are (future) standards which come with cost for maintaining them and projects like Estrella, while offering possibilities to work on such standards, cannot provide the long term support that is required for successful implementation thereof.

The partners of Estrella have expressed the intention to continue to work together in future projects. Some initiatives to create new project proposals have already been undertaken. The partners having complementary knowledge and experiences look for new opportunities to further collaborate in finding solutions to the intriguing problems in the field of AI&Law.

Project main goals

The primary business objective of the ESTRELLA project was to develop and validate an open, standards-based platform allowing public administrations to develop and deploy comprehensive legal knowledge management solutions, without becoming dependent on proprietary products of particular vendors. ESTRELLA has provided support, in an integrated way, for both legal document management and legal knowledge systems. The different solutions created provide a complete solution for improving the quality and efficiency of the determinative processes of public administration requiring the application of complex legislation and other legal sources. The solutions provided by ESTRELLA facilitate a market of interoperable components for legal knowledge systems, allowing public administrations and other users to freely choose among competing development environments, inference engines, and other tools.

The project results

The main results of the Estrella project are:

1. A Legal Knowledge Interchange Format (LKIF).

LKIF has been build upon emerging XML-based standards of the Semantic Web, including RDF and OWL. LKIF extends the current W3C standards by including meta-level rules for reasoning about rule priorities and exceptions, legal arguments, legal procedures, cases and case factors, values and principles. The final version of LKIF is described in project deliverable D4.1.

2. A reference inference engine for LKIF (Carneades).

Carneades is an open source implementation of a hybrid architecture that supports legal reasoning including legal argumentation. This system is intended to serve as a demonstrator for LKIF and as a reference for the vendors when further developing their current tools. The final version of Carneades is described in deliverable D4.3.

3. A content management solution for handling pluriform textual (legal) knowledge sources (eXistrella).

Exploiting the developed standard for describing legal sources MetaLex, an open source content management solution was created that enables users to manage huge amounts of legal documents and use these documents either directly via normal search and retrieval tools or via intelligent systems including legal knowledge systems. The eXistrella system also provides meta data support which improves precision and recall of document search and enables relating various sources using an advanced referential system. We developed a Legal Meta data Interchange Format (LMIF) which can be viewed as a pre-proposal for a meta data standard. LMIF allows us to relate formal legal knowledge modelled in LKIF with legal sources describe in MetaLex. The legal CMS is described in deliverable D3.4.

4. A set of translators to and from the vendor's proprietary formats to LKIF.

The translators allow clients of the vendors in the consortium to port from one vendor's solution to the other. It also allows them to share their formalised legal knowledge with other users and therefore creates a basis for better

reuse of legal knowledge between different governmental users and between governments and businesses.

5. An OWL ontology of basic legal concepts (the LKIF-core ontology).

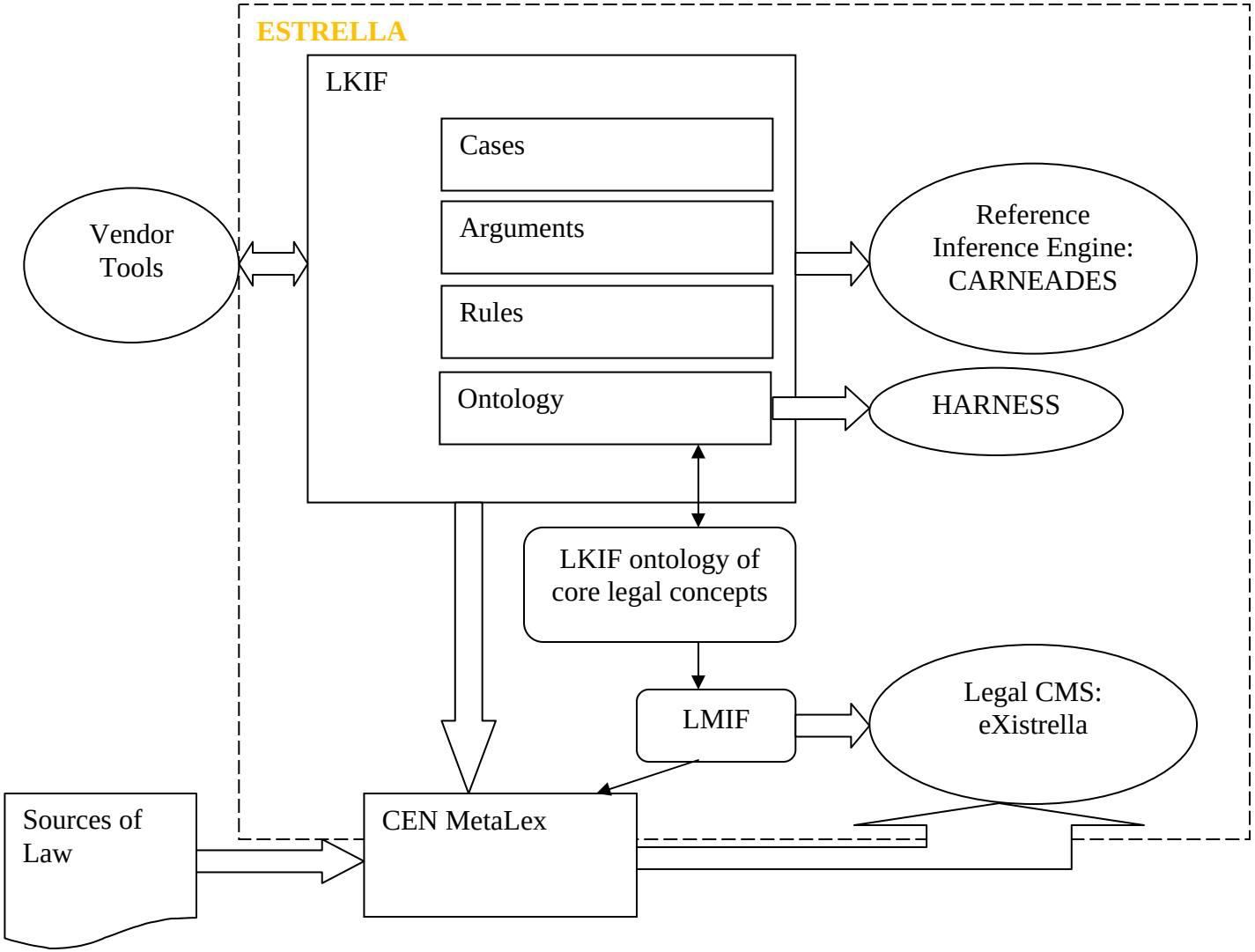
Besides being a modelling aid for knowledge engineers working in the legal domain, the LKIF-core ontology provides a basis for bridging between different legal cultures and languages. The LKIF-core ontology has been used to create LMIF and the different domain models that were used in the knowledge systems developed for the user partners in the Estrella project.

6. A fully Semantic Web compliant knowledge architecture (Harness).

Harness was developed in order to test the strengths and weaknesses of a fully Semantic Web compliant solution for modelling and applying legal knowledge. Harness allows us to create decidable knowledge components which results can be trusted and that guarantee the complete exploration of a knowledge domain. Harness is described in deliverable D4.6.

All Estrella results are available through the project web site and have also been described in many scientific and other publications.

A less tangible result is the impact of the project on the partners and vendors and users outside of the consortium. ESTRELLA was set out to address a significant barrier present in the market for Legal Knowledge Tools, such as rule-based systems – such a barrier arising form the fact of there being different vendor formats for knowledge representation (e.g. rules expression), and there being no readily available standards, methods or tools for interchange of legal knowledge between vendor tools. The ESTRELLA consortium have successfully developed the LKIF (legal knowledge interchange format) and have supported LKIF with a reference architecture and tools, as well as demonstrating LKIF in a series of realistic pilots hosted by key Governmental bodies forming part of the legal-draft and implementation process in their respective countries. LKIF is now available, and in fact has been adopted by vendors outside the project as a standard for legal knowledge interchange. We recognise that in order to further promote LKIF as a sustainable open standard additional activities should be started outside of the Estrella project. These activities will include a standardisation activity through a standardisation body, such as CEN.


ESTRELLA
LKIF
Cases
Arguments
Rules
Ontology
Vendor Tools
Reference Inference Engine: CARNEADES
HARNESS
LKIF ontology of core legal concepts
LMIF
Legal CMS: eXistrella
Sources of Law
CEN MetaLex

Organisation and management

In order to achieve the main results we divided the work in work packages. These work packages reflected the different issues to be covered, some of which were quite general, such as management and dissemination, while others focused on the technical issues addressed in the Estrella project or the tests of the solutions created in those work packages.

We have chosen to use a stepwise refinement method at the start of the project also because we had to guarantee the coherence of the results of the various activities. Especially the relationships between WP 1 and 4 focusing on LKIF and the reference engine and WP 3 addressing the content management solution related issues required management attention. The pilots of WP 2 of course also forced us to take care of creating and preserving the links between these work packages.

In a project with the many different partners as we had in Estrella, combined with the fact that the academic partners would represent different 'schools' having different opinions about the right way to approach things, the fact that we had competing vendors in the consortium and the fact that client organizations are usually focused on concrete solutions to their problems rather than having fundamental scientific problems solved or having the desire to help commercial parties to renew their products, we expected some managerial problems.
This was however not the case. The partners were all very motivated to work on the problems addressed and the combination of virtual and face to face meetings helped to build a team with sufficient coherence to get the challenging job done.
Groupware was used to support the teamwork and the project support system was available on a 24/7 hours basis.
Working together at one location when starting new activities proved to be quite helpful. This way we could exchange ideas in a condensed way and the mutual understanding of the problems at hand and the way to approach them allowed the teams to continue the work later from dislocations.
Also the cooperation when writing scientific papers, making joint presentations at conferences etc. helped knowledge sharing amongst the project partners.

Concluding we can state that the different backgrounds and experiences helped us to produce excellent results and this made it worth to have the managerial troubles connected to such large complex project settings.

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