

Methodological Perspectives for Legal Ontologies Building: an Interdisciplinary Experience

Danièle Bourcier
CERSA – CNRS
University of Paris 2

Mélanie Dulong de Rosnay
CERSA – CNRS
University of Paris 2,
Medialive

Jacky Legrand
University of Paris 2

Abstract

Legal ontologies design raises knowledge management but also jurisprudence issues. To which extent is it possible to establish common concerns between technical means and theoretical constraints?

After a brief presentation of the network methodology, we give two convergent results of our working groups on the feasibility of legal ontologies. First, the definition of a meta legal language handling fundamentals (acts, actors, conditions...) contributes to a shared understanding of legal knowledge between disciplines *and* jurisdictions. Second, ontological alignment concerns not only knowledge management *but* is also the core of the judge's activity.

Keywords

Ontologies, legal information systems, knowledge management, methodology, cognition

1. Introduction

Legal ontologies cover two types of approaches. On the one hand, generic ontologies trying to reflect theories of law produce upper-level ontologies specific to the legal domain but hardly applicable by the practitioners. They are usually built from a conceptual point of view and follow a top-down process from concepts to texts. On the other hand, applicative ontologies answering to professional needs often miss the specificity of legal knowledge but are efficient for information retrieval. They are extracted bottom-up from very large textual corpus.

These two types of ontologies are built by different scientific and professional communities. Generic ontologies are rather made by legal academics for heuristic purposes and represent another way to describe jurisprudence, while applicative ontologies are produced by knowledge management engineers to reduce legal language complexity and favor storage and access to legal documents. It seemed interesting to combine best practices from these various communities experiences

2. Methodology

The Specific Action "Legal ontologies and legal language" proceeded over one year, gathering 25 active researchers from several laboratories (law, legal science, philosophy, logic, linguistics, computer science, cognitive science, knowledge management, semantic web) and institutions (Constitutional Court, local authorities). Working groups have been dedicated to various aspects of the ontological issues: Search and use of fundamentals (legal theory), European Community legal concepts (cognitive approach), and Text-based ontologies (applicative approach). Results have been presented and evaluated by three international experts at a closing symposiumⁱ at the end of 2004 in Paris.

A theoretical subgroup undertook preliminary work to evaluate the difficulty and the interest of the construction of ontologies. Another subgroup worked on European community law Directives. European Directives illustrates the need to have a common representation of concepts in order to translate accurately shared requirements into national legislation during the transposition process. The multilingual aspect of EC Directives transposition offers perspectives in terms of translation applications, comparative legal terminology studies, and the evaluation of compliance, correspondence and harmonization between national lawsⁱⁱ, as it was described by a member of the group who presented his prior workⁱⁱⁱ. What does ontology software bring to legal knowledge understanding?

The working method included multiple face to face meetings with members lectures, presentations and debates and electronic exchanges. A collaborative virtual workspace^{iv} (wiki) will be settled to continue the experiences exchange. Prospective goals investigation has been preferred to a state of the art mining and interpretation.

Substantial tests have been undertaken to illustrate some hypothesis of the participants.

3. Results

3.1 Resources sharing

Legal and software resources were shared among the experts, leading to the production of hypotheses and a comparative reflection between tools and practices. For instance, the parsing results of the two European Directives with Linguistic Craft Workbench and Ontology Craft Workbench tools^{vi} revealed at their intersection the skeleton of a Directive beyond domains characteristics. The terms extracted from the Copyright Directive allowed a re-organization of the intuitive categories that had been built by the legal expert, leading to new mappings and a renewed legal analysis of the European text. Also, a UML-type diagram was produced reflecting the conceptual and relational restructuring that was allowed by the non-linear reading of the Directive.

3.2 Definition of a common language

The goal of the copyright ontology is to gather terminological material for access to copyrighted works automated management. The elaboration of a meta Rights Expression Language based on a legal ontology is necessary to ensure semantic interoperability between humans and machines to describe works and represent contracts.

3.3 Ontologies alignment for applications interoperability

The further use of an ontology editor, the Differential Ontology Editor (<http://opales.ina.fr/public/>) and its associated method^{viii} for semantic differential definition of the ontological resource terms is helping the legal expert to build a knowledge base.

3.4 Legal fundamentals, a construction based on *points of view* and ontology goals

The whole group agreed that the research of fundamentals is a prerequisite for ontologies building. However, it cannot be achieved without taking into account the various *points of view* on law: *legal point of view*, *action point of view*, *logical point of view*.

Another 3-dimensional space with three oriented axes corresponds to the ontology goals perspective .

- more or less *linguistic* ;
- more or less *generalizing* ;
- more or less *decision-making*.

3.5 A walk among theoretical contributions converging to legal fundamentals

The final convergence point is that the syntactical ontological approach (coding what the things *are*) is opposed to the institutional legitimacy of what the legal things *are*.

3.6 Guidelines for legal ontology building

If law is handed over to knowledge engineers in order to achieve ontologies, and if these ontologies are handed over to lawyers in order to implement law, neither the law nor the ontology will be enriched. At this level, we distinguish two types of engineering: legal operational engineering and legal cognitive engineering.

- Legal operational engineering can be considered as closed and static . It proceeds from a bottom-up extraction from textual corpus after a linguistics parsing. The representation process smoothes and rubs out the evolutionary and open characteristics of law.

- Legal cognitive engineering tends to include a dynamic representation , adding three dimensions to the previous figure: time, context and goals. First, a legal ontology is able to act upon the standard evolution, reinforcement or questioning. Second, context may specify the available coded information while potential circumstances can be recorded. Third, a legal ontology is mirroring the legislator teleological aspects: its use has to take the implicit goals into account while the explicit goals must be coded into the information.

3.7 Conclusion

The previous analyses, propositions, suggestions and recommendations may lead to a better understanding of the ontology building challenges and an increasing interest for operational *and* properly designed ontologies.

From a methodological point of view, properly designed ontologies will help to achieve operations on legal matter in order to reduce its constituent indetermination. From a practical point of view, computer and law research as a whole will benefit from properly designed ontologies. A closer examination reveals that to store, to model, to integrate and to differentiate are the key processes for Information Technology in legal domain. Ontologies building and use are an asset for better indexing, integration for use cases modeling, hard cases differentiation.

Further research

The working group activities will continue epistemological insight and legal practical developments within a collaborative workspace environment. The recently created French Legal Information Institute (<http://www.frlfi.org/>) will host this environment to facilitate access to private and public legal databases.

Acknowledgments

The authors are grateful to all the fellow members of the Specific Action and to the invited speakers of the closing symposium who accepted to evaluate the group's results: Giovanni Sartor, Aldo Gangemi and Joost Breuker, whilst taking full responsibility for the views and ideas presented in this paper.

This research has been supported by the Pluridisciplinary Network on Law and Information Systems of French National Center for Scientific Research (CNRS).

- i Proceedings of the Conference on Legal Ontologies, 2004 December 3rd, Paris.
- ii An ontology around the concept of worker has been described in Sylvie Després and Sylvie Szulman, "Construction of a Legal Ontology from a European Community Legislative Text", *Jurix 2004 Proceedings*.
- iii Aldo Gangemi, Alessandra Prisco, Maria-Teresa Sagri, Geri Steve, Daniela Tiscornia, "Some ontological tools to support legal regulatory compliance, with a case study" in *Lecture Notes in Computer Science : OTM 2003 Workshops*, Volume 2889, 2003, Springer Verlag, Heidelberg.
- iv Bruno Bachimont, Antoine Isaac, Raphaël Troncy, "Semantic Commitment for Designing Ontologies: A Proposal", in Asuncion Gomez-Pérez and V. Richard Benjamins, editors, *13th International Conference on Knowledge Engineering and Knowledge Management, EKAW'2002*, volume LNAI 2473, pages 114-121, Sigüenza, Spain, October, 1-4 2002. Springer Verlag.
- v Danièle Bourcier, "Institutional pragmatics and legal ontology - Limits of the descriptive approach of texts", in: Pompeu Casanova and alii (eds), *Semantic Web and Legal Ontologies*, Springer Verlag, 2005, (to be published).

ⁱ *Proceedings of the Conference on Legal Ontologies*, 2004 December 3rd, Paris.

ⁱⁱ Alexander Boer, Tom van Engers, Radboud Winkels, "Using Ontologies for Comparing and Harmonizing Legislation", in *Proceedings of the 9th International Conference on Artificial Intelligence and Law (ICAIL 2003)*, ACM Press, N.Y. 2003, pp. 60-69.

ⁱⁱⁱ Aldo Gangemi, Alessandra Prisco, Maria-Teresa Sagri, Geri Steve, Daniela Tiscornia, "Some ontological tools to support legal regulatory compliance, with a case study" in *Lecture Notes in Computer Science : OTM 2003 Workshops*, Volume 2889, 2003, Springer Verlag, Heidelberg.

^{iv} L. Mommers, "Application of a knowledge-based ontology of the legal domain in collaborative workspaces" in *Proceedings of the 9th International Conference on Artificial Intelligence and Law (ICAIL 2003)*, ACM Press, N.Y. 2003, pp. 70-76.

^v An ontology around the concept of *worker* has been described in Sylvie Després and Sylvie Szulman, "Construction of a Legal Ontology from a European Community Legislative Text", *Jurix 2004 Proceedings*.

^{vi} Acknowledgments to Christophe Roche, University of Savoie, <http://ontology.univ-savoie.fr/main.asp>

^{vii} Melanie Dulong de Rosnay, "Cognitive Interfaces for Legal Expression Description - Application to Copyrighted Works Online Sharing and Transaction", in D. Bourcier (ed.), *Legal Knowledge and Information Systems. Jurix 2003: The Sixteenth Annual Conference*. Amsterdam: IOS Press, 2003, pp. 121-130.

^{viii} Bruno Bachimont, Antoine Isaac, Raphaël Troncy, "Semantic Commitment for Designing Ontologies: A Proposal", in Asuncion Gomez-Pérez and V. Richard Benjamins, editors, *13th International Conference on Knowledge Engineering and Knowledge Management, EKAW'2002*, volume LNAI 2473, pages 114-121, Sigüenza, Spain, October, 1-4 2002. Springer Verlag.

^{ix} ODRL Creative Commons Working Group <http://odrl.net/Profiles/CC/>

^x Danièle Bourcier, "Institutional pragmatics and legal ontology - Limits of the descriptive approach of texts", in: Pompeu Casanova and alii (eds), *Semantic Web and Legal Ontologies*, Springer Verlag, 2005, (to be published).

-
- xi Pepijn R. S. Visser, T. J. M. Bench-Capon, “La création d’une bibliothèque ontologique pour les systèmes d’informations juridiques” in: Bourcier et alii (ed) *Droit et Intelligence Artificielle*, Romillat, 2000.
- A. Valente, *Legal Knowledge Engineering ; A Modelling Approach*, University of Amsterdam, IOS Press, 1995.
- L. T. Mc Carthy, “A Language for Legal Discourse”, 1. Basic Features, *Proceedings of the 2nd International Conference on Artificial Intelligence and Law (ICAIL 1989)*, ACM Press, N.Y. 1989, pp. 180-189.
- R.K. Stamper, “The Role of Semantics in Legal Experts Systems and Legal Reasoning”, *Ratio Juris*, Vol. 4 n°2, pp. 219-244.
- xii B. Russel, *Critical Exposition of the Philosophy of Leibniz*, Cambridge, Cambridge University Press, 1900.
- P. Riley, *Leibniz Universal Jurisprudence. Justice as the Charity of the Wise*, Cambridge, Mass, London, Harvard University Press, 1996.
- xiii Jeremy Bentham, *De l’ontologie*, Seuil, Points, 1997.
- xiv Aristote, *Catégories*, Seuil, Points, 2002.
- xv Articles 2, 3, 4 and 5 of Badinter’s Law n° 85-677 of July 5 1985.