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# An Event Based Design Pattern for Intertextual Legal Links

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**Abstract.** This paper presents an ontology design pattern for legal links based on the event notion. A legal link could not be considered as a direct link between two documents. Many parameters should actually be taken into account when dealing with this information in order to have a closer matching of the real situation at the origin of this link. In fact, law is a highly interconnected network of documents, which makes access to legal knowledge a complex task particularly for information retrieval systems. Many types of links exist between various types of documents, each of which have specific source and target types. Complex queries, centered on types of links and on their related properties, emerge as an urgent need to handle the complexity of this domain. An ontology-based approach is proposed to model a collection of legal documents allowing to manage in a unified way the different characteristics of such a collection. The references module of the document ontology focuses on the typology of links and their related properties (date, author, etc.). Due to the recurrence of the reference situation when modeling any legal event, we propose to define an ontology design pattern for legal references which is intended to enable reusability and thus simplifying the task of a legal ontology designer.

Keywords: Legal documents network, Intertextuality, Legal references, Ontology Design Pattern, Event

## 1. Introduction

This work is part of the Legilocal Project [1] which aims at improving the access to public data and the sharing of information. This is an important challenge to meet for French local administrations which need to inform citizens and the business world of the evolution of the legal and administrative context in which they operate and to improve the document production process so as to produce more easily more reliable documents. The produced documents are of different types, have specific structures, may have distinct or similar semantic content and are interconnected by various types of links.

To meet this challenge, we propose to tackle the complexity of the legal domain by focusing on the document model that represents the diversity and interlinking of legal and administrative documents within and across jurisdictions. A unified document model is proposed to take into account not only the semantic content of the documents, their logical structures and their different versions but also the structure of a document collection consisting of different types of documents interconnected by various types of links.

The development of semantic information retrieval in its professional uses involves exploiting this set of documents properties. In the legal field, especially, we need to find documents of a particular type (*eg.* decrees issued by a given court) that talk about a specific legal concept (*eg.* contract) and specify a particular law text. We should be able to find all the texts on a given topic (*eg.* noise) in force at a particular date and how they were applied, in other words, the case law on these texts along with their date, court, etc. We need also to identify the portion of a text (an article) that has been modified on a particular date and the text introducing the modification. As shown by these queries, intertextual legal links (legal references and citations) are so

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important and should be handled in order to develop advanced search functionalities in this field.

Representing references between legal documents as direct relations has the advantage of making them directly usable for search purposes and visualization. In many encountered situations, a legal reference has more features making it more complex than a direct link between two documents. In fact, a substantial part of legal references is concerning the evolution of legal text (*eg.* the creation of new versions). These type of reference are very recurrent and when they happen, they usually affect more then two documents, which makes a representation by a direct link not possible (such as modification, codification, etc.).

Several discussions have been conducted with legal experts to capture their needs and find the best way to model the situation of a legal reference. A detailed analysis of intertextual links and their exploitation has shown that in the legal domain, a reference between two documents derive in most cases:

- from an action,
- done by an agent,
- of a given legal institution,
- on a document,
- on a particular date,
- thus generating a new document (that could be a new version of an existing document).

Based on this set of specifications, a reference between two documents is a situation (action) having all mentioned features, namely: a date, a place, an agent, an object and a result. We model these references, no longer as a single inter-document property, but taking account of the events that led to the creation of these links (*eg.* modification, transposition) and their circumstances (*eg.* agents, location).

## 2. The Reference event graph

The proposed pattern represents the references which concern the evolution of legal texts: creation, codification, modification, transposition and abrogation. Both a reference and an event are modeled in the same concept. This concept represents a reference expanded by the properties of an event. These types of references usually involve three documents, unlike citations (application, visas, citations of case laws and legislative texts) which concerns just two documents. The involved documents correspond to the source and the target of a reference, the factor and the result of the event behind that reference. In most cases, the target and the matter correspond to one single document. This is for instance the case with the transposition event of the European directive $2004/114/CE$ [2] as shows the graph of Figure 1.

A reference is described in one direction (*eg.* creates, and not is created by). An event creates the two references (with opposite source and target) but only one direction is represented (`creates`), the second one (`isCreatedBy`) could be retrieved by looking on the involved documents.

The graph deals with the legal reference event. It defines one main `ReferenceEvent` concept. A reference event should have a location, a date, an agent, a source, a matter and a result, as depicted in Figure 2. Table 1 describes the classes and properties of the `ReferenceEvent` model.

The properties `matter` and `result` may not be used with some types of actions. For instance, in case of a legislative creation, there is no matter document, and in case of abrogation no document is resulting (an attribute about the document state should be modified).

## 3. Axiomatization

The Turtle/N3 axiomatization of the pattern is given by Listing 1.

```
@prefix ref: <http://www-lipn.univ-paris13.fr/
~mimouni/owl/2014/referenceEvent#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdfs: <http://www.w3.org/2000/01/
rdf-schema#> .
@prefix metalex: <http://www.metalex.eu/
metalex/2008-05-02#> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix event: <http://purl.org/NET/c4dm/
event.owl#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix geo: <http://www.w3.org/2003/01/
geo/wgs84_pos#> .


ref:ReferenceEvent
    a owl:Class ;
    rdfs:label "Reference event"^^xsd:string ;
    rdfs:subClassOf owl:Thing ;
    rdfs:subClassOf
          [ a owl:Restriction ;
            owl:onProperty event:place ;
            owl:someValuesFrom geo:SpatialThing
          ] ;
    rdfs:subClassOf
          [ a owl:Restriction ;
            owl:onProperty ref:target ;
            owl:someValuesFrom ref:LegalDocument
          ] ;
```

[2] http://eur-lex.europa.eu/legal-content/FR/TXT/HTML/?uri=CELEX:32004L0114

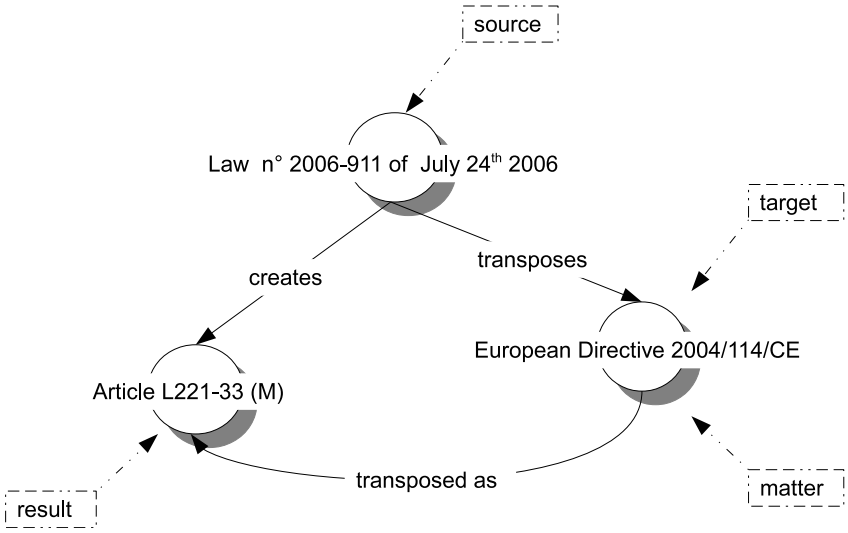


Fig. 1. The transposition of the Directive $2004/114/CE$, being the target of the transposition reference (as source the law text Law nř $2006-911$ of July $24^{th}$ 2006) and the matter of the transposition event (as result the article Art. $L221-33$ (M) of Monetary and Financial Code).

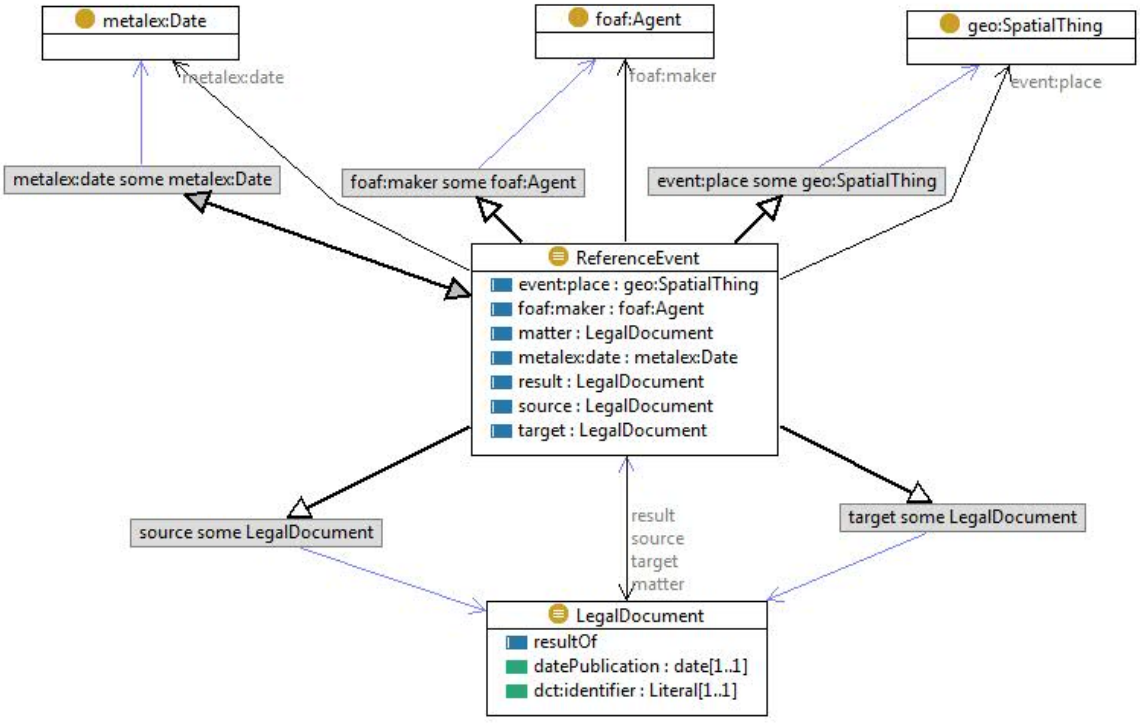


Fig. 2. The legal reference event model.

Table 1
Description of classes and properties of the legal reference event model.

| | |
|---|---|
| Class: `ReferenceEvent` | *Reference event* - A legal reference between a source document and a target document. A reference event have a date, an agent, a factor or a matter (the document on which the agent acts), a product or a result (the document resulting from the agent action), and a location in space |
| | in-domain-of: `event:place`, `foaf:maker`, `metalex:date`, `matter`, `result`, `source`, `target` |
| Class: `LegalDocument` | *Legal document* - A legal text, that could be of any type (types should be represented as subclasses): a legislative text (codified text, uncodified text), an article, a case law, an editorial document, a local authority act, etc. |
| | in-range-of: `source`, `target`, `matter`, `result` |
| Class: `metalex:Date` [3] | *Date* - A date of some reference event (a defined class) |
| Class: `foaf:Agent` [4] | *Agent* - The class of agents; things that do stuff (*eg.* person, group or organization) |
| Class: `goe:SpatialThing` [5] | *Spatial thing* - Anything with spatial extent, i.e. size, shape, or position (*eg.* people, places) |
| Property: `metalex:date` | *date* - Relates a reference event to a Date. Domain: `ReferenceEvent`, range: `metalex:Date` |
| Property: `foaf:maker` | *maker* - An agent who makes the action generating the legal reference. Domain: `ReferenceEvent`, range: `foaf:Agent` |
| Property: `event:place` | *place* - Relates an event to a spatial object. Domain: `ReferenceEvent`, range: `geo:SpatialThing` |
| Property: `source` | *source* - A document that is the source of a legal reference. Domain: `ReferenceEvent`, range: `LegalDocument` |
| Property: `target` | *target* - A document that is the target of a legal reference. Domain: `ReferenceEvent`, range: `LegalDocument` |
| Property: `matter` | *matter* - A document on which an agent acts. Domain: `ReferenceEvent`, range: `LegalDocument` |
| Property: `result` | *result* - A document that results from an agent action. Domain: `ReferenceEvent`, range: `LegalDocument` |

```
      rdfs:subClassOf
            [ a owl:Restriction ;
              owl:onProperty ref:source ;
              owl:someValuesFrom ref:LegalDocument
            ] ;
      rdfs:subClassOf
            [ a owl:Restriction ;
              owl:onProperty foaf:maker ;
              owl:someValuesFrom foaf:Agent
            ] ;
      owl:equivalentClass
            [ a owl:Restriction ;
              owl:onProperty metalex:date ;
              owl:someValuesFrom metalex:Date
            ] .

ref:LegalDocument
      a owl:Class ;
      rdfs:label "Legal document"^^xsd:string ;
      rdfs:subClassOf owl:Thing ;
      rdfs:subClassOf
            [ a owl:Restriction ;
              owl:cardinality "1"
             ^^xsd:nonNegativeInteger ;
              owl:onProperty ref:datePublication
            ] ;
      rdfs:subClassOf
            [ a owl:Restriction ;
              owl:cardinality "1"
             ^^xsd:nonNegativeInteger ;
              owl:onProperty dct:identifier
            ] ;
      owl:equivalentClass
            [ a owl:Restriction ;
              owl:onProperty ref:resultOf ;
              owl:someValuesFrom
              ref:ReferenceEvent
            ] .
event:place
      a owl:ObjectProperty ;
      rdfs:domain ref:ReferenceEvent ;
      rdfs:label "place"^^xsd:string ;
      rdfs:range geo:SpatialThing .

foaf:maker
      a owl:ObjectProperty ;
      rdfs:domain ref:ReferenceEvent ;
      rdfs:label "maker"^^xsd:string ;
      rdfs:range foaf:Agent .

metalex:date
      a owl:ObjectProperty ;
      rdfs:domain ref:ReferenceEvent ;
      rdfs:label "date"^^xsd:string ;
      rdfs:range metalex:Date .

ref:matter
      a owl:ObjectProperty ;
      rdfs:domain ref:ReferenceEvent ;
      rdfs:label "matter"^^xsd:string ;
      rdfs:range ref:LegalDocument .

ref:result
      a owl:ObjectProperty ;
      rdfs:domain ref:ReferenceEvent ;
      rdfs:label "result"^^xsd:string ;
      rdfs:range ref:LegalDocument ;
      owl:inverseOf ref:resultOf .

ref:source
      a owl:ObjectProperty ;
      rdfs:domain ref:ReferenceEvent ;
      rdfs:label "source"^^xsd:string ;
      rdfs:range ref:LegalDocument .

ref:target
      a owl:ObjectProperty ;
      rdfs:domain ref:ReferenceEvent ;
      rdfs:label "target"^^xsd:string ;
      rdfs:range ref:LegalDocument .
```

Listing 1: Classes and properties of the legal reference event model.

## 4. Positioning

An Ontology Design Pattern (ODP) or knowledge pattern is a conceptual component, small, compact and generic enough to be reused as a building block for the design of ontologies [2,3]. In the context of Semantic Web, several ODPs are proposed to model the content in different fields facilitating the design during the life cycle of an ontology [5] (see the Ontology Design Pattern portal [6] collecting ODPs for the Semantic Web). In the legal domain, a proposal is made in [4] to help building ontologies in this field. A CODeP (Conceptual Ontology Design Pattern) was defined to represent the notion of conformity between norms and cases.

For the creation of this pattern, we took inspiration from the Event ontology [7]. This ontology deals with the notion of reified events. It defines a concept of the main event. An event may have a place, a time, active agents, factors and products.

We have compared our reference model with the one proposed by Metalex [1]. Our model differs from the Metalex one in two respects. In one hand, we refine the generic reference notion. A broad distinction opposes the citations that refer to a textual object and the semantic annotations that refer to non-textual objects but we also introduce various semantic citation subtypes (see Figure 3). On the other hand, we represent both a reference and an event on the same concept, whereas the Metalex model represents each concept apart (`metalex:BibliographicReference`, `metalex:Event`) related by the property `metalex:resultOf`. This allows managing references as events (a single reference event is created, although two references may be generated) and thus reducing instantiation efforts.

In our model, each type of reference is associated to specific source and target, which allows to specify not only to which types and parts of texts (articles) it refers but also in which types of texts and parts of texts it may appear. Actually, we introduce an opposition between document fragments and units to distinguish the document parts that are citable (units or `CitableBibliographicObject` in Metalex ontology) from those that are not (mere fragments). For instance, we consider whole documents and articles as units but not the preamble of a law.

[6] OntologyDesignPatterns.org

[7] http://motools.sourceforge.net/event/event.html#Event

## 5. Use cases

The above reference model is designed to assist legal ontology designer and to support advanced search functionalities handling the complexity of link types between legal and administrative documents. Traditional IR queries, involving content descriptors and/or attributes (metadata) of documents, can be answered by one document or a list of documents. However, users in such a domain express the need for relational queries which mainly focus on legal references (*eg.* modification, codification, etc.) and must be answered by a graph of documents or a list of graphs of documents (see Figure 4). Such relational queries could be:

1. *Does this legal text has been modified? at which date? what is the new version (resulting after the modification) ?*
2. *By which legal text the article* 46 *has been codified? this codification has been performed by which agent (or legal institution) ?*
3. *At which date the law* 1994 *has been repealed? and by which legal text ?*

Let's consider the following example of a codification event, selected from Legifrance [8] about the French general tax code (Code général des impôts [9]), which involves:

- as source : the decree (class `Decree`) *Décret nř92-836 du 27 août 1992*,
- as target and (at the same time) as matter : the uncodified article (class `UncodifiedArticle`) *Article 46 quater-00 A bis - 4 juillet 1992*,
- as result : the codified article (class `CodifiedArticle`) *Article 46 quater-00 A bis- 29 août 1992*,
- in the French national assembly (l'Assemblée nationale),
- the $27^{th}$ of August, 1992,
- signed by the budget minister, *Michel Charasse*.

The codification event (class `Codification`) is a type of reference event and is represented as a subclass of `ReferenceEvent`. The classes `Decree`, `UncodifiedArticle`, `CodifiedArticle` represent different types of `LegalDocument`, and are represented as subclasses of that class. In this situation, the uncodified article is at the same time matter and target, this comes from the fact that the codification

[8] http://www.legifrance.gouv.fr/

[9] http://www.legifrance.gouv.fr/affichCode.do?cidTexte= LEGITEXT000006069577&dateTexte=20140623

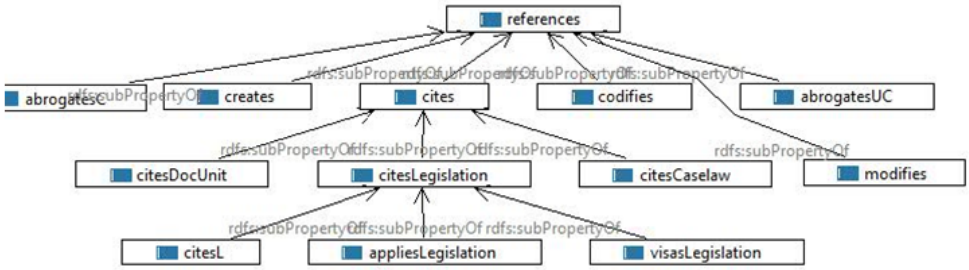


Fig. 3. Types of links between documents and their hierarchy.

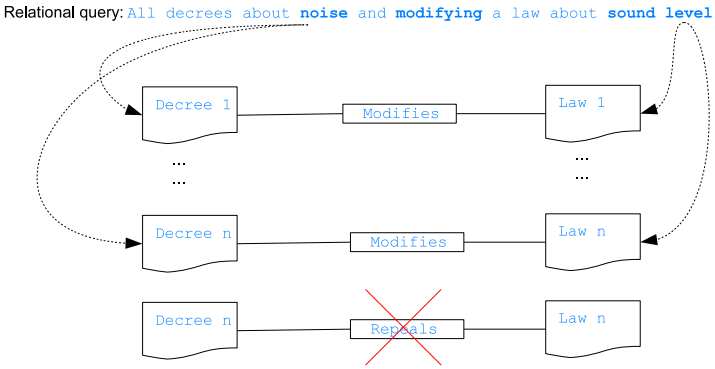


Fig. 4. An answer graph for a relational query

reference targets the document on which the action of codification will act. The Turtle/N3 code given by Listing 2 illustrates the described codification event. The corresponding diagram is depicted in Figure 5.

```
@prefix ref: <http://www-lipn.univ-paris13.fr/
~mimouni/owl/2014/referenceEvent#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdfs: <http://www.w3.org/2000/01/
rdf-schema#> .
@prefix metalex: <http://www.metalex.eu/
metalex/2008-05-02#> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix event: <http://purl.org/NET/c4dm/
event.owl#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix geo: <http://www.w3.org/2003/01/
geo/wgs84_pos#> .

ref:Codification
     a owl:Class ;
     rdfs:label "Codification"^^xsd:string ;
     rdfs:subClassOf ref:ReferenceEvent ;
     rdfs:subClassOf
           [ a owl:Restriction ;
             owl:onProperty ref:matter ;
             owl:someValuesFrom
             ref:UncodifiedArticle
           ] ;
     owl:equivalentClass
           [ a owl:Restriction ;
             owl:onProperty ref:result ;
             owl:someValuesFrom
             ref:CodifiedArticle
           ] .

ref:Codification-Article46
     a ref:Codification ;
     rdfs:label "Codification-Article46"
     ^^xsd:string ;
     event:place ref:national-assembly ;
     ref:matter ref:art-46-quarter-1991 ;
     ref:result ref:art-46-1992 ;
     ref:source ref:decree92-836 ;
     ref:target ref:art-46-quarter-1991 ;
     metalex:date ref:date-cod-art46 ;
     foaf:maker ref:budget-
     minister-michel-charasse .

ref:art-46-quarter-1991
     a ref:UncodifiedArticle ;
     rdfs:label "art-46-quarter-1991"
     ^^xsd:string .

ref:date-cod-art46
     a metalex:Date ;
     rdfs:label "date-cod-art46"^^xsd:string ;
     metalex:xsdDate "1992-08-27"^^xsd:date .

ref:decree92-836
     a ref:Decree ;
     rdfs:label "decree92-836"^^xsd:string .

ref:art-46-1992
     a ref:CodifiedArticle ;
     rdfs:label "art-46-1992"^^xsd:string .

ref:national-assembly
     a geo:SpatialThing ;
     rdfs:label "national-assembly"
     ^^xsd:string .

ref:budget-minister-michel-charasse
     a foaf:Agent ;
```

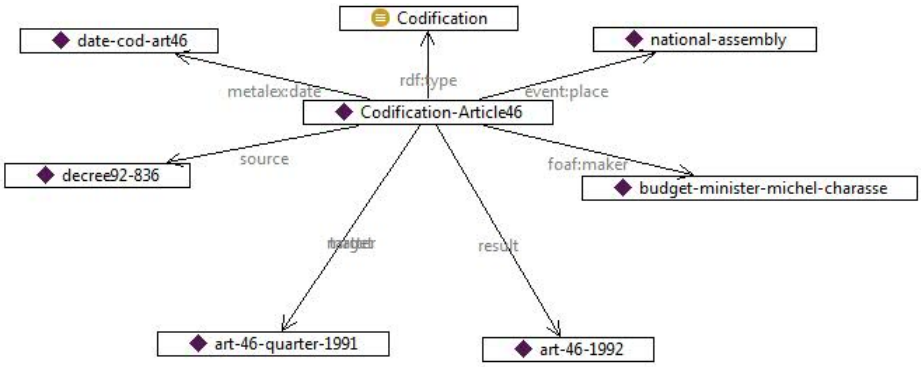


Fig. 5. Codification of the *Article 46 quater-00 A bis - $4^{th}$ July 1992*.

```
70      rdfs:label "budget-minister-
71      michel-charasse"^^xsd:string .
```

Listing 2: A sample reference event : codification. The codification consists in generating a codified text (document or article) from an uncodified one.

## 6. Datasets

As part of the Légilocal project, local acts, editorial documents as well as French legislative texts are collected from several sources: local authorities, legal editors and legal portals, mainly Legifrance. A sample Legilocal collection was used to test and validate the proposed model. A corpus of documents from the International Labour Organization (ILO) [10] was also used.

Many legal databases in different jurisdictions from different countries could be used with the pattern. Several data and documents are available online such as:

- The data from the UK Opening Up Government initiative [11].
- The data from the Dutch Regulations as Linked Data initiative [12].

## References

[1] A. Boer, R. Winkels, and F. Vitali. Proposed xml standards for law: Metalex and lkif. In *Proceedings of the 2007 conference on Legal Knowledge and Information Systems: JURIX 2007: The Twentieth Annual Conference*, pages 19–28, Amsterdam, The Netherlands, The Netherlands, 2007. IOS Press.

[10] www.ilo.org
[11] http://data.gov.uk/data/search
[12] http://doc.metalex.eu/

[2] P. Clark, J. Thompson, and B. Porter. Knowledge patterns. In S. Staab and R. Studer, editors, *Handbook on Ontologies*, International Handbooks on Information Systems, pages 191–207. Springer Berlin Heidelberg, 2004.

[3] A. Gangemi. Ontology design patterns for semantic web content. In *Proceedings of the 4th International Conference on The Semantic Web*, ISWC'05, pages 262–276, Berlin, Heidelberg, 2005. Springer-Verlag.

[4] A. Gangemi. Design patterns for legal ontology constructions. In P. Casanovas, M. A. Biasiotti, E. Francesconi, and M.-T. Sagri, editors, *LOAIT , Proceedings of the 2nd Workshop on Legal Ontologies and Artificial Intelligence Techniques June 4th, 2007, Stanford University, Stanford, CA, USA*, volume 321 of *CEUR Workshop Proceedings*, pages 65–85. CEUR-WS.org, 2007.

[5] V. Presutti and A. Gangemi. Content ontology design patterns as practical building blocks for web ontologies. In Q. Li, S. Spaccapietra, E. S. K. Yu, and A. Olivé, editors, *ER, Conceptual Modeling - ER 2008, 27th International Conference on Conceptual Modeling, Barcelona, Spain, October 20-24, 2008. Proceedings*, volume 5231 of *Lecture Notes in Computer Science*, pages 128–141. Springer, 2008.