When a FrameNet-Style Knowledge Description Meets an Ontological Characterization of Fundamental Legal Concepts

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Abstract. The need for bridging the gap between linguistically-oriented knowledge resources (i.e. lexicons) and domain-oriented ones (i.e. ontologies) is acknowledged within both the NLP and the AI&Law community. In this paper we propose to face this need by comparing a FrameNet-style and an ontological characterization of the 'obligation' Fundamental Legal Concept. In particular, we carried out a case-study aimed at investigating whether and to which extent different views on this Fundamental Legal Concept offered by the FrameNet resource can be mapped to an ontological characterization of the complex concept of 'public function', stemmed from the basic normative position 'obligation'.

Keywords: Legal Ontologies, Semantic Lexicons, Fundamental Legal Concepts, FrameNet.

1 Introduction

The increasing improvements in Natural Language Processing techniques result nowadays in a fast growing of Ontology Learning strategies based on bottom-up approaches. At the same time, within the Ontology Engineering field big efforts are devoted at developing networking tools which link accurate and specialized Domain Ontologies, rather than at building time-consuming and complex Core or Foundational Ontologies.

Consequently, two parallel directions of research are followed: the first one is aimed at making local ontologies more inter-operational through the definition of standards and mapping procedures; the second one is aimed at improving NLP techniques with a view to higher-level semantic potentialities.

According to these premises, bridging the gap between linguistically-oriented knowledge resources (i.e. lexicons) and domain-oriented ones (i.e. ontologies) is more and more a strategic phase. Namely, it is aimed, on one hand, at lexicalizing the ontology and, on the other hand, at structuring the literal meaning in accordance with many domain perspectives.

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Currently, the gap between the lexicon and knowledge cannot be considered completely filled by automatic procedures, nor it is realistic to think that it will be in a short time; but aside from the technical aspects, there is a lively debate within the sector about theoretical assumptions, meta-models and formal architectures that are able to express the links between lexical meaning and conceptual/ontological meaning.

The goal of this paper is to contribute to the aforementioned discussion by describing the results of an experiment carried out in the law field. The representation of legal concepts in an ontological framework has become very popular within several applications to the legal domain, as legal ontologies provide a shared vocabulary, able to support the inferential process, case-based reasoning and argumentation. Even if ontological models are often built on the conceptualization provided by domain experts, it is widely agreed that a flexible and re-usable methodology would require a middle-out approach, able to respect both the reference to written sources and the generalization of coherent shared models.

The represented study is aimed, on one hand, at testing a methodology for enriching, through the lexicalization, the models formulated by legal doctrine and implemented in core and domain legal ontologies and, on the other hand, at assessing the potentialities of a semantic lexicon such as FrameNet[1], developed in the NLP community, in providing a description of legal knowledge based on linguistic principles. As a consequence, we expect to consolidate the design of the meta-model reported in Dalos [1], which expresses links between conceptual models and terminology extracted from normative statements; in order to capture the multi-layered structure of legal discourse the framework should be extended to include 'local' meanings as defined within national systems, or the extensional meanings inducted from case-law or common sense interpretations, while keeping distinct different levels of localization.

In particular, we have carried out a case-study meant to explore evidence for mapping ontological models that describe Fundamental Legal Concepts [2], expressed by the deontic operators of *obligation*, *permission*, etc. with suitable linguistic structures (i.e. FrameNet Semantic Frames which describe 'deontic' situations). We have chosen this case-study for several reasons: they concern the availability of formal reformulations of the Fundamental Legal Concepts [3], [4], [5], the availability of their ontological description in the Core ontologies as LKIF-Core and CLO [6], the availability of semantic models of the legislative provisions [7], [8] and of their formal specification [9]. Moreover, the deontic operators are domain independent and they are expressed by a relatively limited number of linguistic structures. This feature allows the portability of our approach to several different legal sub-domains.

By stemming our analysis from the Fundamental Legal Concepts, we have the opportunity to model complex legal concepts from the basic ones. In fact, the Hofheldian concepts formalised in classes of normative positions (duty, liability, claim, power, etc..) as reifications of deontically qualified situations, are the building blocks on which it is possible to express complex concepts like, for example, *delegation*, *entitlement*, *authorization*, etc. Accordingly, in our case-study, we model on the normative positions the concept of 'public function', a key concept in the ontology of the services proposed in [10].

[1] http://framenet.icsi.berkeley.edu

In what follows, we will provide an overview of the existing projects aimed at bridging the gap between linguistically-oriented (lexicons) and domain-oriented (ontologies) knowledge resources, which have been developed both for the open-domain and for the legal domain (Section 2). Section 3 reports teorethical approaches to the formal specification of fundamental legal concepts and the state of the art on the existing Core Legal Ontologies, where they are represented. In Section 4, we show the potentialities of the FrameNet lexical model we have chosen. The case-study we carried out is reported in Section 5. Section 6 reports some reflections on the obtained results.

2 State of the Art and Related Projects

Interoperability is a crucial issue, as large scale applications mainly depend on the possibility to map and to connect different models and structures. One point under discussion is the definition of consistent models for interfacing resources and ontologies, as argued in [11] «There is an implicit mapping assumption between lexical and conceptual knowledge, which underlies "ontology lexicalization", namely that (intensional) senses from a lexical model are mapped to (extensional) interpretations on ontology elements (individuals, classes, restrictions, properties). The lexical semantic content of the lexicalizations, originating from linguistic/terminological resources such as term banks, thesauri and dictionaries, is considered to be lightweight, and in need of formalization. Classes, properties or individuals of the ontological meta-model can be provided with lexicalizations from the separate linguistic model in the form of lexemes, i.e., units of form and meaning. This model contains a set of data categories that captures all the relevant linguistic/terminological information associated with concepts such as lexicalizations, lexicalization types and multilinguality.»

The Linguistic Meta-model LMM [12] is based on a semiotic perspective, that takes into account the social-cognitive aspects on which the DOLCE foundational ontology is inspired, in order to offer a new linguistic layer to the foundational conceptualization and an adequate linguistic interpretation of terms and predicates expressed in a language with a formal semantics. The LMM framework allows several notions of concept (as a synset, a frame, a thesaurus descriptor, etc.) to be connected and both intensional (through class relations and restrictions) and extensional (among instances, e.g., Synsets) meaning to be expressed.

Lexical semantic databases can be combined by means of a meta-model as LMM or by aligning semantic structures, as in [13]. Here a FrameNet and a WordNet-like database are mapped and lexical units (LUs and synsets) are merged in a unified lexical ontology where sense distinctions and semantic structures are preserved. In Kyoto[2] a collaborative and multi-perspective definition of meaning will be allowed by the creation of platforms "different organization principles will enable semantic resources expressing multiple points of view and different layers of linguistic and conceptual information to be interconnected, while keeping distinct different conceptualization models".

[2] http://www.kyoto-project.eu/

In the legal domain, projects aimed at providing multi-layered frameworks where lexical and conceptual meaning are combined, have been proposed in [14], [15]. Methodological issues are discussed in [16]. Even if the work on ontology and the linkage between terminology and ontology have been carried out manually, nevertheless the project outcomes are promising, both from the perspective of dealing with the language/law interdependencies and at the level of improving semantic annotation.

3 Ontologies on Fundamental Legal Concepts

The initial trend in legal ontology engineering was to heavily draw on legal theory and built relatively highly axiomatised ontologies of the legal domain. One of the consequences of this trend was the development of several *core ontologies* early in the history of legal ontology engineering. Core ontologies are formal ontologies which contain the general basic concepts of a specific domain, for instance, the legal domain. They can be called generic domain ontologies as well, in the sense that they make commitments to a certain domain but in a very generic way that enables reuse in other subdomains [17]. Despite their nature being mainly theoretical, core legal ontologies have not been contextualised yet in the history of legal thought. This section provides some initial insights in this direction (3.1), as well as a brief overview of the core legal ontologies so far developed and their main characteristics (3.2).

3.1 A Short History of *Informal Ontologies* on Fundamental Legal Concepts

It has been acknowledged that legal theories contain ontological assumptions about the sources of legal knowledge and that their primitive concepts could be translated into an ontology [18]. In this line, similarly, if we take a broad notion of ontology as meaning the result of the effort to provide a clear conceptualisation of a domain (therefore excluding the requirement of formalisation), it is possible to talk about a history of core legal ontologies. By this concept we refer to the identification and clear definition of the basic conceptual units of the legal language. The most significant efforts in this direction took place during the XIXth century. Indeed, partly influenced by the positivist paradigm, partly driven by the desire to give law a scientific methodology, decades of legal research were committed to this endeavour. Apart from the philosophical underpinnings of the effort, practicalities were as well at issue, for the development of a common terminology for legal reasoning was deemed essential for achieving clarity and correctness in legal thought. In the common law sphere several scholars referred indeed to the need of establishing a clear usage of legal terms that would set free legal discourse from obscurity (for instance Bentham, Austin or Wigmore). This is the stream of thought corresponding mainly to analytical jurisprudence, with roots in Bentham's thought and that starting from Austin's *The Province of Jurisprudence determined* (1832) [19], leaded the quest for the main conceptual components of the law. In continental legal thought a similar line of thought was manifested in the works of the German pandectists. Represented by main legal scholars such as Savigny, Ihering, Puchta and Windscheid, and with origins in Hugo, it developed in the context of a strong debate on the suitability of codification which

would eventually culminate in the German Civil Code, which has been considered more similar to a doctrinal treatise than to a legislative piece of work[3].

Core conceptualisations of the law include different types of basic legal concepts. Firstly, they contain general concepts about the entities that populate the domain, such as `legal person`, `norm`, `responsibility`, and so on. Secondly, they refer to deontic concepts that are in charge of expressing the normativity of legal discourse. The latter are the result of the detailed and *logical*[4] analysis of rights and duties aimed at providing a formal account of legal discourse and reasoning. The one to provide a complete and detailed framework for such notions and to go down in history for such an achievement was Hohfeld [21], [22], who built up the following system of correlatives: `right/duty`; `privilege/no-right`; `power/liability`; `immunity/disability`[5].

Even if focus has shifted in legal thought during some periods from analytical conceptualism to more pragmatic approaches, modern computable models of the law have revived the need of giving a formal account of core legal concepts such is the case of core legal ontologies and not infrequently have drawn inspiration from some of these informal historical models, specially Hohfeld's.

3.2 Core Legal Ontologies

Early attempts to conceptualise the legal domain for computational purposes can be found in representational formalisms proposed as languages containing the lowest common denominators of legal discourse for expressing legal knowledge. In this line, a pioneer in the application of formal methods to the law was L.E. Allen, who built on the Hofheldian conceptualisation of legal relations as a model for representing the deontic structure of norms [25]. Similarly, McCarty proposed a representational formalism for the law which despite not being an ontology embodies a general conceptual model of the legal domain, based on a compositional syntax and well-defined semantics and inference mechanism [26], [27].

Later on a variety of core conceptualisations of the law have been proposed explicitly as ontologies. Among them we can at least mention the following seven: FOLaw [28]; Frame Based Ontology [17]; Ontology of causality [29], [30]; Applied Legal Epistemology [31]; LRI-Core [32], [33]; Core Legal Ontology [6]; LKIF-Core [34].

Some of them take a more epistemological approach by representing the categories of legal knowledge (for instance, FOLaw and Applied Legal Epistemology); some others represent just a fragment of the basic conceptual blocks of the law (such as the Ontology of causality); some others put an emphasis on building an actual ontological representation of the law distinguished from its epistemological component (LRI-Core); and still some others try to ground a core legal conceptualisation on a sound

[3] The BGB (German Civil Code) has actually been criticised for embodying an abstract system of private law, in accordance to the conceptual apparatus built by the pandectists rather than a system adapted to actual conditions of life in society [20].

[4] In late XIXth century legal discourse the adjective 'logic' was used to characterise something analytical, clear, ordered, not contradictory, but by no means included a precise reference to the properties of modern symbolic logic.

[5] Some other legal scholars had already lingered on the clarification of the concepts of rights and duties for a while (see for instance [19], [23], [24]).

philosophical scheme (such is the case of CLO, an extension of the DOLCE foundational ontology which draws inspiration from cognitive science studies and from traditional philosophical categories, such as *endurants* and *perdurants*). Nevertheless, even if core legal models are already there, a current issue is still how to connect those language-independent models with actual textual manifestations, so that beyond philosophical accuracy those abstract conceptual models support concrete applications. Following this line, this paper explores the issue of the missing bridge between conceptual core legal notions and their linguistic expressions as presented in legal texts.

4 A FrameNet Resource for the Legal Domain

Amongst the various existing kinds of lexical resources, we have chosen the FrameNet project model [35] (hereafter referred to as FN) to ground our study. We believe that the organization principles underlying the FN lexicon can adequately represent events and situations typically expressed in legal documents.

As a matter of fact, in the legal knowledge modelling community, it is pointed out the need for *capturing and handling all possible stereotypical situations distinguished by law* [36]. Thus, the importance of taking into account the **context** where legal entities move is acknowledged. Accordingly, legal experts state that, despite their utility, WordNet-like resources are not completely satisfactory in order to represent the inner structure of complex situations in terms of their participants, e.g. "under which *Circumstances*, which *State of affairs* is sanctioned by which *Principle*". In fact, in the WordNet (hereafter referred to as WN) model [37], words are organized in *synsets* (i.e. sets of synonyms) in turn linked by hierarchical or taxonomical relations such as hyponymy and hyperonymy. Under this view, the meaning of a word is intended as a distinct, atomic semantic object, fully identified by its position in the general semantic network.

4.1 The FrameNet Project

The FN resource considered here is a lexical resource for English, based on Fillmore's *Frame Semantics* theory [38] and supported by corpus-evidence. The goal of the FN project is to document the range of semantic and syntactic combinatory possibilities of each word in each of its senses. Typically, each sense of a word belongs to different Semantic Frame, conceived in «a script-like conceptual structure that describes a particular type of situation, object or event along with its participants and properties». For example, the APPLY_HEAT frame describes a common situation involving participants such as "Cook" and "Food", etc., called Frame Elements (FEs), and is evoked by Lexical Units (LUs) such *bake, blanch, boil, broil, brown, simmer*, etc. As shown by the following example, the frame-evoking LU can be a verb (bolded in the example) and its syntactic dependents (those written in subscript) are its FEs: [Matilde $_{\text{COOK}}$] **fried** [the catfish $_{\text{FOOD}}$] [in a heavy iron skillet $_{\text{HEATHING\_INSTRUMENT}}$]. FN currently contains more than 800 Frames, covering roughly 10,000 Lexical Units; these are supported by more than 135,000 FN-annotated example sentences.

The type of representation produced by FN is a network of "situation-types" (frames) organized across inheritance relations between Frames (frame-to-frame relations), as opposed to a network of meaning nodes, as in the case of WN. In FN, Frame Elements can be also specified with Semantic Types (i.e. ontological categories) employed to indicate the basic typing of fillers that are expected in the Frame Element. Most of these semantic types correspond directly to synset nodes of WN, and can be mapped onto already existing ontologies. The latter is the case of [39], who developed a semi-automatic approach for linking FN Frame Elements to the Suggested Upper Merged Ontology (SUMO)[6] [40] classes.

4.2 Towards a FN-Like Resource for the Legal Domain: The General Approach

It should be noted that the case-study presented in Section 5 is part of a broader project which we are currently carrying out. It is aimed at developing a FN-like resource specialized for the legal domain, by extending and refining the general purpose FN resource.

To our knowledge, the most notable example of legal-domain specialization of an open-domain lexical resource is represented by the JurWordNet ontology-driven semantic lexicon [41], developed for the Italian language, together with its multilingual extension LOIS [42]. Note that both JurWordNet and LOIS have been developed following the organization principles underlying WordNet model. However, legal experts claim that, despite its utility, the taxonomical organization of legal concepts is not the only possible one. This is the reason why we faced the need for building a lexical resource initiated from the organization principles underlying the FN model. A detailed description of a number of design issues encountered so far is provided in [43].

5 A Case Study

In the first phase the modelling activities were directed to achieve two distinct and independent tasks, namely:

a) testing the expressiveness of the Framenet model in capturing the deontic modalities in legal statements.

b) testing the possibility of building complex legal concepts from the Basic Hofheldian positions.

The second step was devoted to the main goal, i.e. is to combine the two conceptualizations in order to evaluate how far the lexical manifestations of normative position are from the abstractions of legal theory. This goal, as explained above, is of interest not only from a purely methodological point of view, but also in the light of building tools and framework for interfacing lexical and formal models in order to support practical applications.

Following this idea, we have built on the conceptualisation of the legal notion of public function, a fragment of an 'ontology of public services' (which can be viewed as the 'operative' expression of the notion of public function) and we have evaluated how

[6] http://www.ontologyportal.org/

mapping frame elements to ontological class could at the same time enrich the ontological representation and support the process of linguistic knowledge acquisition.

In order to investigate how domain-specific knowledge is differently represented from a linguistically-oriented and from a domain-oriented point of view, we carried out a case-study by comparing a FN-style and an ontological characterization of the 'obligation' Fundamental Legal Concept. As domain for the case-study we have chosen the European norms on consumer protection and the Italian regulations on car tax payment. The two corpora have been analysed in order to annotate suitable examples for testing how the 'obligation scenario' is defined in the FN resource (see Section 5.1). The concept of 'public function', formally modelled starting from the 'obligation' normative position (see Section 5.2) and the derived ontology (see Section 5.3) mainly rely on the taxation norms. In Section 5.4, we suggest an example for linking the two differently-grounded views.

5.1 A FrameNet-Style Description of the 'Obligation' Scenario

In order to provide corpus-evidence of how the 'obligation scenario' is defined in terms of Semantic Frames, we have analysed some sample sentences taken from two different corpora, i.e. a corpus of European Directives on consumer protection and a corpus of Italian and regional regulations on car tax payment domain. Considering two document collections containing texts which regulate two different domains is made fundamental in order to verify that the semantic (conceptual) representation of deontic modalities is domain independent. Moreover, this approach can be suitable to highlight different linguistic realizations of the same deontic semantics.

The study we conducted concerns:

- the selection of which Semantic Frames fully characterize 'obligation';
- the study of the frame-to-frame relations, such as *Inheritance*, *Using*, *Causative_of*, *Perspective_on*, etc., between the selected Semantic Frames, as modelled in the general FN;
- the annotation of some sample sentences containing frame-evoking Lexical Units (e.g. *must*, *obligated*, etc.) with frame information.

According to [35], the frame-to-frame relations are inheritance and «directed (asymmetric) relation[s] between two frames, where one frame (the less dependent, or more abstract) can be called the Super_frame and another (the more dependent, or less abstract) can be called Sub_frame». Figure 1 shows a portion of the net drawn by those relations that link Semantic Frames expressing 'obligation'. Interestingly enough, this deontic modality is seen under different views. For example, the *Perspective_on* relation provides two different perspectives on the non-lexical (with no frame-evoking lexical units) OBLIGATION_SCENARIO frame. The one is offered by the BEING_OBLIGATED frame which represents an obligation situation focusing on the 'Responsible_party' which is required to perform some 'Duty', as shown in the following sentences[7]:

[7] In these and in the following examples the frame-evoking Lexical Unit is bolded; the textual span instantiating the Frame Elements is in squared brackets. It should be noted that the first examples are taken from the corpus of European Directives on consumer protection and the second one from the corpus of Italian and regional regulations on car tax payment domain.

[Unless the parties have agreed otherwise CONDITION], [the supplier RESPONSIBLE_PARTY] **must** [execute the order DUTY] [within a maximum of 30 days from the day following that on which the consumer forwarded his order to the supplier TIME]. (Dir. 97/7/CE, art.7)

[gli autoveicoli adibiti al trasporto del latte, delle carni macellate fresche, delle immondizie e spazzature, dei generi di monopolio e i carribotte per la vuotatura dei pozzi neri RESPONSIBLE_PARTY] **sono soggetti** [al pagamento della tassa sulla portata, ridotta del 50% DUTY] (art. 22. legge 21 maggio 1955, *n.* 463) (lit. [vehicles used to the transport of milk, of fresh slaughtered meats, of garbage and rubbish, of monopoly provisions and liquid manure spreaders used to empty cesspools RESPONSIBLE_PARTY] **are subject** [to the payment of carrying capacity tax, reduced of 50% DUTY])

The other perspective is offered by the the BEING_OBLIGATORY frame which conversely describes the situation from the 'Duty' point of view which needs to be fulfilled by a 'Responsible_party', as the following sentences exemplify:

[This Regulation DUTY] **shall be binding** in its entirety and directly applicable in all Member states. (Reg. (CE) n. 522/96)

[La tassa di circolazione regionale DUTY] **è dovuta** [in misura fissa CONDITION] [per anno solare TIME] (lit. [The local circulation tax DUTY] **is due** [in permanent measure CONDITION] [per calendar year TIME])

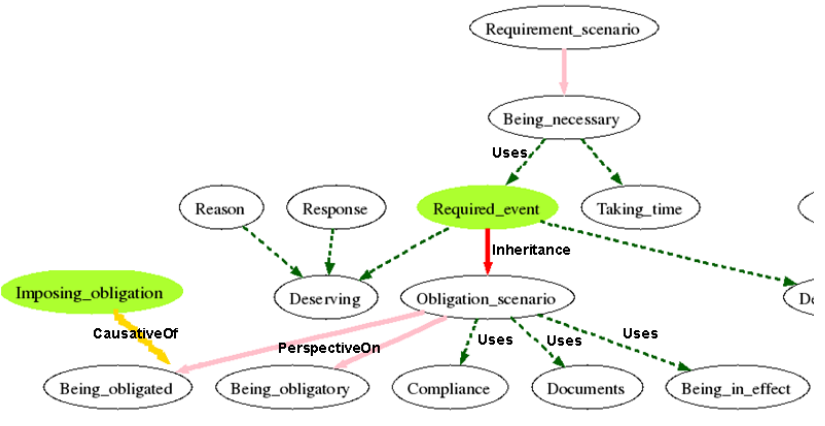

Fig. 1. Some of the relations that link Semantic Frames expressing 'obligation'[8]

[8] The net has been visualized through the FrameGrapher tool available at http://framenet.icsi.berkeley.edu/FrameGrapher/

Moreover, the *Causative_of* relation by linking the IMPOSING_OBLIGATION and the BEING_OBLIGATED frame puts the focus on the situation offered by the IMPOSING_OBLIGATION Frame. Figure 2 reports how this Frame is shown in the FrameNet resource. Firstly, the *Definition* of the Frame describes in details the situation-type framed. Some few examples follow. Secondly, the Frame Elements (FEs) are listed, distinguishing between *Core*, i.e. compulsory to uniquely pinpoint the IMPOSING_OBLIGATION Frame (e.g. 'Duty', 'Obligator', etc.), and *Non-Core*, i.e. optional (e.g. 'Condition', 'Time', etc.). It should be noted that for each Frame Element a short description and a sample sentence are reported. The Frames linked to the IMPOSING_OBLIGATION Frame by one of the listed Frame-to-Frame relations are reported (e.g. the IMPOSING_OBLIGATION Frame *Is Causative of* the BEING_OBLIGATED Frame since they are linked by a Causative_of relation). Finally, the list of frame-evoking Lexical Units are shown (e.g. *bind.v, charge.n,* etc.)[9]. Interestingly, the focus is put on the presence of an 'Obligator' who imposes on a 'Responsible_party' a 'Duty', according to a 'Principle' which regulates how the 'Responsible_party' should respond to a 'Situation', as the following sentences show:

> [Article 3 of Directive 79/112/EEC PRINCIPLE] **made** *it* **mandatory**, [in the labelling of beverages containing more than 1,2 % by volume of alcohol CONDITION], [to indicate the actual alcoholic strength by volume DUTY] (Dir. 87/250/CEE)

> Visto [l'articolo 8 della legge regionale 23 settembre 2003, n. 23, "Disposizioni in materia di tasse automobilistiche" PRINCIPLE_ANT][10], [il quale PRINCIPLE_REL] **dispone** [l'assoggettamento alla tassa di circolazione DUTY] [per le autovetture ed i motoveicoli che abbiano compiuto 30 anni dalla costruzione RESPONSIBLE_PARTY] (lit. Considering [article 8 of the regional law 23rd September 2003, n. 23 "Provisions about car tax" PRINCIPLE_ANT], [which PRINCIPLE_REL] **provides** [the subjugation to the circulation tax DUTY] [for what concerns vehicles and motorcycles 30-year old from the construction RESPONSIBLE_PARTY)

The *Using* relation between REQUIRED_EVENT and the BEING_NECESSARY frame implies that a part of the scene evoked by the Sub_frame (i.e. the REQUIRED_EVENT frame) refers to the Super_frame (i.e. the frame). Namely, a more abstract situation where "a 'Dependent' state-of-affairs has a 'Requirement' as a prerequisite for obtaining or occurring", is specifically referred to a less abstract situation where "unless a particular 'Required_situation' obtains, 'Negative_consequences' will follow.". Examples of the BEING_NECESSARY frame are provided in the following sentences:

> [The labelling REQUIREMENT] **shall** [convey information relating to the three parts of the footwear as defined in Annex I, namely … DEPENDENT] Dir. 94/11/CE, art.1, par.2

[9] Note that each frame-evoking Lexical unit is followed by the corresponding part-of-speech, i.e. verb, noun, etc.

[10] In this example both the antecedent of relative pronoun (i.e. the article 8…) and the relative pronoun (i.e. which) are annotated as instantiation of the 'Principle' Frame Element.

> Infatti, [come prescritto dall'art. 11 della legge 27 luglio 2000, n. 212 CONDITION] e [come ampiamente illustrato nella Risoluzione n. 1/Uff del 23 gennaio 2002 CONDITION], [le procedure di interpello DEPENDENT] **devono** [essere istruite dall'ente impositore REQUIREMENT], [nel caso di specie dalla regione cui è affidata la gestione del tributo REASON]. (lit. [As it is prescribed by art. 11 of law 27th July 2000, n. 212 CONDITION] and [as broadly showed within the Resolution n. 1/Uff of 23rd January 2002 CONDITION], [the summoning procedures DEPENDENT] **must be** [instructed by the assessing body REQUIREMENT], [in this case by the region keeping the duties REASON].

In particular, the frame-to-frame relations link one or more single Frame Element(s) of the two considered Frames. As Figure 3 visualizes in detail, it follows for example from the *Using* relation that the 'Required_situation' Frame Element of the BEING_NECESSARY frame is dependent on the more abstract 'Requirement' Frame Element of the REQUIRED_EVENT frame. This relation highlights a link between the 'Dependent' *state-of-affairs which cannot hold without the 'Requirement'* within the BEING_NECESSARY frame and the 'Explanation', i.e. *the reason why the 'Required_situation' is necessary*, in the REQUIRED_EVENT frame.

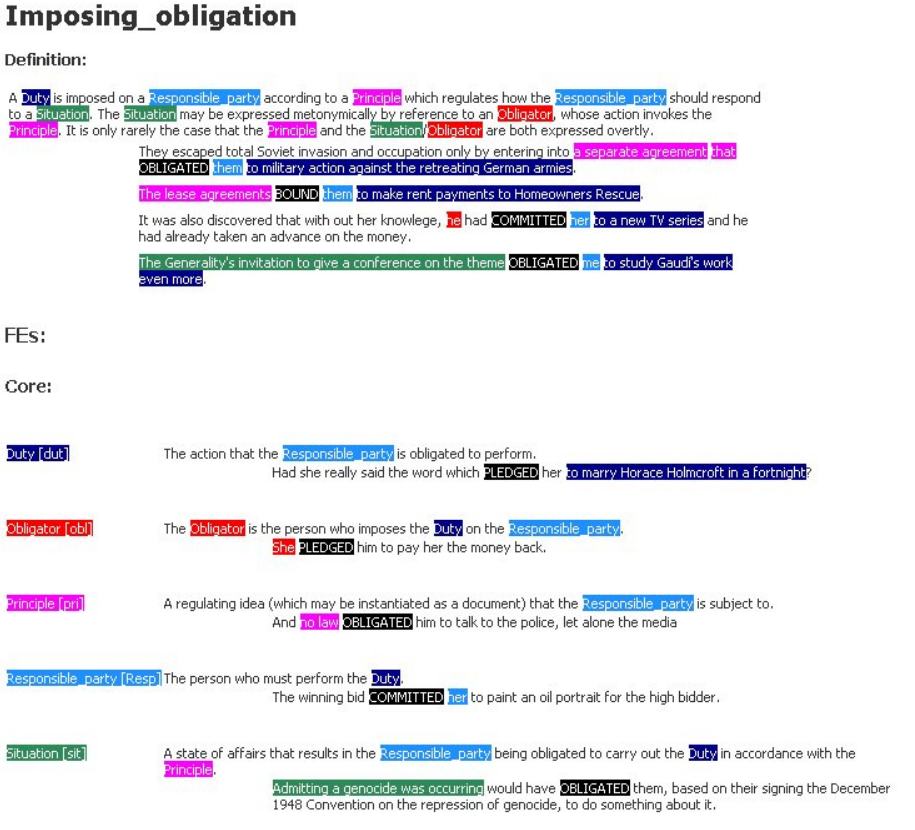

Fig. 2. The Imposing_obligation Frame

Non-Core:

Condition [con] This FE indicates the Condition under which the Responsible_party is obligated to perform the Duty.

Manner [man] Any holistic description of the details of the action, either comparing to another event or describing the action in terms of characteristics of the Obligator that affect the action holistically.
You COMMITTED me to this maliciously !

Means [mea] An event which brings about the obligation.
She did n't understand that she OBLIGATED me to stay by always getting in trouble .

Place [pla] A location in which the Responsible_party has a specified Duty .
Semantic Type
Locative_relation
At Dayton, the parties OBLIGATED themselves to respect and promote fulfillment of the annexes.

Purpose [pur] The state-of-affairs that the Obligator hopes to bring about by imposing the obligation.
She PLEDGED him to work on the project just to get him out of her hair .

Time [tim] The time interval during which the Duty is imposed on the Responsible_party by the Obligator or the Situation.
Semantic Type Time
The City Council then OBLIGATED themselves to have the sewers made ready and the streets leveled off without any additional cost to the Sisters.

Inherits From: Transitive_action
Is Inherited By:
Subframe of:
Has Subframes:
Precedes:
Is Preceded by:
Uses:
Is Used By:
Perspective on:
Is perspectivized in:
Is Causative of: Being_obligated
See Also:

Lexical Units

bind.v, charge.n, charge.v, commit.v, obligate.v, pledge.v, require.v

Fig. 2. (*continued*)

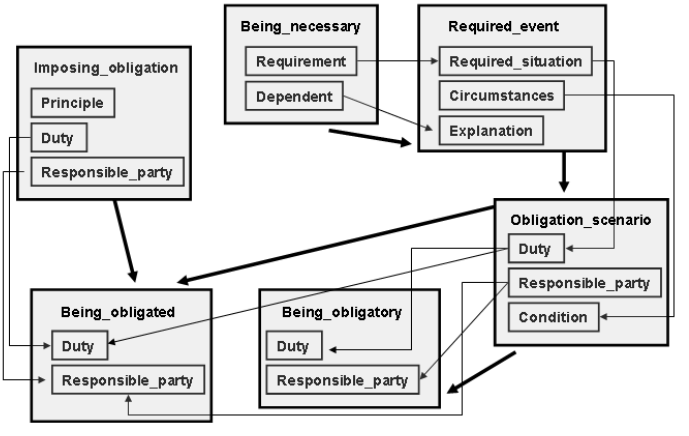

Fig. 3. Some of the FE-to-FE relations

Moreover, the *Causative_of* relation, which links the Super_frame IMPOSING_OBLIGATION and the Sub_frame BEING_OBLIGATED, results in a relationship between the 'Duty' imposed on a 'Responsible_party' within an IMPOSING_OBLIGATION situation and the 'Duty' which the 'Responsible_party' must perform within the BEING_OBLIGATED situation. Interestingly enough, as it will be described more in detail in Section 5.2, such a *Causative_of* relation between the two considered frames is similar to the domain-oriented (ontological) relationship between public bodies and citizens. Namely, similar to the fact that when a 'Principle' *imposes an obligation* on a 'Responsible_party' he/she is *obligated* to perform an action, when a public body *imposes* a duty on citizens they are *obligated* to perform such a duty.

5.2 A Formal Characterization of the Concept of 'Public Function' and of 'Fiscal Function'

The notion of public function has been defined by legal doctrine as the subjective situation of the public body which has a power directed to the satisfaction of objective interests of someone else [44]. Following the formalisation of fundamental legal concepts proposed in [4] we can distinguish:

On the one hand, the notion of *obligation*[11] (since the power exists in the interest of citizens):

O_x Bring (Z): (obligation of *x* of bringing about a certain state of affairs *Z*)

On the other hand, the notion of power:

Pow_x Bring (Z) (power of *x* of bringing about a certain state of affairs *Z*)

A particular subclass of public function is the function of burdening citizens with taxes in order to collect the economic surplus and meet social public needs. Similarly, thus, this function is composed of:

Firstly, the power of imposing the obligation on citizens of paying taxes, which corresponds to the power of creating norms that create an obligation for certain people:

Pow_{State} [Bring ($Obl_{citizens}$ (pay.taxes))] (power of the *state* of bringing about the state of affairs in which *citizens* have the obligation to pay taxes)

Secondly, the obligation of creating these norms:

O_{State} [Brings ($Obl_{citizens}$ (pay.taxes))] (obligation of the state of bringing about the state of affairs in which citizens are obliged to pay taxes)

And thirdly, the obligation of ensuring the fulfillment of the obligation created by the norm:

O_{state} [Brings ($pay.taxes_{citizens}$)] (obligation of the state of bringing about the state of affairs in the world in which citizens pay taxes)

These concepts together with the conceptual framework of the ontology of services suggested in [10], provide the main building blocks for the ontology of fiscal function that we present in the following section.

[11] Formalised in [4] as "Obl $Does_j$": it is obligatory that *j* does something, and "Obl $Brings_j$": it is obligatory that *j* brings it about that something happens.

5.3 The Ontology of Fiscal Function

In the ontological characterisation of services, as reported in [10] "at the core of any service there is a *commitment* situation in which (the *service provider*) guarantees the execution of some kind of *action(s)* in the interest of somebody who agrees (the *service customer*), at a certain cost and in a certain way. This action is executed by the *service producer,* who may coincide with the *service provider*, may be somebody else delegated by the service provider, or even coincide with the service customer [...] service commitment needs to be distinguished from *service content,* which concerns the kind of action(s) the provider commits to guarantee, and service process, which is a set of business processes implementing the service commitment".

In the classification of services an important distinction is between public and private services, which is connected to the delegation of the commitment situation and to the transferability of responsibility in performing the services. This is related to the understanding of services as comprising different levels of responsibility. On the one hand, the obligation of guaranteeing the delivery of the service exists; on the other hand, the obligation of actually delivering the service by performing a set of actions exists. The difference between public and private services lies on the fact that whereas in the case of private services both obligations are transferable, in the case of public services they are not. The public administration committed to guarantee a certain service will always maintain the responsibility of ensuring the delivery of that service towards the citizen (and could thus be held liable in case it was not delivered), even in the case it has delegated the actual delivery of services (actual production of the service) to a third party. Thus we assume that, in public services, the commitment situation is the expression of public function, i.e. both the obligation of public bodies to guarantee the service (for instance to ensure, that tax payers perform their duty) in the general interest of citizen, and their related power to enact norms on which the obligation is grounded. (note the similarity with the *causative_of* relation that in Framenet links Imposing_Obligation with Being_obligated).

For the purpose of our model, the service ontology provides us with the framework on which building the ontology:

- the *commitment situation*, expressed by the formalization of the notion of fiscal function. Since fiscal function must be performed in the benefit of citizens, the previous formalization in terms of power and obligation can be reformulated according to the formalisation of other-directed obligations suggested by [4]: $\mathrm{Obl}^{k}\ \mathrm{Does}_{j}$ A (it is obligatory toward *k*, that *j does* A).

$O_{State}^{[citizens]}$ [Brings ($Obl_{citizens}$(pay.taxes))] Obligation of the *state*, in *the interest of citizens*, of creating norms that obligate to pay taxes:

$O_{State}^{[citizens]}$ [Brings ($pay.taxes_{citizens}$)] Obligation, *in the interest of citizens*, of ensuring that taxes are paid.

A particular instantiation of the previous model corresponds to car taxation. In this concrete domain the fiscal function can be translated into an obligation of the state of imposing the obligation of paying taxes to those persons who own a car:

$O_{state}^{[citizens]}$ [Brings ((owns.car$_x$)→ Ob (pay.taxes$_x$)] Obligation of the State, in the interest of the citizens, of bringing about the state of affairs in the world in which if a citizen *x* owns a car, then citizen *x* is obliged to pay taxes.

- a set of legal roles: in the taxation scenario citizen are at the same time services customer and tax-payer; public bodies are both agents empowered to impose obligations and services providers committed to ensure that the obligations are fullfilled
- the class Action in the ontology subsumes not only the *service content,*i.e., the set of activities performed in order to execute the service, (e.g. charging, controlling, sanctioning,etc.), but all actions due to fullfill the obligations: due to the well known limited expressiveness of Description Logic the operator Bring(Z) is represented introducing a CoercitiveAction class that reifies such a relationship [45]. The notion of Power and Obligation of a PublicBody can then be expressed through binary relations hasPowerOver and hasObligationTowards some CoercitiveAction of which for instance ObligationToPay is a subclass. In a similar way the ObligationToPay class reifies the complex relation of Obligation for Citizens to PayTaxes by putting in relation the corresponding classes Citizen and TaxPayment.

A fragment of the ontology is reported in Figure 4.

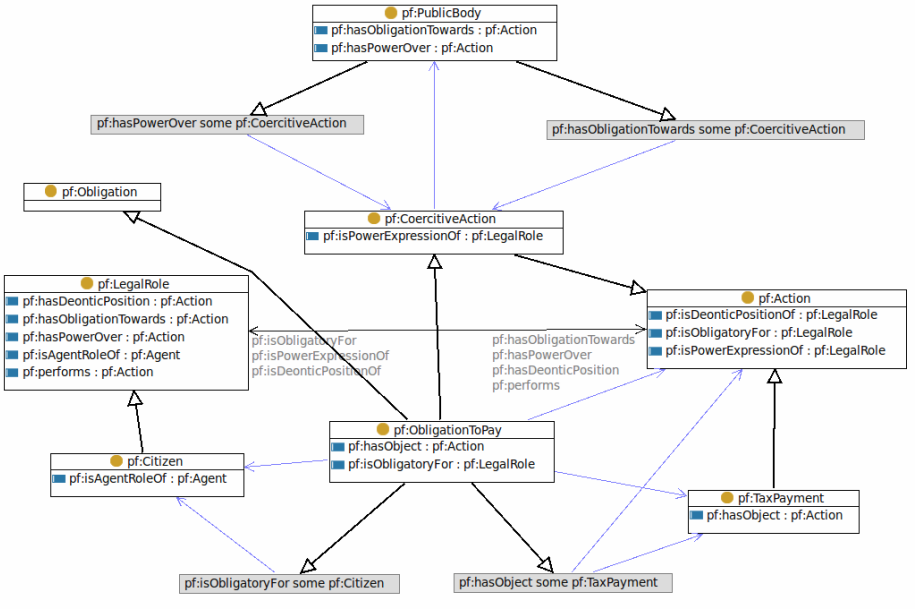

Fig. 4. 'Public function' ontology

5.4 Linking a FrameNet-Style Knowledge Description with the Corresponding Ontological Characterization

Figure 5 sketches out how the textual content represented in a FrameNet-style description can be linked with the corresponding ontological characterization described in Section 5.2. In fact, it is possible to map each Frame Element, belonging to a given Frame and instantiated in a given sentence, to the corresponding class of the provided ontology. For example, given the following sentence, i.e. "Citizens are **obligated** to pay taxes", evoked by the (*are*) **obligated** Lexical Unit, the FE "Responsible_party" (i.e. *citizens*) belonging to the BEING_OBLIGATED frame can be mapped to the "LegalRole" class; and, the "Duty" (*pay taxes*) can be mapped to the "Action" class.

Interestingly enough, the example provided in Figure 5 shows a potentiality of our approach. The FN-style knowledge organization allows to consider the basic 'obligation' normative position from a number of different points of view. Accordingly, it should be noted that even though the two considered sentences (i.e. "Citizens are **obligated** to pay taxes" and "Article 18 **provides subjection** to the payment of circulation tax owners of vehicles") respectively evoke two different frames, i.e. the BEING_OBLIGATED and the IMPOSING_OBLIGATION frame, their Frame Elements can be both mapped to the same corresponding class in the ontology. Thus, both the "Responsible_party" belonging to the BEING_OBLIGATED frame (i.e. *citizens*) and the "Responsible_party" belonging to the IMPOSING_OBLIGATION frame (i.e. *owners of vehicles*) are mapped to the same "LegalRole" class.

Moreover, we foresaw a second level of mapping. It concerns the linking of the lexical filler which instantiates a given Frame Element with a sub-class of the ontology. As shown in Figure 5, the lexical filler *citizens* of the Frame Element "Responsible_party" is mapped to "Citizen" sub-class of the "LegalRole" class; and, *pay taxes* instantiation of the FE "Duty" is mapped to "TaxPayment" sub-class of the "Action" class.

The mapping suggested in Figure 5, only sketched here to give an idea of the whole picture, assumes that a formalization of the FrameNet model in terms of an OWL-DL metamodel such as the OWL version of OntoFrameNet [46] is used.

According to the OntoFrameNet model `Frame`, `FrameElement` and `LexicalUnit` are conceived as classes. Thus the linking of `FrameElement` with a class of the domain ontology is provided by the objectProperty `hasSemanticType`. Frame Elements are then mapped to classes of the domain ontology by linking their Semantic Types with the most specific ontology class in order to enforce the most possible constrained meaning which is useful for semantic parsing purposes.

Similarly the mapping at the Lexical Unit level requires a formalization scheme such as the one introduced in [1] where a mapping between concepts at the ontological level and their possible lexicalizations at the lexical level is formalized introducing the properties `hasLexicalization` ↔ `isLexicalFormFor` between concepts and their lexicalizations.

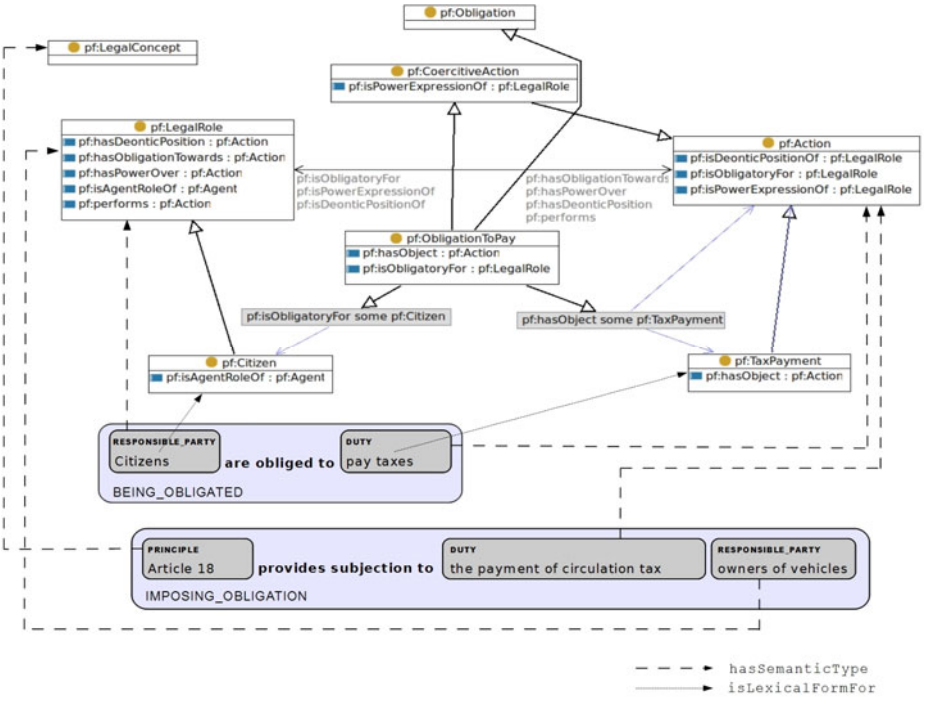

Fig. 5. Mapping Frame Elements to ontology classes

6 Conclusion and Future Directions of Research

This paper was meant to explore evidence for bridging an ontological and a linguistic characterization of Fundamental Legal Concepts. In particular, we carried out a case-study aimed at investigating i) how the 'obligation' Fundamental Legal Concept is differently represented in the FrameNet resource, in terms of Semantic Frames, and ii) how the concept of 'public function' stemmed from the 'obligation' Fundamental Legal Concept can be ontologically characterized. In the latter case, we proved how it is possible to build complex concepts (e.g. the concept of 'public function') by drawing upon a basic normative position (e.g. 'obligation').

Several issues worth discussing follow from this investigation. Firstly, they concern the opportunity offered by the FN-style knowledge organization to consider the basic 'obligation' normative position from a number of different points of view. Interestingly, that affects our proposed mapping approach. This implies that more than one Semantic Frame instantiated in different sentences can be mapped to the same ontology class. Secondly, the case-study pointed out two possible layered approaches to the linking of a linguistic-oriented with a domain-oriented way of modelling the basic 'obligation' normative position. As shown in Section 5.3, the mapping can be carried out at the Frame Element level or at the level of their lexical fillers, respectively linking them to more general classes or to their specializations, providing further constraints on the lexicalization of the involved concepts.

A number of future directions of research can be foreseen. They concern, for example, the use of machine learning techniques to successfully extract semantic structures concerning prescriptive qualifications of facts, in terms of legislative provisions. These semantic structures can be further mapped [47] to FrameNet with the aim of specializing already existing Semantic Frames. An example of a possible methodology which can be followed is reported in [48].

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