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Closing the Awareness Gap Between IT Practice and IT Law

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Abstract. Some of the ordinary activities of IT practitioners require a certain degree of knowledge of IT law. Assuming these professionals will acquire legal knowledge better if expressed in terms familiar to them, this Chapter explores different manners of organising and presenting legal knowledge for its better cognition by IT professionals. This proposal features data models and knowledge organisation rooted in the specific legal theory of critical legal positivism of Kaarlo Tuori. It has been evaluated with an experiment, where BSc students in Computer Science have been provided with models and reference material describing the EU legislation on cookies, and have been asked specific questions. In sight of the new theoretical framework and the experiment results, we postulate that models and ontologies can bridge the knowledge gap and serve as lingua franca between the legal and the IT profession.

Keywords. legal knowledge, critical legal positivism, cognition of law, semi-formal models

1. Introduction

A model is a representation of a reality, an abstraction, a simplification, a depiction. Modelling law can be a necessity for a number of reasons: legal drafting, analysis of court cases, development of computer programs implementing or enforcing law, teaching law [1]. This Chapter discusses the pros and cons of using formal or semi-formal models for representing the law with didactic purposes, specifically when introduced to IT practitioners.

The use of ontologies and semi-formal models in education environments is not new [2]. Semantic Web Technologies have been used for e-Learning [3], to align curriculum and syllabuses with learning objectives [4] or to support adaptive learning [5]. This work proposes their novel application to the legal domain – which has its own idiosincracy – and addressing a specific collective – IT experts. The contribution of this Chapter revolves around the two proposed ideas: (i) that this target group is likely to understand better UML diagrams and related documentation and (ii) that legal knowledge representation must consider a theoretical framework and lean on a rich tradition: languages and methods for software and ontological engineering make explicit an idea that has been traditionally part of legal thinking, the idea that legal concepts have a structure and are linked one to another [6].

We engage Tuori's critical legal positivist theory [7], which conceives law as a multi-layered phenomenon, as a feasible way to pre-conceptual modelling[1]. Tuori refers to an 'upper level' concerned with legislative acts and case law, a "middle level, mediating level in the law" related to the practical knowledge which lawyers and judges require to interpret the law, and finally at the 'lower level', or the 'deep structure' of law, a compendium of the most basic principles and habits of mind by which we think and argue about the law. Critical legal positivism acknowledges the two faces of the law: "on the one hand, the law is a symbolic normative phenomenon, and on the other hand, it can be defined as a set of specific social practices". This Chapter assumes that one interesting mapping from a pragmatic point of view is that of the mediating legal culture level, where concepts have a cultural existence even for laymen.

Some of these legal concepts must be apprehended by IT professionals who need to comply with the applicable legislation in their daily activity, but do not have the time or the background to learn about law[2]. We contend that the intermediation of semi-formal models and their derived diagrams and schemas are helpful towards improving the legal literacy of IT professionals, contributing to decrease the number of unintended law breaches.

As a case study, this work considers the legal regime on cookies as sample of the domain of IT law. Models and associated reference material meant to be employed by human users to learn this subject will be designed and presented. We pretend to assess the effectiveness of ontologies and Unified Modelling Language[3] (UML) as representations of IT law to cover the legal knowledge needs of IT practitioners. Are UML models and derived documentation suitable to teach the domain of IT law to an audience of non-legal experts? In order to answer this question, this Chapter is organised as follows. Section 2 frames the work first, describing the theory of critical legal positivism. Section 3 describes the methodology followed, both for creating the models and for evaluating their didactic aptitude. Section 4 describes the metamodel created for this project in the context of the state of the art of legal ontologies. Finally Section 5 presents the UML model of the EU legal regime on cookies resulting from this project and the experiment designed for its evaluation.

2. Framework: Critical Legal Positivism

Epistemology is a branch of philosophy that deals with the questions of "How do we know that we know?" Because our endeavour aims at providing legal knowledge to non-legal experts, we can ask from an epistemological perspective how do we know that non-legal experts understand what is a right, an obligation, a norm, a doctrine and all the concepts implicit in law that lawyers learn the hard way through their legal education.

[1] Tuori's contribution tries to reconcile the public civil law approach with the realist socio-legal one, the rule of law with the European *Rechtsstatt*, cfr. [8]. Tuori [9] has pointed out his starting critical stance: "[...] how can the law limit and discipline the exercise of state power, if the law itself emanates from this very state power, as it according to the dominant positivist understanding does?".

[2] Sometimes they are not even fully aware, as demonstrated by the Deloitte 2016-2017 CIO survey, where 'Governance and compliance' was only chosen in 6th place by CIOs as one of the organisational capabilities for success.

[3] http://www.omg.org/spec/UML/2.5/.

As posited by Valente and Breuker [10], "the perspectives and conceptualizations used in Legal Theory have the advantage of having been discussed and debugged in the course of years, for a research community whose work is centered on these problems. For the AI & Law community to create or use ontologies without regard to Legal Theory is a certain path to reinvent the wheel". In their article, the authors propose a review of the ontological views about the legal order from the perspectives of the main legal theories. Legal positivism describes the legal order as characterized by its formal normative sources, as opposed to the legal realism which focuses instead on "what happens in Court". A third avenue would be focusing on the legal discourse.

Following the dominant positivist approach, the authors ([10], p. 143) take as reference the works of Hart, Kelsen, Bentham or Hohfeld and their respective theories of norms; "because legal knowledge is closely associated to the formal sources of law (statutes, jurisprudence, etc.), ontologies of law may adopt (and frequently do so) as a phenomena not the legal phenomena in legal practice but these sources". Other work on legal theory, sources of law and semantic Web, by Alexander Boer [11], has also approached the legal order via the intermediation of taxonomies of legal norms, distinguishing between legislative acts, institutional rules, constitutive rules and normative rules. We subscribe to the position of Boer who concludes, his PhD thesis ([11], p. 271) with the acknowledgement that sources of law are only "indirect, incomplete and approximate representation of the normative order", and discounts the direct relation (or isomorphism) between formal normative sources and the legal order. This comprehensive approach is shared by cognitive [12] and socio-legal [13] approaches to legal ontologies. Rinke Hoekstra has shown both the need and difficulty of knowledge representation and design patters in ontology reengineering [14].

The domain of IT law has a number of characteristics against a conception of such an isomorphism between the sources of law and the legal order. Indeed, a dualistic separation between the world of 'is' and the world of 'ought' would fall short of explaining practices which are typical of the domain of IT law and which blur this strict ontological duality. We are referring for example to the practice of self-regulation, which is widespread in the IT sector, the interplay between technology and law so relevant for the question of regulability [15] or the atypical involvement of online intermediaries in enforcement as regulatory gatekeepers [16].

The domain of IT law is also characterized by its very low contentious nature and scarce volume of judiciary decisions – in our case, there are very few cases reported on cookies[4]. As a matter of fact, the level of contentious resolutions of conflicts is very low in the IT domain compared to other branches of law, and parties usually prefer to turn to other conflict resolution methods such as more discrete and predictable Alternative Dispute Resolution solutions [17].

Parting from the positivist normative definition of Law, our work preliminary employs the conception of the *legal order* proposed by Kaarlo Tuori, which combines positivism and legal practice and takes the very structure of the legal order as the defining criteria of law. Tuori's critical positivist theory conceives law's structure as partitioned into three clearly defined layers [7]. The *surface* layer consists in the symbolic normative order made of rules and principles. The *intermediate layer* refers to the legal culture as the practical legal knowledge (or practical consciousness) that legal experts (e.g.,

[4] An example is represented by the 2017 Annual Report of the French Data Protection Authority.

lawyers, among other legal professions) acquire through education and practice and require to participate in legal community. Finally, the *deep structure of law* also refers to practical knowledge, even if usually subconscious to legal actors. Figure 1 summarizes the perspective of the legal order that will serve as theoretical framework for our models of IT law.

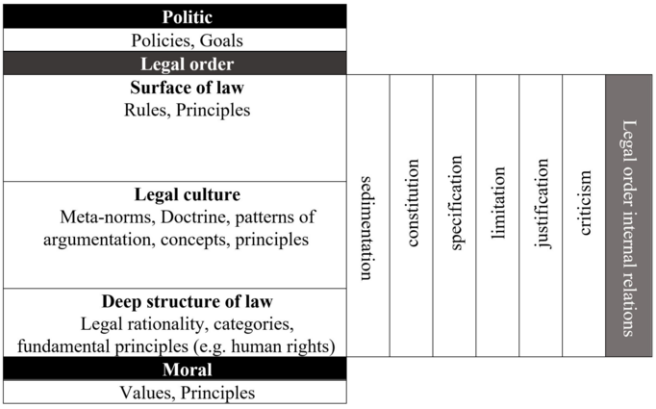

Figure 1. Critical legal positivism epistemological framework

3. Methodology

3.1. Methodology and Toolset for Knowledge Representation

The enterprise at hand is one of knowledge representation, a description of the objects, concepts, rules and relations that exist in the domain of IT law. Because it is impossible to represent law in all of its details, this implies a level of conceptualization and abstraction. For that purpose, the discipline of knowledge engineering has borrowed from philosophy the notion of ontology, which in Philosophy means an account of Existence. Knowledge engineers create computer ontologies to specify conceptualizations of specific domains [18]. From this point of view, there are some differences between philosophical and computational ontologies: "we refer to an ontology as a special kind of information object or computational artifact (...) the account of existence in this case is a pragmatic one: For AI systems, what 'exists' is that which can be represented. Computational ontologies are a means to formally model the structure of a system, i.e., the relevant entities and relations that emerge from its observation, and which are useful to our purposes" [19].

Soon after computer ontologies were developed first in the early 90's, routine procedures for their definition were given. The ontologist's work was systematically analyzed, and the new discipline of Ontology Engineering was born.

From all the available methodologies for ontology design [20], the NeOn Methodology has been selected for its comprehensive coverage of the entire ontology development lifecycle, the systematization of requirement specifications activities, the availability of documentation and detailed guidelines [21].

The NeOn Methodology organizes the design work in a waterfall-like manner [22]. Applying the NeOn methodology for the development of a model of the EU legal regime on cookies, a requirement document was developed spelling out the purpose, intended audience and use of the model. This document also identifies the definitions that the model should provide and the competency questions that it should answer. A summary of these requirements is provided in Table 1.

Table 1. Requirements specifications for the model on the EU legal regime on cookies

Purpose	Inform online providers on legal requirements they should consider before placing cookies on the terminal equipment of Internet users in the European Union (EU legal regime on cookies)
Scope	The model uses a general granularity at the level of legal provisions, representing rights, obligations, prohibitions, exceptions, constraints, enforcement procedures, further interpretation, requisites, legal sources.
Intended end-users	Webmasters, CIOs and in-house counsellors for online service providers Advertising network providers and publishers Regulators Member States Data Protection Authorities
Intended uses	Training Sharing of consensual knowledge on the EU legal regime on cookies Support to legal opinion on compliance with EU legislation Legal theory
Competency questions	To which technologies is Art. 5(3) of the E-Privacy Directive (2002/58/EC) applicable? What are the legal grounds to store cookies on the terminal equipment of a user? What are the legitimate purposes of such devices? What are the illegitimate purposes of such devices? What are the rights of the users of the terminal equipment? What are the elements of a valid prior informed consent? Who has the obligation to seek prior informed consent? What are the obligations of the advertising network providers and publishers? What are the modalities of the prior informed consent? Can the consent serve for several cookies? For how long does the consent serve? What mechanisms can be used to seek consent? Can valid consent be implicit (e.g. obtained through browser settings)? When can cookie be exempt from the principle of informed consent? For what purposes can (or can not) the exemption be applied? What is applicable in these exceptional cases? What are the possible enforcement action in case of non compliance?
Defined terms (definitions not provided here)	Cookies (technical definition) Cookies and similar tracking technologies (or related technologies) (legal definition) Characteristics of cookies Online Behavioural Advertising Terminal equipment Setting cookies (syn. planting cookies) Third party Web site operator Users

Representing knowledge with models requires to select a formalism from the available formal and semi-formal alternatives. This project considered formalisms and meth-

ods developed for software and ontological engineering. The industry standard for software engineering is the semi-formal UML, whereas computer ontologies rely on the formal Ontology Web Language (OWL). The suitability for this project of these modelling languages was assessed against a set of common requirements.

These requirements not only considered the expressivity of the language itself (UML/OWL) but also the capabilities of a toolbox of reference (Protégé vs Sparx Enterprise Architect). The requirements were divided into three domains related to the ability to *model* (e.g. ability to work with modules), *share* (e.g. quality of automatic documentation) and maintain (e.g. *manage versions*) the resulting modelling artifacts. Under this pragmatic perspective, it was concluded that the semi-formal UML was the most adequate formalism for the needs of this study.

3.2. Methodology for evaluation of the pedagogic efficiency

A rigorous pedagogic methodology is needed to assess whether this project achieves its objective, which is to provide models and reference material that can actually teach law to IT practitioners. Following the academic best practice methodology of constructive alignment in higher Education advanced by Biggs [23], it is essential to refer to taxonomies of learning outcomes, such as the SOLO taxonomy [24], Hailikari's levels of understanding or Bloom's taxonomy of educational objectives [25]; [26]. In what follows, we will refer to the revised version of Bloom's taxonomy of educational objectives [27] which explains that human learning follows different levels of increasing complexity: *Remembering*, *Understanding*, *Applying*, *Analyzing*, *Evaluating* and *Creating*. Students need to reach one level before being able to access the next one.

In what follows, we will justify the assumptions that leads us to limit the learning outcomes for this project to the bottom three levels of the Bloom's taxonomy, *Remembering*, *Understanding* and *Applying*.

To that end, we need to make an assumption about the learning preference of IT practitioners based on the empirical research performed by Joe Peppard [28] who has benchmarked the personality traits of hundreds of Chief Information Officers (CIO) against the Myers-Briggs Types MBTI®. The result of Peppard's experiment is that 70% of CIOs are of profile type ISTJ (compared to 12% ISTJ in the rest of the population).

Having such a distinctive personality trait of CIOs is helpful to determine their learning preferences. D. Dunning has established a direct correlation between MBTI® types and their learning preference [29]. In order to learn efficiently, people of profile type ISTJ need [30]:

- Clarity and structure;
- Detailed and concrete information;
- Clear objectives and expectations (e.g. learning outcomes);
- Self-study with sufficient time to absorb the material on their own before engaging in group activities;
- Practical application of the knowledge learned (e.g. examples, case studies).

Based on this last point, we conclude that *Applying* should be the highest level for our learning outcomes in order to satisfy the dominant learning preference of IT practitioners, whereas the three topmost levels of the Bloom's taxonomy are excluded from the learning outcomes of this project, as they are clearly meant to develop the legal culture of the aspiring lawyers and exceed the legal knowledge needs of the IT practitioner in non-litigious matters.

In the following Section, we will review the reusable elements available from the state of the art in the discipline of legal knowledge engineering, and how these elements converge, together with the theoretical framework described in Section 2, to constitute "Metamodel for an ontology of IT law", as described in the Section 4.2.

4. Data models and related documentation

4.1. Legal ontologies

The seminal definition of computer ontologies is often attributed to Gruber who described computer ontologies as "an explicit specification of a conceptualization" [18]. However, the notion of ontology is polymorph and there is a wide variety of possible definitions to choose from, as shows the recompilation proposed by Nuria Casellas [20] in her thesis on legal ontologies engineering ([20], p. 57). She ascribes to the working definition by Uschold and Jasper (1999) [31]: "An ontology may take a variety of forms, but necessarily it will include a shared vocabulary of terms, and some specification of their meaning. This includes definitions and an indication of how concepts are interrelated which collectively impose a structure on the domain and constrain the possible interpretations of terms".

By legal ontology, we mean in this article ontologies that have been developed to represent legal knowledge for a variety of purposes such as search and retrieval of information, reasoning applications, or communication between people or organizations. The development of legal ontologies has been a prolific area of research, resulting in growing number of available ontologies which can be inventoried following the specific typology proposed by Nuria Casellas. According to her conclusions, most legal ontologies are domain ontologies and focus on particular applications based on domain knowledge, aiming at representing knowledge towards a specific application. The observed uses of legal ontologies include information search and retrieval (e.g. semantics), reasoning, communication between systems and organizations (e.g. interoperability), with limited occurrence of legal ontologies for communication between humans for example for a use case such as education. Some ontologies have been developed at the core level (e.g. LKIF Core) aiming mainly at knowledge reuse with more theoretical legal knowledge in mind, but reuse has not been the main feature in the development of legal ontologies.

Legal ontologies have been recently evolving towards a manageable and useful way of implementing regulatory systems [32], with several examples coming from several EU projects[5], managing legal queries and services on the EurLex platform CELLAR [33]; [34], and the implementation of rights contained into new EU important regulations (such as the GDPR protections) [35].

Following the adopted knowledge engineering methodology (NeON), one crucial step consists in identifying sources of knowledge, either in formal or semi-formal languages, reusable for the purpose of the design. Building on the epistemological framework introduced in Section 2, this multidisciplinary study shall focus its epistemological viewpoint into each of the different layers of law, the surface, the legal culture and the deep structure of law, as well as from other disciplines tied to law such as politics. Each of these layers and disciplines constitutes a distinguished medium characterised by its

[5] Such as RESPECT, OPENLaws, and LYNX.

own rationality and functional language, its own ontology. The analysis of the state of the art of the existing legal ontologies shall provide us with the shortlist of candidate ontologies for reuse for this project.

In Table 2, we list some of the relevant ontologies for each of these layers and disciplines.

Table 2. Different types of legal ontologies according to Tuori's layers

Layer / Discipline	Sources of knowledge
Politics	Regulatory Institute (Manfred Kohler) handbook Howtoregulate.org
Surface of law	CEN/Metalex, FRBR, ELI, ECLI, ODRL vocabulary, LegalRuleML
Legal culture and Deep structure of law	Policy language expression: ODRL core (concepts) LKIF [Deliverable 1.4 OWL Ontology of Basic Legal Concepts (LKIF-Core)]

4.2. Metamodel for an ontology of IT law

Epistemological choices introduced in Section 2 and the elements reused from the ontologies described above converge into a metamodel for our IT law (Figure 2).

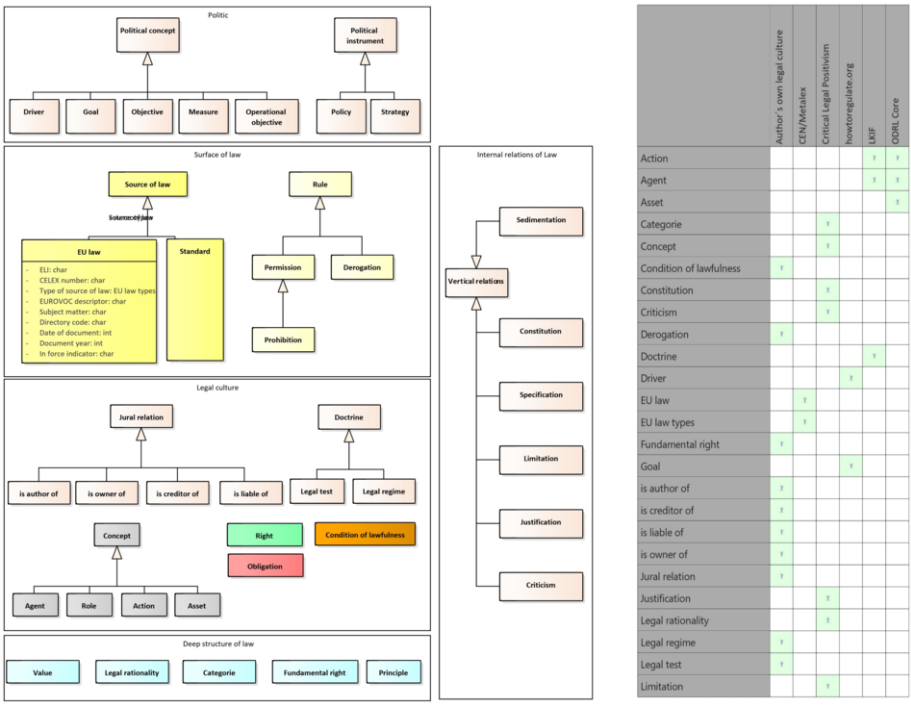

Figure 2. Metamodel for an ontology of IT law with indication of provenance of ontological commitments

5. Evaluation

In the seminal work of Gruber [18] in 1993 on formal ontologies, he determined that their primary role was to "support knowledge sharing activities". Even if a number of other use cases has justified the use of ontologies since the time of Gruber, ontologies are still primarily used to share the common understanding of a domain among people or software agents.

However, not many specific uses of computer ontologies have been reported where ontologies have mediated between humans with a different background knowledge, nor computer ontologies have been much used for teaching and learning [36].

This study experiments with the use of models representing IT law for the purpose of bridging the legal knowledge needs of IT practitioners. It takes as a test bed the EU legislation on cookies (ePrivacy) of which it provides an ontology interconnecting terms, concepts, categories and principles of IT law. The outcome is a self-learning material consisting of the UML model accessible via an HTML user interface[6].

The ontology has been formally specified using UML notation (semi-formal language), see Figure 3, whereas an early version of the model was specified in the formal language OWL[7].

5.1. Experimental setting

An experiment was run with a class of engineers from the Universidad Politécnica de Madrid in their last year of Master Degree. A summative assessment was used to assess the achievement of the learning outcomes.

The twenty-four students were divided into 3 groups:

- Group 1 (11 students): Students with access to the model of the EU legal regime on cookies as only source of knowledge. No time granted to familiarize with the model before answering the questions.
- Group 2 (7 students): Students with access to Google as only source of knowledge.
- Group 3 (6 students): Students without access to any source of knowledge.

The assessment method consisted in a quantitative assessment of the relative accuracy of answers of each student groups.

The students were asked to answer a quiz of nine questions[8] designed as formative assessment [37]. The total duration of the test was 20 minutes. None of the students had received recent courses on the topic of the EU legal regime on cookies.

In relation with the learning outcomes introduced in Section 3.1, the quiz was featuring questions one to four to assess the learning outcome of level 1 (*Remembering*), questions five to eight assessed the level 2 (*Understanding*) and question nine assessed the level 3 (*Applying*).

5.2. Results

The results of the assessment are provided in Figure 4.

[6] http://www.ciolaws.com/courses/cookies/ (username:cookies, password:1cookies1).
[7] http://www.ciolaws.com/ontologies/eulr-cookies.htm (25/04/2018).
[8] https://goo.gl/forms/qt0TpAsfT2gSJAQB3.

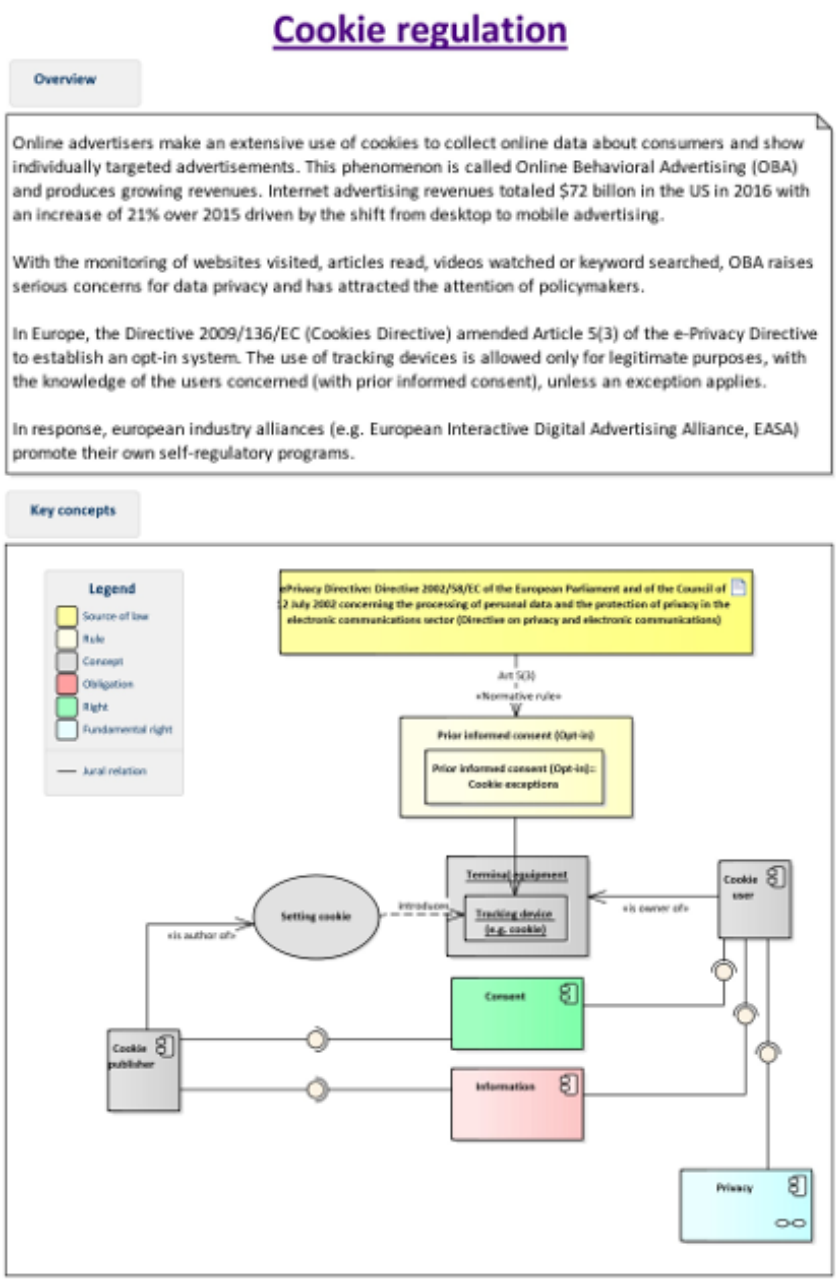

Figure 3. Model of the EU legal regime on cookies (UML version)

Result of the assessment of the learning outcome level 1 (*Remembering*): questions from 1 to 4. Group 1 scored better than groups 2 and 3 on the questions from 1 to 4, which were questions of type 'fill the gap', which correct answer could be found in the model.

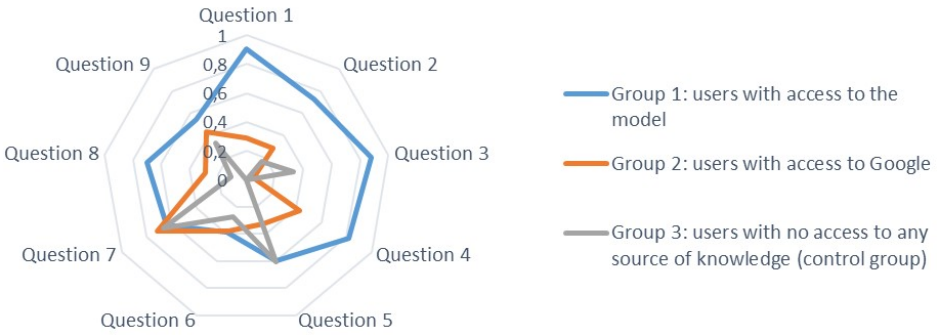

Figure 4. Results of quantitative assessment

Result of the assessment of the learning outcome level 2 (*Understanding*): questions from 5 to 7. Question 5 was essential to this test as it was asking "What are the right of the cookie users?" On this question, students from group 3 (without access to any source of knowledge) achieved identical scores as the students from group 1. This unexpected result allowed to identify a flow in the design in the representation of rights and obligations in the model. This aspect was subsequently improved in an updated version of the model. The three groups achieved similar results on questions 6 and 7. In these questions, the level of understanding of students in group 1 was challenged by using a vocabulary slightly distinct from the one used in the model, requiring them to paraphrase the question and recognize associations between similar concepts.

Analysis of learning outcome level 3 (*Applying*): question 9. The question 9 was testing the ability of applying the knowledge acquired on a practical case, by providing a short description of the EASA/IAB Code on cookies and asking if "The EASA/IAB Code provides users with consent options compliant with Article 5(3)". Group 1 scored better than groups 2 and 3, even though with little difference. Also, having only one single question to test this learning outcome, the experiment is inconclusive on that point and the results from this question need to be excluded from this experiment.

Overall Analysis: the model achieves to provide a good level of knowledge of the subject matter at level 1 (*Remembering*), as users are able to access knowledge in an autonomous manner, provided that the same language is used in the questions as in the model. The level of understanding of the students in Group 1 was challenged by testing the ability to paraphrase and relate similar concepts. However, the experiment was designed in a way that students had very limited time to read through the material provided, learn and understand its content. This explains that the students in Group 1 did not achieve higher scores than the other groups. The experiment cannot conclude on the achievement of the level 2 (*Understanding*) of the learning outcomes. For that purpose, a new experiment should be designed where students from Groups 1 and 2 would avail of identical amount of time for self-learning, prior to receiving the questions of the test.

6. Conclusion

IT executives today deal with more legal issues than ever before. These issues include compliance with privacy rules and data protection related measures, which are of capital

importance for their daily professional activity. Complying with these legal requirements becomes a complex burden for IT executives who need to understand the legal objects, concepts, rules and their relations. Whereas the use of ontologies and IT-friendly diagrams for learning is not new, the legal knowledge organisation proposed in this Chapter has been grounded on legal theory to facilitate an accessible visual language able to offer an intuitive representation of IT law.

This work has required a multidisciplinary approach, with a legal standpoint relying on Tuori's critical positivist theory of law's levels systems, and a knowledge engineering standpoint borrowing languages and methods from software and ontological engineering to represent knowledge in an explicit, shareable and maintainable manner. The result of this effort has been materialized in a collection of data models and a specific experiment carried out with IT students. Its conceptual and experimental results are promising enough as to invite to further exploration.

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