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A NOTE ON VALIDITY IN LAW AND REGULATORY SYSTEMS (POSITION PAPER)

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Abstract: The notion of *validity* fulfils a crucial role in legal theory. The emerging Web 3.0 opens a new landscape where Semantic Web languages, legal ontologies, and the construction of Normative Multiagent Systems are built up to cover new regulatory needs. Conceptual models for complex regulatory systems shape the characteristic features of rules, norms and principles in different ways. This position paper outlines one of such multilayered governance models, designed for the CAPER platform.

Keywords: Validity, regulatory systems, legal theory, Semantic Web (SW), legal ontologies, Normative Multiagent Systems (nMAS).

1. Introduction

I will contend in this brief Note that there is an asymmetry between the main architectural design of the Semantic Web, and the architectures built so far to give an account of the main components of legal theory. I have not developed this issue in recent contributions on the same matter (2012a, 2012b, 2013) nor am I the first one to point it out. Some years ago, at the beginning of the ontological work that would become pervasive, André Valente and Joost Breuker (1994) referred broadly to this problem as «the missing link between legal theory and AI & law».

Computational ontologies would help to bridge the gap leaning onto legal theory assumptions about norms, rules, principles, values, directives, and the like. However, nearly twenty years later and despite the longstanding efforts to build up a core-ontology for law, we do not have one but many core-ontologies with different functionalities, ends and purposes.[1] This is not a negligible outcome, for there are several approaches to legal ontology building (Sartor et al. 2011). I will assert in the following pages that the reasons for this to happen are equally manifold. Ontologies have revealed to be quite useful for classification and information retrieval, but they still need to assume conceptual schemes that are complex in nature and not completely closed, as they have to be represented within dynamic and evolving social, political and legal contexts. Moreover, although it may seem otherwise, the link between legal theory and the Semantic Web is not completely explicit, and there is a gap between regulations of Web 2.0 applications and legal concepts, as recent privacy suits and data protection regulatory patchwork have revealed in Europe.

Therefore, a *hybrid perspective* taking into account phenomena that are different in nature —e.g. linked open data; the conceptual structure of legal data, metadata and rules, or the conceptual structure of networked governance— would better match the link. Put it differently,

[1] See Casellas (2011) for a summary.

in the Web 3.0 law turns out to be *relational*, deploying thorough multilayered governance regulatory systems. The «missing link» does not occur between legal theory and AI & Law, but between the plurality of options from which law can be theorized and put in practice, and the plurality of perspectives that the new generation of Semantic Web technologies opens up.

2. The Semantic Web

From a technical point of view, the Semantic Web (SW) consists of a stake of computer languages.[2] These are semantic languages[3] to model data or to annotate and relate them — RDF [*Resource Description Framework*] and OWL [*Ontology Web Language*]. RDF facilitates the description of knowledge using triples encoding factual and linguistic knowledge; OWL facilitates reasoning (a simple deductive reasoning) through sets and properties that model formally concepts, relationships and instances. They are graph-languages on XML [*eXtended Mark-up Language*] «serialized», that is, *representing* data in files (using Turtle[4] or Phyton, e.g.).[5] The result leads to information management and processing as *knowledge —hypertext* links, connection of objects, and information retrieval from the Web using not keywords (terms), but concepts.

Table n.1 summarizes the main SW Technologies. It distinguishes between Berners-Lee's hypertext original ones, and those adding structure and meaning to the information, transforming it through *metadata* from «tagged» or «marked» data into a set of linked objects of knowledge.

TABLE 1
Semantic Web Technologies

	Hypertext technologies
Web 1.0/2.0	• IRI [*Internationalized Resource Identifier*], generalization of URI [*Uniform Resource Identifier*], it facilitates the identification of semantic resources to manipulate and handle them.
Web 1.0/2.0	• *Unicode* is a codification standard of features of multiple technical and natural languages (including legacy ones). It drives to uniformity, singularity and universality of their representation.
Web 1.0/2.0	• XML [*Extended Mark-up Language*] is a tag or mark-up language (a meta-language in fact) defining a set of documents in a readable format language, either by humans or by machines.[i]
Web 1.0/2.0	• *XML Schema* is a schema language that constraints the structure and content of XML documents, adding more abstraction into it.[ii]

[2] See the last version of the famous SW 'cake' or stake of languages by T. Berners-Lee at <http://www.w3.org/2007/03/layerCake.png>.

[3] For a technical introduction, cfr. Grigoris Antoniou; Frank van Harmelen, *A Semantic Web Premier* (MIT, 2004); Vid. also John Domingue; Dieter Fensel; James A. Hendler, J.A. *Handbook of Web Semantics Technologies* (2011).

[4] <http://www.w3.org/2007/02/turtle/primer/>.

[5] 'Serialization is the process of converting the state of an object into a form that can be persisted or transported. The complement of serialization is deserialization, which converts a stream into an object. Together, these processes allow data to be easily stored and transferred.' <http://msdn.microsoft.com/en-us/library/7ay27kt9%28v=vs.80%29.aspx>.

[i] <http://www.w3.org/XML/>.

[ii] <http://www.w3.org/XML/Schema>.

Web 1.0/2.0	• *XML Namespaces* furnish elements and attributes with a single name to a XML sequence; this sequence may contain element names or attributes coming from more than one vocabulary. It is used to identify and single out entities to be referred to without any ambiguity.[i]
	Standard Semantic Web Technologies (meaning for structured data)
Web 3.0	• *Resource Description Framework* [RDF] is a knowledge representation language where concepts are represented as triplets of the form subject-predicate-property (resource-property/relationship-property/property value-relationship), facilitating the description of relationships among concepts as graphs.[ii]
Web 3.0	• *Resource Description Schema* [RDFS] extends RDF vocabulary allowing the description of taxonomies of classes and properties. It also sets the domain and range of properties and relates the RDF classes and properties to taxonomies (hierarchies).[iii]
Web 3.0	• OWL [*Web Ontology Language*] adds more structures to describe the semantics of RDF sentences (cardinality, restrictions of values, transitivity…). It is based on descriptive logics, and gives some reasoning power to the SW. It defines sets, properties, instances and operations through the construction of *ontologies*.[iv]
Web 3.0	• SPARQL [***S**PARQL **P**rotocol **a**nd **R**DF **Q**uery **L**anguage*] allows the search of structured data (in RDF, RDFS and OWL). It is a standard search language to perform graph queries and to build up SW applications.[v]

3. Legal theory

In addition to the emergence of several legal ontologies, during the past five years, an intensive work on rules, norms and interchange formats has been carried out within the AI&Law community. I borrow from Gordon, Governatori and Rotolo (2009) the following summary of the main components of the legal systems that can be modelled:[6]

1) *Isomorphism* (a one-to-one correspondence between the rules in the formal model and the units of natural language text which express the rules in the original legal sources).
2) *Reification* (rules are objects with properties):
    a) Jurisdiction: limits where the rule is authoritative and its effects are binding;
    b) Authority: ranking status of the rule within the sources of law (constitutional rule, or statute…);
    c) Temporal properties: (i) time when the norm has been enacted, (ii) time when the norm can produce legal effects, (iii) time when the normative effects hold.
3) *Rule semantics* (semantics allows for correctly computing the legal effects that should follow).
4) *Defeasibility* (when the antecedent of a rule is satisfied by the facts of a case, the conclusion of the rule presumably holds, but is not necessarily true). Defeasibility breaks down into:

[i] <http://www.w3schools.com/XML/xml_namespaces.asp>.

[ii] <http://www.w3.org/RDF/>.

[iii] <http://www.w3.org/TR/rdf-schema/>.

[iv] <http://www.w3.org/TR/owl-guide/>.

[v] <http://www.w3.org/TR/rdf-sparql-query/>.

[6] This summary is reproduced slightly modified in Balke et al. 2013, 11 and ff., in which the authors explicitly assert that these aspects «contribute to classifying norms and *can be extended to other normative domains besides the law*» [emphasis added P.C.].

   a) Conflicts (rules may lead to incompatible legal effects): (i) one rule is the exception of the other, (ii) rules have different ranking status, (iii) rules have been enacted at different times.[7]
   b) Exclusionary rules (some rules provide one way to explicitly undercut other rules, namely, to make them inapplicable).
5) *Contraposition* (if some conclusion of a rule is not true, the rule does not sanction any inferences about the truth of its premises).
6) *Contributory reasons or factors* (It is not always possible to formulate precise rules for aggregating the factors relevant for resolving a legal issue).
7) *Rule validity* (rules can be or become invalid). Deleting invalid rules is not an option when it is necessary to reason retroactively with rules which were valid at various times over a course of events: (i) the annulment of a norm is usually seen as a kind of repeal which invalidates the norm and removes it from the legal system as if it had never been enacted (the effect of an annulment applies *ex tunc*: annulated norms are prevented from producing any legal effects, also for past events); (ii) an abrogation on the other hand operates *ex nunc* (the rule continues to apply for events which occurred before the rule was abrogated).
8) *Legal procedures* (rules regulate also whether or not some action or state complies with other, substantive rules): (i) procedures that regulate methods for detecting violations of the law, (ii) procedures that determine the normative effects triggered by norm violations (reparative or compensatory obligations).
9) *Normative effects* (such as obligations, permissions, prohibitions and also more articulated effects) e.g.:
   a) Evaluative, there is a value to be optimized or an evil to be minimized.
   b) Qualificatory, which ascribe a legal quality to a person or an object.
   c) Definitional, which specify the meaning of a term.
   d) Deontic, which, typically, impose the obligation or confer the permission to do a certain action.
   e) Potestative, which attribute powers.
   f) Evidentiary, which establish the conclusion to be drawn from certain evidence.
   g) Existential, which indicate the beginning or the termination of the existence of a legal entity.
   h) Norm-concerning effects, which state the modifications of norms (abrogation, repeal, substitution…).
10) *Persistence of normative effects* (some normative effects persist over time unless some other and subsequent events terminate them).
11) *Values* (some values are promoted by the legal rule).

This summary is extremely useful. It should be noticed that the Semantic Web and the components of legal theory have different structure, uses and goals. The former was born to solve interoperability problems and expand the functions, roles, scalability, reusability and management of knowledge across the web. The Web of Data (or «web of things») focuses both on linking data and end users, thus, on *personalization* of knowledge. On the other hand, legal components address issues concerning knowledge and management of regulations, ethics, governance and the law. Nevertheless, both approaches converge on almost every aspect of the so-called *identity layer* and the valuation of data, protocols and behaviour of citizens,

[7] Accordingly, rule conflicts have been traditionally resolved using principles about use priorities: (i) *lex specialis* (it gives priority to the mores specific rule), (ii) *lex superior* (it gives priority to the rule from the higher authority), (iii) *lex posterior* (it gives priority to the rule enacted later).

consumers, companies, and administrations on the web.[8] Actions such as negotiating, contracting, drafting, reasoning, arguing and even ruling, resolving, and sentencing should not be considered aside from the technologies that support them. Is there a reasonable way to bridge both types of languages and theoretical approaches, those coming from SW developments and those stemming from legal theory that serve to model legal norms?

4. Discussion

In recent times, rule interchange languages for the legal domain have been flourishing to give an answer to this question. The RuleMarkup Language (RuleML),[9] Semantics of Business Vocabulary and Business Rules (SBVR),[10] the Semantic Web Rule Language (SWRL),[11] the Rule Interchange Format (RIF),[12] and the Legal Knowledge Interchange Format (LKIF).[13] Gordon, Governatori and Rotolo (2009) have selected the above legal components as requirements to be complied with by interchange languages. But they correctly assert that there is no language which can satisfy all of them at the same time (ibid., p. 294).

I am not going to delve into them now nor will start a discussion on the definition of rules or norms. In computer science, rules are commonly divided into *production rules* and *declarative rules*.[14] In the social sciences, norms have been often referred as having a social goal, such as the reduction of transaction costs in coordinated and collaborative situations. In philosophy, norms have been spelled out into different types of logics (descriptive, modal, deontic) following different analytical concepts referring to prescriptive natural language or to actions.

In legal theory, many outstanding legal philosophers of the 20th century have attempted to set up a general framework to structure the overall relations among rules, norms, principles and values. I will call *legal architecture* the attempt to find a common inferential base that serves as a reasonable starting point for such an attempt.

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[8] As stressed in the second version of *Code*, by Lawrence Lessig: «identity layer» or «metasystem layer» of the Internet, «a protocol to enable a kind of virtual wallet of credentials». Cfr. L. Lessig (2006, p. 50 and ff.).

[9] RuleML (Rule Markup Language, which has also become a Rule Modeling Language and a Rule MetaLogic) is a unifying family of XML-serialized rule languages spanning across all industrially relevant kinds of Web rules. It is mainly focused on industry rather than on academy uses. Vid. <http://www.ruleml.org>.

[10] The SBVR defines the vocabulary and rules for documenting the semantics of business vocabularies, business facts, and business rules; as well as an XMI schema for the interchange of business vocabularies and business rules among organizations and between software tools. Vid. <http://en.wikipedia.org/wiki/Semantics_of_Business_Vocabulary_and_Business_Rules>.

[11] Vid. <http://en.wikipedia.org/wiki/Semantic_Web_Rule_Language>. The specification was submitted in May 2004 to the W3C by the National Research Council of Canada, Network Inference (since acquired by webMethods), and Stanford University in association with the Joint US/EU ad hoc Agent Markup Language Committee. Cfr. <http://www.w3.org/Submission/SWRL/> (latest version, 2004).

[12] The Rule Interchange Format (RIF) is a W3C Recommendation. RIF is part of the infrastructure for the SW, along with SPARQL, RDF and OWL Vid. <http://www.w3.org/TR/2013/NOTE-rif-primer-20130205/>.

[13] LKIF was built in the EU Project ESTRELLA (2006-2008), and its goal was to develop an interchange format for models of legal norms.

[14] Cfr. <http://www.w3.org/TR/2013/NOTE-rif-primer-20130205/>. A productive rule assumes that if a certain condition holds, then some action is carried out (an instruction). E.g. «If a customer unduly delays the payment, then he will be considered a defaulter and he can be sued». Alternatively, a declarative rule is thought as stating a fact about the world and is understood of having the form it has the form «if P, then Q»; e.g. «If a person is born in Madrid, then he is Spanish». Declarative rules do not specify an action that is to be carried out.

This base is clearly connected with philosophical assumptions and with an intuitive idea of the world constituents to be represented. It is worthwhile to notice that *isomorphism* between rules of the legal system and their referred entities in the world (units of legal texts as *documents*, *objects* or *behaviour*) have been often taken for granted. To quote key contributions by Hans Kelsen, Herbert Hart and Alf Ross, the legal architecture is firmly grounded onto some pillars which attribute the quality of «legal» to the whole building. As it is widely known, Kelsens' *Grundnorm*, Hart's *Recognition rule* and Ross' *sources of law* fulfil this foundational role and proportionate a conceptual scheme to represent and bridge facts and norms, on the one hand, and the layered structure of legal norms, on the other—as positive law is intended to be known and represented through primary and secondary rules (Hart) or norms (Kelsen, Ross). The analytical property which captures for any rule or norm the quality to belong to a legal system is termed *validity*. A «valid» norm is a «legal norm». And, to acquire this quality of law, a rule or norm is expected to be (or become) *valid*. Analytical legal philosophers use to conceive this property as a *recursive* (Alchourrón and Bulygin, 1974) and *supervenient* one (Hage, 2005).

'Validity' [*Geltung, validesa, validez, validità, validité*) is one of the most discussed properties in analytical legal theory. Bulygin (1991a, 1991b) distinguished several normative and factual meanings. In contrast, Sartor (2007) follows Ross' inferential analysis and contends that the concept of 'valid law' is a normative notion, irreducible to any factual description (and based upon assumptions pertaining to morality as well because of its functioning upon «intermediate legal concept», that have to be properly distinguished from its binding implications).[15] Alexy (1997, 2006), conversely, maintains the classical positivist distinction between law and morals while asserting that the *internal* dimension of law makes room for *inclusive positivism*.[16]

What I find interesting in the Scandinavian doctrine is the notion of inference stemming from legal concepts. Legal concepts are considered as directly *generatives* of consequences, and, therefore, they can trigger normative legal reasoning and argumentations from this position in a logical way, getting rid of unnecessary definitional criteria.[17] Pattaro (2007) calls 'validity' the «pineal gland» of law, and speaks of a cosmological «matrix» to which

[15] «Intermediate legal concepts» are «those concepts through which legal norms convey both legal consequences and preconditions of further legal effects» (Sartor, 2009, 35). E.g. «ownership». Legal validity is «an evaluative property whose establishment pertains to moral reasoning» because «the function of legal validity consists of linking certain features of a norm to the conclusion that a norm is legally binding» (Sartor, 2007, 26).

[16] From the observer's point of view, Alexy defends the separation between law and morals; however, from the internal point of view (such as the judge's perspective) he accepts the link between law and moral norms. Cfr. Alexy (1997, 32 and ff., 92 and ff.). Moral principles are different from legal norms, but can enter into the legal application of norms via external justification of arguments, or ethically valid internal choices of the premises. Therefore, legal validity contains elements of social and ethical validity. To me, the *architecture* of Sartor's arguments about validity stems from the Scandinavian *conceptual* perspective which does not postulate any hypothetical norm as a primary source, while Alexy's architecture of law maintains the Kelsenian perspective of the existence of law as a normative order, as a system of norms. Therefore, 'validity' can be satisfied by several (ethical, social or legal) criteria, and acts as an identifier of ethical, social and legal systems. According to Alexy (2006, 27), the formal structure of the core of the theories of validity can be expressed as follows: «when in respect of norm N the Criteria C_1,… C_n apply, then Norm N is valid. The various theories of validity can be distinguished by the criteria they adopt».

[17] The assumption is that especially nonmonotonic logic, defeasible reasoning (not based on epistemic truth) and the analysis of noninferential reasoning (e.g. analogy) can provide theoretical foundations for AI & Law. See Prakken (1997).

it makes sense to postulate that law is 'valid', without referring to its normative elements as 'valid' or 'invalid'.[18]

However, this theoretical approach is in itself prescriptive, *argumentation-prone*. In a way, authors assume what they are applying, because normative reasoning, argumentation, holds as their spring or starting point for the whole notion of 'legality' (i.e. of 'regulations'). However, I don't think that this approach precludes a more empirical one when it comes to computer and information processing environments. It rather depends on the specific problems to be solved. In this sense, other non-normative intuitions could be equally considered.

In our case, we face the tasks of designing regulatory systems for platforms and web services, regulating semantic web applications, or building electronic institutions or Normative Multiagents Systems (nMas).[19] These tasks entail different epistemological and ontological commitments and different types of technical designs. But they all share the need of using norms, rules, guidelines and principles as building blocks and computerized devices. E.g. the implementation of nMAS requires five essential elements: a virtual space, a shared ontology, an interaction model, a set of regulations, and a governance model (Noriega et al. 2013, p. 96). This is not to mirror legal norms and legal behaviour. Rather, the implementation of SW technologies to the law, and the functioning of normative systems into embedded artificial settings enlarge and modify by the same stroke what law traditionally means for human users. Interaction poses its own problems and challenges for nMAS (Boella et al. 2008). Accordingly, some more requirements to match SW technologies with legal ontologies and interchange languages have to be put in place, not only those coming from the conception of law pertaining to legal theory and jurisprudence. The notion of a «legal Semantic Web» cannot stand alone to bridge the gap between semantic languages and regulatory fields. The social implementation of complex regulatory systems would require a broader design.[20]

From our perspective, e.g., validity can be conceptually defined as a *second order property*, a four-tuple function of ethics (justice), policies (efficiency), soft law (effectiveness) and hard law (enforceability), fostering the application of metrics to measure institutional strengthening, i.e. the coordinated organization of components in specific platforms applying semantic technologies. Fig. 1 plots the architecture of such a regulatory model, set for the multilayered governance, cooperative behaviour and citizens' data protection in CAPER, a security platform for the interoperability of legal enforcement agents to fight organized crime.[21] Fig. 2 shows that validity cannot be defined as a first order property: it depends upon other properties along two different axes (binding power, social dialogue) emerging as a property of a third axe, i.e. the institutional functioning of the whole system. Regulations unfold along an institutional *continuum*. Validity is a characteristic feature of such a *continuum*, a property pertaining and emerging from the whole regulatory system.

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[18] «Validity is the congruence, and invalidity the incongruence, of a token with a type» (Pattaro, 2007, 14). «It is misconceived to equate or connect validity with norms (Ought-effects). Validity depends not on norms but on types» (Ibid. 23, see also pp. 41 and ff.).

[19] The consensual and standard definition of a normative multiagent system is the following one: «a multiagent system organized by means of mechanisms to represent, communicate, distribute, detect, create, modify, and enforce norms, and mechanisms to deliberate about norms and detect norm violation and fulfilment.» (Luck et al. 2005; Boella et al. 2008, p. 2). Cfr. about the use of electronic institutions, Mark d'Inverno et al. (2012), Fornara et al. (2013).

[20] Cfr. also Casanavoas et al. (2010).

[21] <http://www.fp7-caper.eu/>.

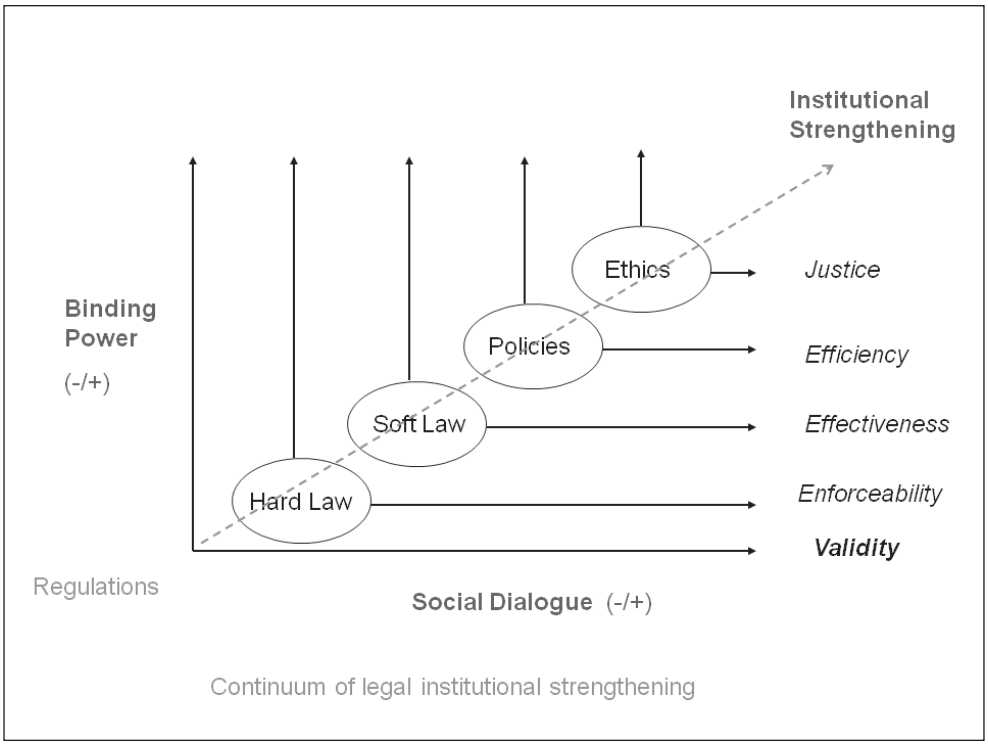

Fig. 1. CAPER Regulatory Model (CRM)

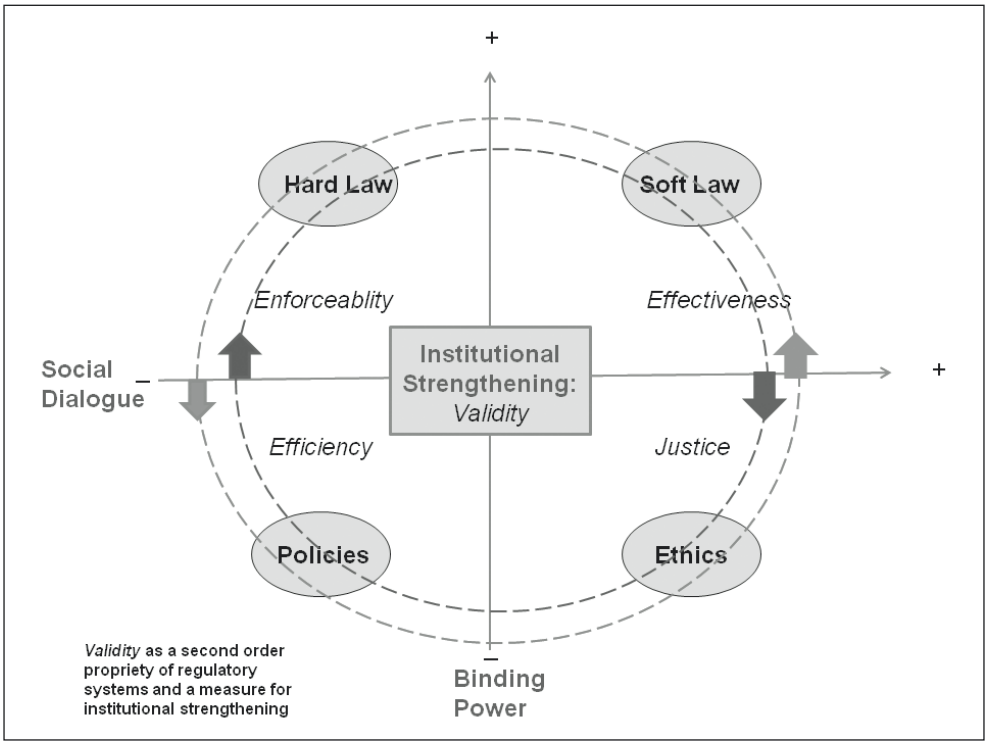

Fig. 2. Three axes, four first order properties and one second order property to model regulatory systems

5. Conclusion and further work

In this position paper I have outlined a way to conceptually model from a descriptive approach some elements that refine and slightly modify the normative notion of law, stemming from its implementation in regulatory systems. I have contended that the validity of norms, rules and principles cannot be directly applied as an identification property to single out their legality. This means that there is a tension between the ideal or prescriptive dimension of regulations and the design of specific regulatory systems, either in nMAS or embedded into concrete platforms and web services. A contrast or strain is produced between:

1. *Legal top-down* (inferential) and *social bottom-up* (emergent) approaches, as pointed out e.g. in nMAS perspectives about norms and rules (Blake et al., 2013; Noriega et al. 2013).[22]
2. A *legalistic* view of nMAS, where the normative system is considered «as a regulatory instrument to regulate emerging behaviour of open systems without enforcing the desired behaviour», and an *interactionist* view, in which norms can be viewed «as regularities of behaviour which emerge without any enforcement system» (Boella et al., 2008, 3).
3. Conceptually ontology-based and linguistically folk-based approaches in Semantic Web applications, as pointed out by second generation designs for SW services and applications (Angeletou et al. 2007).
4. Sociolegal practices and academic approaches in e.g. Online Dispute Resolution (ODR), crowdsourcing platforms, and mobile applications (Poblet, 2011).

Both ends of the spectrum should be taken on consideration by social intelligence theoretical approaches to model nMAS or other complex regulatory systems. But deepening into aggregated individual knowledge and social collective knowledge, or into intentional and causal epistemic approaches, falls outside the scope of this paper.

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[22] «Notice that we will not assume that the social perspective of norms be necessarily contrasted with the legal one. In fact, these two views are often taken to be symmetrically opposed: in the social paradigm norms fall within a bottom-up approach to normativity that is based on the concept of norm emergence; in the legal paradigm norms are mostly defined within a top-down, authority-based and institutionalised perspective» (Blake et al. 2013, p. 2).

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