The Construction of Models and Roles in Normative Systems*

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Abstract. Roles are widely addressed in multi-agents systems with social norms but roles in legal systems are quite different. The relation between legal norms and roles have specific features that when comes to applications create a distance with the expectations from law practitioners. This paper analyse roles in legal systems with legal norms and present the extension of [1] about representing norms as social objects consenting the representation of the assignment of roles and the chain between principles, norms and roles.

Keywords: social ontology, legal reasoning, normative system, roles.

1 Introduction

Roles are basic bricks for the construction of social and normative system. Roles are widely addressed in a general perspectives without taking in account how roles and norms are created in real systems. This proposal addresses roles in legal normative systems focusing on the relation between roles and legal norms. The relation between legal norms and roles have specific features in particular about how roles are defined and assigned. In particular, role assignment is considered as a "normative act" defining the scope and the rules for acting as role holder. In this perspective a role is firstly being "hold" and only secondary "played" by agents. Furthermore, the focus on legal norms requires a strong distinction between the social expectation and the juridical function of roles. Considering the norm dynamics as perspective, this contribution addresses the following mechanisms:

1. the social characterization of agents and other entities,
2. the creation of models,
3. the assignment of roles to entities and
4. the connection between principles and norms and agents' actions playing roles

The main goal is to represent the dynamics of norms though exposing the hidden relations between the different information sources (laws, contracts, judgements, etc.)

* "European Legal Culture" funded by Compagnia di San Paolo.

P. Casanovas et al. (Eds.): AICOL IV/V 2013, LNAI 8929, pp. 115–129, 2014.

The overall methodology involves the use of social ontologies to rebuild incrementally the state of affairs as the social objects within normative systems. We present an extended version of a social ontology[1] and its use to represent chains of norms and roles: norms implementing principles, roles defined in norms, principles implicated by norms and role assignments. Furthermore considering a semiotic perspective, we show how the general mechanism behind the creations of social concepts and social artefacts, for instance for the creation and use of new roles. The proposal focus at abstract level, entities (norms, principles, roles, concepts, agents) and relations are represented as graphs of resources from different data sources. The presented proposal is meant to represent the state of affairs of legal systems from different perspectives enabling different kind of legal reasoning. In other words, the presented framework can be applied to interconnect legal databases in order to rebuild the evolution of the legal system enabling many different analysis using custom interpretation theories implementing a specific perspective of the legal system.

The rest of the paper is structured as follows. In section 2 is discussed the state of the art about roles. Following in section 3 is discussed the concept of roles in normative systems and in section 4 is presented the extended social ontology for roles and models. In section 5 are presented and modelled two scenarios about chain of norms and role goals. Finally in section 6 are presented some final remarks and future works.

2 State of the Art, Methodology and Aims

Roles are been widely addressed from different perspectives in the multi-agent systems (MAS) and the normative multi-agent systems (NorMAS) communities. In general roles are used to abstract behaviour, position within organizations and, in normative systems, normative status (obligations, powers, permissions, etc.)

A role is a set of activities that were delegated by a social institution to agents (role holders). Roles connect powers to and goals consenting to reason about it abstracting from single agents. In MAS roles are described in many ways: in terms of rights, permissions and obligations[2], expectations, standardised patterns of behaviour[3], social commitments[4,5], goals and planning rules[6].

The overall metaphor behind the model of roles is the “agent play a role”[7]. This metaphor has several consequences: someone can or cannot play a role, a role can be player for a certain amount of time, an agent can switch roles, roles are played in a specific context, roles are related each other implicating games or protocols of behaviour. Furthermore, roles have a scope: there is a relation between acting in a role and organizations, roles playing roles and roles as pseudo-agents with their own mind set-up where discussed in [8,9]. As far as we know the works about roles are actually about social roles, it is still missing a study of roles within legal systems (considering the differences between legal norms and social norms), and following a theory about the evaluation of agents’ playing roles considering legal norms.

2.1 The Relevance of Principles in Role Evaluation

The problem with models of role is related to the very metaphor behind them: “agents playing roles”. The reasons are the dynamics of playing and the consequences on the

mechanisms to handle roles. For instance, role conflict is reduced to a selection problem (which role to play) avoiding to deal with the conflicts of role purposes and the correctness of the use of the role powers . Moreover, the current metaphor is even less appropriate for roles in legal systems where roles are "owned" by agents.

In legal systems, a role cannot be not recognised by agents. The ownership of roles give much more freedom than the acting in a role: to remove an agent from a role it is not just a matter of fail the social expectation but it needs a legal support, such as a contract breaking, that can be quite difficult to build. This set up is much more rigid, the results is to give to agents the chance to establish their own interpretation of roles: combining goals, the use of powers, the interpretation of obligations, building new strategies, etc.

In order to evaluate a role acting it is required to consider norms in a broader sense. An overall evaluation of an agent acting requires a goal, but the goals of roles cannot be founded in the prescriptive content of norms with their definitions. The goal of norms and so the goal of roles can be founded in what is called the principles of norms. Legal norms are implementation of principles, following their goals do not always correspond to their effects or with the interpretations of the legal texts. Legal norms do not have only one meaning, it is always need to make interpretations: there is an intrinsic vagueness in law that is actually used by legislators to avoid arbitrary decision [10]. Norms contain open concepts connected to society and language. In legal systems roles are defined though legal norms: the descriptions of roles involves vagueness, open concepts like norms.

When comes to representations, legal norms are usually treated as set of rules that should be extracted from legal texts. Usually it is possible to find in legal texts scenarios, actions associate to positive and/or negative sanctions. Moreover, the text structure allow to extract a context, entities and rules (considering references and definitions). That gives the impression that a conversion of a legal system in a knowledge base is possible. The construction of knowledge base from legal contents is indeed possible but only considering one interpretation of norms at time and resolving vagueness. Rules represent only one of the possible interpretation at time.

The content of norms are far more than their legal text. Their meaning is grounded in existing social norms, principles and shared beliefs. Principles are part of the norms such as the prescriptive content uses to formulate rules[11]: rules indicate a specific behaviour that can be or cannot be followed but principles are generally considered what norms should maximize. Different theories [12] about principles agree on their quantitative nature. Differently from rules, principles do not allow a crisp evaluations it is not possible to be compliant to a principle. Principles require to consider the contingency and the material possibility to archive a desired effect [13]. Those aspects need to be considered because principles plays an important role in the use and interpretation of norm like norm scope and efficacy in society. For instance the efficacy of norms can be evaluated confronting the archived results with the desired effects. Norms depends on principles and so roles depends on both principles and norms, following agents' actions playing roles are bounded to principles and are part of the effect of norms.

2.2 Perspective on Roles

There are two aspects of roles corresponding to two different perspective of legal norms:

1. roles are prescriptive description of agents behaviour: capabilities, protocols, scope, goals, etc.
2. roles are symbols of social expectations about agents' behaviour in specific contexts (cognitive and socio/cultural artefacts): context-aware interpretations, pragmatics of powers, conflict resolution, principles, etc.

In artificial systems only the first aspect of roles is involved, formal systems belong to this category. Human and hybrid systems involves both aspects of roles, for instance human agents can follow formal procedures but they can also change, reshape or ignore them, change the rule of game or change the very meaning of the rules. The main assumption of this approach is that the state of affairs does not imply a specific interpretation, the collection of the social facts covers heterogeneous aspects about legal systems, that is a common ground for different kind of reasoning.

3 Roles as Social Objects

Roles and norms are both social artefacts, from now on we refer to them as "social objects". Social objects are created through a *communicative act* that became is some way *public and independent* from who performed the action and it can be *shared* through media. For instance documents and promises are social objects, when created they become independent and part of the society.

Social objects need to be interpreted, a contract without interpretation is just ink on paper and without the common knowledge it do not result in obligations: the difference between a real and a fake contract is not in their shape or content but in the circumstances they are been created. Agents rely on shared experience, models of objects, concepts and social objects to create new ones in an efficient way.

Example 1 (making contracts). For instance to make a new contract it is not required an long and extensively explaination about its meaning but only to indicate its specific parts such as objects and terms. This is possible because we rely on the shared knowledge about contracts, everyone will understand just recalling the term contract and reproducing the right circumstances (witnesses, signatures, etc.)

The representation of norms as social objects is been addressed in [1]. They presented an ontology to build abstract representations of social facts about norms and the mechanism to extract specific interpretations (historical, teleological, etc.) Now, we briefly recall the theory of social objects and following we provide an extension for principles and roles.

3.1 Social Objects

Social objects are a category of entities between ideal (abstract) and physical objects[14] sharing some features with both of them. Social objects are created trough the rule "Object = Inscribed Action". An action is constitutive and communicative, it says something about the social reality, and it is fixed (inscribed) in one or more objects (media used to spread the action). The contexts of social objects are part of them as the communication content, their use or creation if related to the common ground of agents (shared

concepts) are used to build their interpretations by agents. For instance, legal concepts are used to complete an object meaning (recall example 3). Social objects are accessible through their inscriptions like papers, drawings, digital or human memory.

Social objects represent an incomplete knowledge with multiple possible interpretations. One possible meaning of a social object is the result of a reconstruction process including: the interpretation of its inscription, its context, the interpretation on the referred concepts and all the involved other social objects, and their integration. Social objects are composed and asynchronous[1,15] speech acts[16]. They are asynchronous because the communications are performed again and again when agents access to the objects. Social object are composed because made by several sources (e.g. pages or documents) and several speech acts. An agent loses the control of the context of use: when, who, how and why a social object is used. Therefore there are multiple sources of a social object interpretation and the different results comes from how those sources are handled. What is not at the stake is the general representation but how to use them during the reasoning processes. For instance a contract leads to trials not because it is not recognised as authentic but because the two parties do not agree on the consequences of the contract (obligations, etc.)

The social ontology we start from define three types of entities:

Agents called subjects that can act, communicate and create social objects.

Concepts include "ideal objects" and "physical objects". "Ideal objects" are entities like numbers that do not have a body, a unique definition and that exist outside time. "Physical objects" are all the entities with a physical body and a life cycle. For the purpose of speech acts both categories are considered concepts that can be used in a message.

Social objects that we discussed so far.

Social objects can be composed, agents can act as groups and concepts are part of conceptual or physical structures. Among entities of the same class it is defined a generic relation "part of" that stands for "is-a", semantic and other ontological relations. The ontology is meant to build abstract representations so "part-of" is an abstraction of all those relations that can be defined for lower level representations of the same entities.

Part of is a relation defined between entities of the same category:

- from agents to agents part of represent groups of agents making the same action on a social object;
- from social object to social objects part of represent the composition of social objects;
- from concept to concept part of is an abstraction of the ontological relations between concepts.

Among the previous entities are defined the following relations:

Support given to social objects by agents through their actions.

Represent (representation) of concepts used in the social objects

The relations "support" and "representation" represent the following dynamic: agents create social objects from public acts (messages) about concepts. That scenario do not

require concepts like models or roles of agents (called "Subjects" in [1]) so those where not considered. Furthermore, the presented ontology do not distinguish between "ideal objects" and "physical objects", both are considered linguistic "concepts" composing the message content. That solution was driven by the analysis of the dynamic of norm interpretation. In order to represent the norm/role relation we extend this ontology, the norm graph and the norm network.

3.2 Norms and Roles as Social Objects

Norms are social objects made of normative messages[17] in a juridical field[18]. The meaning of norms are the result of a dialectic process between juridical actors. In legal systems, roles are also social objects as part of the conten of norms. Furthermore, the assignment of roles of agents are also social objects because formal public acts like contracts.

A role assignes a position and a juridical function to an entity in a social structure: a) the role as position defines the scope of the function and the relations with other roles; b) the juridical function is the normative characterization of the role, assigning to situations in which the role is involved and to actions an effect.

Roles are not characterised by being assigned to agents but to the delegating prerogatives they hold and to assign the capabilities (powers) to archive an effect within a social structure. For instance also a norm can have a specific role within the normative system: relations with other norms and the delegation to have a specific effect on society. From now, we refer to agents as holders of roles but all the considerations we are going to present can be extended to any social objects.

A juridical function is one of the effect that a norm should archive, a role is what i put in action to do so. Thus as there is a connection between principles (the aim) and norms and between norms and roles, there is a connection from principles and roles. In particular, the juridical function of roles follows the principles behind the norms. Roles can be the result of several norms. Considering the hierarchy of the sources roles are the result of chain of social objects from constitutions to regulations. As roles assign new capabilities allowing agents to consider and make in action new strategies, those strategies are be related to the principles behind roles. Following, the meaning of a role (its juridical function) is the result of a chain of interpretations of the different sources by the holders of roles, and a role evaluation is the comparison between the principles and the effects of the holders' actions.

Example 2 (Contract 2). Considering a contract in wich a role r_j is assigned to an agent a_i, the contract uses the concept of role r_j relying on previous definitions and it socially describes the agent a_i assigning a role r_j within a context c_k. Searle's constitutive rule[19] describes the role assignment "X count as Y in C": agent a_i count as r_j in a context c_k. The context is the structure where the agent acts as r_j, the role r_j is the description of the agent a_i. The relation between r_j and a_i can be represented with the "represent" relation already defined. Nevertheless, it is necessary to reshape the ontology allowing the "represent" relation from social objects to agents.

3.3 The Social Characterization of Entities and Models

The current version of the ontology of social objects (as recalled in section 3.1) does not consent to represent the following two mechanisms: 1) the assignment of role to agents, 2) the connection between role as description in norms and role assigned. Those two are the basic mechanisms of the creation of social objects.

The mechanism of role assignment enriches an agent and bounds the agent to the social expectation and the other agents to role holder if they want to access to the role powers. The same mechanism of social characterization is involved when it is defined a social aspect of some entity. The meaning (interpretation) of social objects is always a message about other entities: social objects talk about something or someone. From this perspective a social object is a "social characterization" of other social objects, physical objects, agents or ideal objects.

The second mechanism we need is the one used to transfer the meaning between social objects or the construction of the meaning of social objects from other social objects. Social objects are instances of models that gives part of the meaning to the object, for instance we can another example about contracts:

Example 3. [Contracts 3] A selling contract between two agents a_1 and a_2 of an object o relies of the idea of "contract": it does not need to contain all details about the meaning of contracts, signatures or selling but only the information about the two parties a_1 and a_2, the object o and other contingent details.

To catch the mechanism in the previous example we need to extend the social ontology, in particular we need the relation between model and social object, e.g. the model of contracts and a contract between a_1, a_2 for o.

The mechanism of social characterization can be expressed using the "represent" relation if it is extended allowing the representation of agents. In order to represent roles, it is also required to catch the model/instance dynamic introducing a relation between models and social objects. The transferring of meaning using models is the base of the incremental growth of social structures. Norms involving a role can be considered incremental descriptions of the role. We can consider again an example about contracts.

Example 4 (Contract 4). Considering the example 3 we expect:

(1) several norms about contracts temporally and hierarchically ordered,
(2) examples of standard contracts made between different parties,
(3) examples of special contracts made, for instance, for real estates,
(4) examples of real estate selling contracts between different parties.

The contract as described in norms (1) is a model for the contracts (2) but also a model for a specialized contract for real estate (3). The real estate contract (3) is a model for the contracts (4) even if it is not considered yet a standard model of contracts (3) or in court it is found illegal. There is a connection between (1), (2), (3) and (4) created through an abstraction process from a specific social object to a concept used as model for a new social object. For each step of abstraction and use, models involve agents' interpretation about what is the model of contract (1) according with the current norms (an conflicts),

what they consider in those contracts (2), how a contract should be extended for real estate (3) and what take in account from contract (1) and real estate contract (3) in order to make single contracts (4).

To represent the contract scenario it is requires a "model of" relation between concepts and social objects. For instance a social objects (a norm) "represent(s)" a role as abstract object (agent interpretation of the role) that is "model of" the assignment of the role to a specific agent.

4 A Social Ontology of Roles

Now we apply the discussion in section 3 introducing important changes to the recalled social ontology. First of all, we revise the assumptions behind the current version of the social ontology. In legal systems the type and number of inscriptions actually matters[1]. For instance the different copies of a document can have different normative status such as an original compared to a copy. Physical objects can give support to social objects, figure 1 summarizes the required social ontology changing the relations.

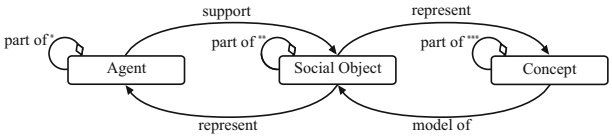

Fig. 1. Conceptual extension of the social ontology for models and roles

In this new version of the social ontology, agents and physical objects can both "support" social objects, agents' memory is a form of inscription. In this set up agents' actions and inscriptions are equivalently described with the relation "represent". Still there are differences between agents and physical objects in particular in term of "support", in this set up it is still possible to distinguish two types of support considering the two class types "physical object" and "agent". Agents' memory cannot be considered just an inscription for two reasons:

1. agents' memory embodies also their own evaluation of the objects, so it can be more or less important according with the type of reasoning footnoteFor instance during a trial a witness can considered more or less important than a signed document according to the context, the trial and the witness.;
2. physical object are not necessary to create social objects while agents are.

Summarizing we consider "agent" a specialization of "physical object" in order to make distinction among them defining interpretation theories.

[1] Considering digital media inscriptions are not important, they are always digital and in multiple copies across the web.

4.1 Creation of Models

The last issue we need to address is about the relation between models and entities. In society models change over time, that is possible because their current use: a model meaning is the result of its instances. On the other hand, legal models are defined through formal acts[2] and they can change also through new formal acts.

Physical objects and agents have their own life cycle independently from society. Differently, models are shared, they can survive their instances single objects and they can also be defined. Now the question is which kind of entity a model is? Social objects are social representations but they also have a life cycle involving their inscriptions (as physical objects) and their meaning (related to agent interpretations). Ideal objects represent shared concepts without time and a specific definition: they refer to a meaning that changes with the context. For instance consider the "rights", the meaning in court is different from its moral meaning but still "right" is a used and understandable concept. "Rights" as ideal object can represent different models of good behaviour in different domains because its meaning can be replace by agents' interpretation. This effect is what we want to represent, so we conclude that be a model is a relation between "model of" relation need to be defined from "ideal object" to "social object". Following the interpretation of a social object is a grounding problem. Now we describe how our model works considering a semiotic perspective and the Peirce's triadic signs:

a. an entity can be represented with a social object, for instance considering a physical object as the "object", the inscription of social object (i.e. the communication) is the "signifier" while the meaning of the social object is the "signified", figure 2 (a).
b. considering the abstraction of a concept used in social objects, a set of social object inscription are the "object", the ideal object referred by them the "signifier" and the meaning given to the ideal object (the result of the social object interpretation) the "signified", figure 2 (b).
c. an ideal object can be used a model of new social objects, the "object" is the meaning given to an ideal object (figure 2 (b)), the "signifier" is the social object inscription and the "signified" is the meaning of the social object, figure 2 (c).

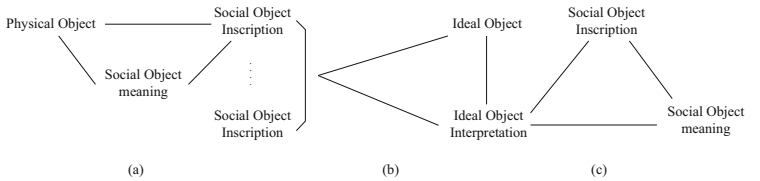

Fig. 2. The creation of meaning with social ontology, three semiotic cycles: (a) from physical object to social object, from a set of social object to concepts and (c) from concepts to new social objects

[2] It is easy to find example where social models are quite different from legal models, for instance contracts can offer quite anti-intuitive cases.

In this scenario, ideal objects represent agents' interpretation of social objects: they stand for the meanings used by agents. Any entity can be used to create social objects, for instance, an agent *a* playing a role can be the example for its successor: the some aspects of the predecessor's behaviour can be selected and become the meaning of the role as model. Summarizing, a model can be created from agents or physical objects in two steps: 1) interpretation step, from any "agent", "physical object" or "ideal object" to a "social object"; 2) abstraction step, from a "social object" to an "ideal object". Concluding, "agent" are not considered a specialization of "ideal object" but still they can be source of models through the creation of social object and them ideal objects.

4.2 Extended Social Ontology

In figure 3 is represented the extended social ontology. First of all, the class "concept" is split back in "ideal object" and "physical object". In [1] is used a class "Time" as specialization of "ideal object", we indicate "Time Interval" as specification of "ideal object". The class "agent" is a specialization of "physical object" represented with the relation "is-a".

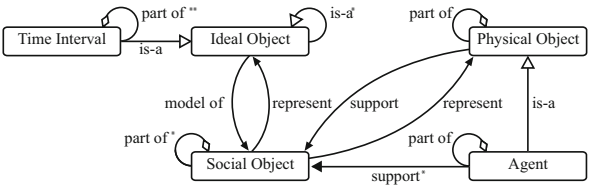

Fig. 3. The new social ontology extended with entities and relations

Relations changes as follows:

a. as consequence of splitting concept, the relation "represent" is defined from "social object" to "ideal object" and from "social object" to "physical object";
b. now the relation "support" is defined in general from "physical object" to "social object", with "support*" we indicates agents' support that involves actions and evaluation of social objects;
c. the new "model of" relation is from "ideal object" to "social object".

We do not discuss the details of the "part of" and "is-a*" relations, we will recall the general idea of this abstract model and give an intuition of the meaning of such relations.

The authors of [1,20] do not present a specific proposal for the "part of" and "is-a*" relations. The reason is that for each perspective in which norms can be looked at there are several specific formalisms. An abstract representation is required to represent the whole concept of norm while the specific formalism is required to reason about the specific aspect. Furthermore the semantic of the relations should chose considering the capability and level of details of possible tools for document analysis. We indicate the "part of" and "is-a" relations in order to provide some further considerations:

is-a relations is used to indicate "agent" as specialization of "physical object" and "Time Interval" as specialization of "ideal object", the consequence is only relation inheritance.

part of is used to describe agents groups (a group is an agent composed by agents), and physical objects like the wheels of a car.

is-a* abstracts the ontology relations, ideal objects are considered external entities from specialist ontologies with their own relations.

part of* abstracts the structure of social objects. Due to the big difference that can be found in non linguistic and linguistic documents (like paints and contracts), it is difficult to specify a set of possible semantic relations. Considering juridical entities, social objects have linguistic contents so a proposal can to use relations from semantic networks like kl-one or conceptual graphs[21]. Thus, there are norms aspects such as prescriptions that can be represented with more specific formalisms like deontic logic.

part of** represent all the possible relations between time interval such as Allen's interval algebra[22].

Now we define the network of social object and the social-object graph ignoring the class "Time Interval" and considering the "part of" relations as general relation among nodes of the same class.

Definition 1 (social object network). *Let be $G_S(V,E,\varphi)$ a directed graph with:*

V *set of nodes with* $V^1,V^2,V^3,V^4 \subseteq V \mid V^i \cap V^j = \emptyset \; \forall i,j \in [1,4]$
E *set of directed edges* (v_k^i, v_q^j) *with* $v_k^i \in V^i, v_q^j V^j, ij$ *and* $i,j \in [1,4]$
$\varphi : V \to [1,4]$ *function assigning a label to each vertex* $v \in V$

We call $A = V^1$ set of agents, $S = V^2$ set of social objects, $I = V^3$ ideal objects ("Time Interval" included) and $P = V^4$ physical objects. Considering the edges E, we call

support relations is the set of all edges $(v_k^i, v_q^2) \in E$ *with* $i \in 1,4$
represent relations is the set of all edges $(v_k^2, v_q^j) \in E$ *with* $j \in 1,3,4$
part of relations is the set of all edges $(v_k^i, v_q^i) \in E$ *with* $i \in 1,2,4$
is-a relations is the set of all edges* $(v_k^3, v_q^3) \in E$

Following we define the social object graph over a root $s \in S$. The social object graph contains the social objects connected to s, all directly connected group of agents and ontologies of physical or ideal objects.

Definition 2 (Social object graph). *Let be $G_S(V,E,\varphi)$ a social object network and $s \in S$ a social object $G_s(V_s,E_s,\varphi)$ is called social object graph of s and it is defined as follows:*

$G_s \subseteq G_S$
$V_s^1 = \{v_k^1 \in V \mid \exists$ *path from* v_k^1 *to s or from s to* $v_k^1\}$
$V_s^2 = \{v_k^2 \in V \mid \exists$ *path from* v_k^2 *to s*$\}$
$V_s^3 = \{v_k^3 \in V \mid \exists$ *path from s to* v_k^3 *or from s to* $v_k^3\}$
$V_s^4 = \{v_k^4 \in V \mid \exists$ *path from s to* v_k^4 *or from s to* $v_k^4\}$

$$V_s = \cap_{i=1}^{4} V_s^i$$
$$E_s = \{\forall (v_k^j, v_q^i) \in \exists \mid v_k^j, v_q^i V_s\}$$

Those definitions overrides the definitions in [1] consenting to build the same representations and use.

5 Reasoning about Norms and Roles

In order to reason about roles we need to represent both norms and principles. Principles are social objects connected to norms in the same way as roles are connected to norms. The relation between principles, norms and roles follows the schema presented in section 3. For the sake of compactness, in the next examples we focus only on the relations between agents, social objects, physical objects and ideal objects omitting their structure and the relations among their components. What we show can be applied to the substructure of entities to build complex structures.

Now we present two examples, the first one is about the implementation of norms, or more generally it is about how create new social objects using concepts as models.

Example 5 (Chain of norms). In Europe every state need to implement European norms in their national normative systems and in some case this is extended at local level involving regions, public institutions, municipalities, etc. Usually European norms comes with an introduction about the goal and sources of the norm explaining the principles behind defining scope, goals, limits, etc. The legal texts of the national norms can be quite off from the goal and the scope of European normative. This distance increase with each step down to the local level.

Figure 4 (a) represents a chain of norms: a principle p promotes a norm n_1 implemented at national level with norm n_2 as result of an interpretation p' of n_1. Figure 4 (b)

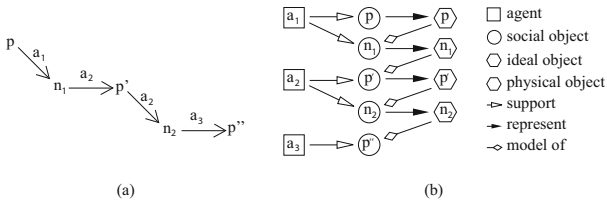

Fig. 4. (a) agent a_1 creates n_1 from p, agent a_2 interprets n_1 as p' and creates n_2 from from it. An agent a_3 interprets n_2 as p''. (b) agent a_1 is responsible for converting principle p into n_1, agent a_2 for using its interpretation p' of n_1 to create n_2. If an agent a_3 what to use n_3 it will be do it on the base of its own interpretation p''.

shows how to represent the chain as a network of social objects: when a norm in been implemented ($p \rightarrow n \rightarrow p'$) agents' interpretation occurs ("support" given to a social object) the ideal objects stands for agents' interpretations used in the social object

Evaluating the distance between principle and effects of norms involves several interpretation steps. Considering the previous example, the comparison require to check p and p': a) n is been created interpreting p, the "model of" indicates the passage from an ideal concept to a social object with a specific use of it; b) p' is also an interpretation of n effects. Every step from ideal objects to social objects is the result of an interpretation of the involved ideal objects. Roles use the same mechanism with more steps. The evaluation of agents "playing" roles is usually made considering norms as set of rules. In this set-up the whole process from principles to agent' actions is involved. This enables several different type of reasoning, for instance the miss-use of powers, handling the conflicts between roles, the role scope and much more than norm compliance.

Finally, the in this last example we discuss the relation between roles and principles:

Example 6 (The principles behind roles). The role of teacher involves the mission of "education" but schools regulation sets rules on measurable parameters like teaching hours and students rates. Good teachers end up doing extra work and being involved with students family to pursue the educational goal of their roles even if it there is not a within rules. Society evaluate more important the teachers' attitude than their compliance to school rules forgiving some rules breaking. On the other hand bad teachers will not be forgiven for even small rule brake that can also become a pretext to fire them.

Considering a, Figure 5 (a) represent a role r defined through a norms n and an agent a empowered with a role r creating a social object o like a norm or employment contract.

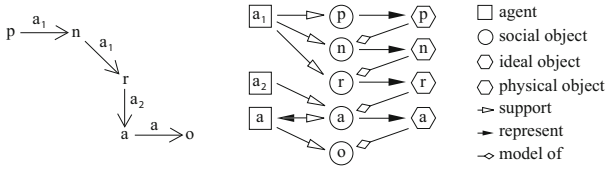

Fig. 5. (a) agent a_1 creates a norm n defining the role r, agent a_2 assigns r to agent a and a creates the document o. (b) agent a is connected with a double arrow indicating a "represent" relation to assign the role r to agent a and the "support" give by agent a to the assignment of role r.

This scenario can be represented with the network in figure 5 (b). The principles p of role r are inherit from n, r is also the result of interpretation of n content. The result of agent's action o can be compared respective with p, n or r according to the scope of the evaluation

6 Concluding Remarks

In this contribution we discussed the creation of models and roles in legal systems. In particular we addressed the relations between roles, norms and principles. The result is

an ontology to build representation of social entities related to normative systems. The presented ontology is not an upper ontology but it is inspired to social object theory and sociology of law.

The presented ontology follows a discussion about the role and models in normative systems. In particular we focused on how roles are created from legal norms and what is the influence of agents' interpretation occurs. Reasoning about norms and roles required the introduction of models and the exposure of the mechanism behind the chain connecting principles, norms and roles. The ontology of social objects allows the representation the mechanisms involved in roles dynamics:

1. About the social characterization of agents and other entities, we addressed the mechanism of "social characterization" of entities using the "represent" relation. In particular we discussed what can be represented with social objects and consequently extend the "represent" relation to agents.
2. The creation of models was described with a two-phases mechanism: 1) social characterization and 2) abstraction of social objects as ideal objects. Therefore we extended the social ontology with the "model of" relation enabling the construction of complex chains of social and ideal objects.
3. Using the "model of" and "represent" relations, we described the assignment of roles and how a specific assignment is related to the general meaning of a role.
4. The connections between principles and norms can be represented with the social ontology consenting also many pattern of legal reasoning. The ontology consent to represent the steps between principles and norms in a normative system. Also it shows with agents' interpretation is involved in each step.

The general approach we use is intent to avoid strong assumptions in knowledge representation, to combine together representations in different formalisms about different aspects of entities and to allow different kind of reasoning. We proposed an abstract representation that do not require to address the vagueness of norms. Moreover it distinguish the representation from the interpretation and use of norms. The goal of this approach in general is to focus on the creation of the social reality along with the legal systems instead of focusing on a specific aspect on law (obligations, arguments, rule revision, etc.)

This proposal is mainly based on the prospective of sociology of law. This systematization of model dynamics will be analysed and validated considering primary law practitioners. We plan to include the model in the norm management system Eunomos[23]. It can be extended according to our proposal in order to enable a wider use, recognising different prospective according to the user role. For instance a lawyer can use a norm database to find norm exceptions based on the interpretation of principles, or based on cases of use in courts[3]. In future development we will focus on extending the idea of ontology dynamics showed (the creation of concepts), on defining a semantic for graph operators a methodology for a quantitative comparison between social objects.

[3] Two cases involving the concepts of norm principles, model and roles discussed in this contribution.

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