

Application of a knowledge-based ontology of the legal domain in collaborative workspaces

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ABSTRACT

Legal ontologies are generalised conceptual models of specific parts of the legal domain. They provide stable foundations for knowledge representation. The ontology presented in this paper is based on an analysis of the relation between the legal domain and knowledge about that domain. It is explained how knowledge in the legal domain can be analysed in terms of three dimensions (acquisition, object and justification), and how these dimensions can be employed in alternative designs for collaborative workspaces.

Keywords

Legal epistemology, legal information systems, ontologies, collaborative workspaces

1. INTRODUCTION

‘Knowledge’ is a key term in AI & law research. It takes a central place in the representation of the legal domain, because a large part of that domain consists of (or is constituted by) knowledge. As such, the value of knowledge is unchallenged. Still, on many occasions, the relation between knowledge and the domain it is about remain obscure. The same is valid for the characteristics of knowledge. The research described in this paper is a follow-up to earlier work on legal ontologies (*cf.* [5], [7], [11], [15]). It is an attempt to take a closer look at what legal theory can contribute to the analysis of the concept of knowledge in the legal domain. It does so in order to unveil the meaning of this concept, considering such phrases as ‘legal knowledge representation’. Often, knowledge representation refers to the representation of elements of the legal domain and relations between these elements, rather than to knowledge about these entities and relations. An analysis of the difference between knowledge about a domain and the domain itself can help to prevent conceptual confusion. Thus, it may prove relevant to a well-founded legal ontology.

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In this paper, I explain the foundations on which the knowledge-based ontology is built. First, I explain three dimensions of knowledge that constitute the basis for the ontology (section 2). Second, I discuss the role and value of knowledge in a model of the legal domain, and the basic constituents of the model (section 3). Third, I provide an explanation of the practical relevance of the ontology (section 4). Finally, I pay attention to further research (section 5) and I provide a conclusion (section 6).

2. THREE DIMENSIONS OF KNOWLEDGE

To elaborate on the role that the concept of knowledge plays in the legal domain, I start from two relevant disciplines: ontology and epistemology. Ontology scrutinises the existence of (legal) entities, such as rules, norms, and legal institutions, and the dependencies between these entities. Epistemology regards the acquisition, object and justification of knowledge. Together, ontology and epistemology can provide an integrated view on the legal domain, thus facilitating the representation of knowledge. Below, the three dimensions of knowledge are discussed: acquisition (subsection 2.1), object (subsection 2.2), and justification (subsection 2.3).

2.1 Acquisition

Knowledge can be acquired from various sources, for instance through the sources Audi [2] lists: perception, memory, consciousness, reason, and testimony. Although legal knowledge may arise from the same sources, the focus is somewhat different. This applies especially to the content sources of legal knowledge, *i.e.*, sources that are classified because of their content rather than by the acquisition method employed. These are the so-called knowledge sources for the law. The content of legal knowledge is often derived from formal and material sources of law. In the Dutch legal system, formal sources of law are, according to Algra and Van Duyvendijk, statute law, treaties, and legal precedents [1]. Customary law is often also considered a formal source of law.

Material sources of law are the origination sources of law, *i.e.*, those factors that contributed to the drafting and interpretation of positive law. Material sources of law themselves cannot be reduced to legal rules or legal norms. They form, however, the grounds for those rules and norms. For instance, as soon as a judge has made a decision in a case, and he has based his decision partly on the consequences his decision will have for the social structure (socio-economical developments constitute a material

source of law), he establishes a verdict (a legal precedent is a formal source of law). Material sources of law are, for instance, political powers, pressure groups, religious beliefs, and moral beliefs.

Knowledge sources for the law are the sources through which we acquire knowledge about the law. Acquiring (explicit) knowledge about the law requires us to know two properties of the law: its *content* and its *validity*. Knowledge about the two properties is acquired in different manners for different legal-philosophical stances. In a legal-positivist stance, formal sources of law largely coincide with valid law. Thus, if one acquires knowledge of the formal sources of law, one will acquire knowledge of both the *content* and the *validity* of law. In a natural-law stance, however, this is not necessarily the case; the validity of law is also determined by principles that are not part of the system of positive law, and thus are not part of the formal sources of law. Thus, the reconstruction of the acquisition of legal knowledge depends on the legal-philosophical stance taken.

2.2 Object

Knowledge generally is *about* something. It reflects some view on how things relate to each other in reality. For instance, knowledge is about the weather, a book, or a judgement. In that case, the weather, book, or judgement forms the *object* of knowledge. The main difference between the object of legal knowledge and the object of regular knowledge, is that the object of legal knowledge largely consists of intangible institutions and entities, which brings about the danger of a confusion of the object of knowledge and the knowledge itself.

I discern two categories within the object of knowledge about the legal domain. The first object category is *legally-relevant*, the second object category is *legal*. The objects within the first category are situations in the world that are relevant for the legal domain, *i.e.*, entities, facts, acts, and practices that have not (yet) got assigned a legal status. The objects within the second category are situations in the world that are part of the legal domain, *i.e.*, entities, facts, acts, and practices that have been assigned a legal status. For instance, the object category of knowledge about the fact that John hit a pedestrian with his car is not legal. However, the object category becomes legal whenever the fact has the assigned legal status of criminal negligence.

The confusion of knowledge with the object of knowledge often starts when the object of knowledge is intangible: if it arises from reasoning or interpretation, or if it is an artifact resulting from social conventions. Whereas it is easy to distinguish the situation that John hits a pedestrian from the belief 'John hits a pedestrian', it is somewhat harder to distinguish an interpretation from a belief about that interpretation. The reason for this is that interpretations are not objects in the same way as we can regard, for instance, toys as objects: we cannot hold, feel, and look at interpretations from different angles (*i.e.*, not literally), whereas in the case of toys, we can. We construct interpretations ourselves, and by doing this we 'make' knowledge. At the same time we add something to the world: a new interpretation, a new object of our knowledge.

2.3 Justification

Justification amounts to those circumstances in which the content of some entity or behaviour is sufficiently defended. Such a defence can be given in an explicit way: in terms of reasons for the content of an entity, or a proof of the content of the entity. A de-

fence can also be given in a rather implicit way, for instance by establishing a high chance that the belief is true. Justification thus consists of all those factors that make us *believe* something. Justification is found in several forms. The typology I give in this subsection is partly based on Audi ([2], p. 2-3). I distinguish three main types of justification: justification as a state, justification as a process, and justification as a status.

The first main type of justification is justification as a state. It refers to a situation in which an entity is justified, or in which a person is justified in believing something. A distinction of subtypes of justification as a state is possible on the basis of the entity that attains the state of justification. This entity can be a belief, a person, a proposition, or a situation. For instance, if there are sufficient reasons for justifying a proposition, that proposition is in the state of being justified. The second main type of justification is justification as a process. A state of justification can, but need not be, the result of a successful process of justification. Such a process may consist of exchanging reasons, or applying certain rules, or any series of acts that aims at accomplishing a state of justification. For instance, the different steps in a penal trial among others aim at reaching a clear picture of the actual facts. The rules that govern this process let the different parties present and explain their stances, and by presenting the evidence and responding to each other, ideally relevant and true statements are made as a conclusion. The third main type of justification is justification as the status of an entity. It refers to the justifying role an entity can play. For instance, a fact can be qualified as a reason, and then its justifying role is based on a status layer of the fact. In the example given above, the fact that Mary's name is in the marriage register can be qualified as a reason for believing that Mary is married. Because it has the status of a reason, it performs a justifying role with respect to the belief that Mary is married.

All three justification types are found in the legal domain. Some of the instances of the types are actually institutionalised in the law. An example of justification as a state is the legitimate character of evidence (which is attained by acquiring evidence in a lawful manner). An example of justification as a process is the application of parts of civil procedural law, which guide two parties in exchanging arguments. An example of justification as a status is the legitimising force a piece of evidence exerts towards a conclusion (*e.g.*, evidence for finding a suspect guilty).

3. CONSTITUENTS FOR A MODEL OF THE LEGAL DOMAIN

The knowledge-based ontology leaves open the possibility of expressing different views on the role of knowledge and the existence of entities in the legal domain. On a theoretical level, this enables us to avoid taking a stance in the legal-philosophical debate prior to building the model. In this sense, the model developed may be called a 'meta-ontology' of law – it allows for different views on what knowledge in the legal domain actually amounts to. On a practical level, the model allows for a detailed description of the context of knowledge items – how they are acquired, what they refer to, and how they are justified. To attain this, the model distinguished between ontological status layers and epistemic roles. The ontological status layers allow for different views on the existence of entities in the legal domain, and the epistemic roles allow for expressing different views on what knowledge amounts to. In subsection 3.1, the value and utility of

the knowledge concept are discussed. In subsection 3.2, the elements of the model are further explained. In subsection 3.3, I discuss epistemic roles.

3.1 The value and utility of knowledge

The relevance of knowledge about the legal domain is twofold. First, there is the utility of knowledge. Compared to mere belief, knowledge can be used as a reliable ground for behaviour. It may also serve as a means of gaining authority relative to those only having belief. In the legal domain, knowledge provides grounds for authoritative decisions. Rather than basing one's decision on relatively unreliable beliefs, the basis for one's inferences should be knowledge. Second, attaining knowledge is a goal that is worth aiming at as such, regardless of its utility. An argument with this content is put forward by Finnis ([3], p. 59-80). He claims that the pursuit of knowledge is a value, in the sense of a good: a goal that is worthwhile independent of any further utility in the achievement of survival, power, and popularity. The value of attaining knowledge is a principle of practical reasonableness, Finnis claims. It provides us with a direction in which we can lay out lines of argumentation. It can be used to generate new principles, and to direct the application of rules. In his discussion of the value of knowledge, he emphasises the importance of truth. Having knowledge presupposes truth, whereas beliefs can be true or false. Knowledge and truth are very close relatives, if we may regard the following quotation as representative of Finnis' opinion on the matter ([3], p. 61):

“In explaining, to oneself and others, what one is up to, one finds oneself able and ready to refer to *finding out, knowledge, truth* as sufficient explanations of the point of one's activity, project, or commitment.”

Finnis regards the value of knowledge as a self-evident principle. He asserts that self-evidence of some principle has little or nothing to do with our feelings of certitude about that principle. Rather, he claims, the self-evidence of a principle shows itself in its employment as a criterion for the assessment of feelings. A principle such as worthiness of knowledge cannot be proved. It can be adopted, though, on the assumption that its employment is fruitful, or rather, that, if it is not adopted, rational discourse becomes hard or impossible. In sum, legal knowledge is a better starting point for making inferences (the utility argument), and it is worthwhile in its own (the value argument).

Knowledge, I claim, may be regarded as the mark of a quality stamp. It is a mark of approval; it says that a belief or a skill conforms to a set of criteria, and that it deserves to be called 'knowledge' for that reason. The applicable set of criteria depends on the type of entity that we wish to qualify as knowledge, and the context in which we encounter that entity. For instance, if we wish to qualify a belief about the whereabouts of a suspect as knowledge, we may demand that this belief is true. However, if we wish to qualify a belief about the value of a piece of circumstantial evidence as knowledge, we demand that this belief is justified rather than true. Knowledge is a value predicate, a way to express the worthiness of an entity.

Representing knowledge thus requires to make explicit the criteria by which the represented entities deserve their qualification as knowledge. These criteria may apply to the acquisition, object and justification of knowledge. Thus, they do not only concern the content (object) of knowledge, but also the sources of knowl-

edge (acquisition), and the reasons there are to believe its content (justification). Together, the criteria provide a framework for assessing whether to assign the quality mark. What is more, they provide valuable additional information on represented knowledge. For that reason, the concept of knowledge is useful, even if its meaning does not conform to the traditional view of having one set of criteria that determines all possible instances of the concept.

3.2 Basic categories of the knowledge-based model of the legal domain

In most existing models of law, there is no clear distinction between knowledge about the legal domain on the one hand, and the legal domain itself on the other hand, or there is focus on only one of the two elements. Knowledge about the legal domain may play two roles: as the object of a model of the legal domain (represented by the arrow between boxes 1 and 2 in Figure 1), and as a potential part of the legal domain (because of the mutual dependence between knowledge about the legal domain and the legal domain itself, represented by the arrow between boxes 2 and 3 in Figure 1).

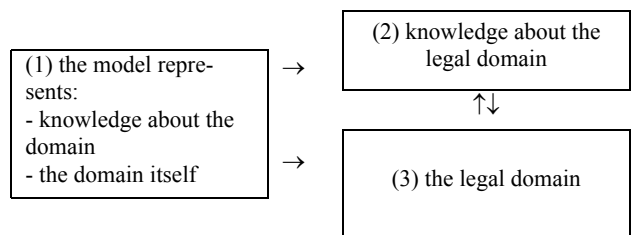


Figure 1. Distinction between model, knowledge and domain

An ontology specifies what elements and relations we can find in the legal domain. As a consequence of incorporating the concept of knowledge, the resulting ontology caters for the need to express relevant characteristics of knowledge about the legal domain. In Table 1, I give an overview of main types and subtypes present in the knowledge-based model of the legal domain. The basic types and subtypes represent categories of things and phenomena that are typical of the legal domain.

Table 1. An overview of the knowledge-based ontology

| Type | Legally-relevant | Legal |
|----------------------------------|--|---|
| <i>Entities</i> | sentences statements propositions beliefs artefacts rules concepts | legal rules legal principles legal norms legal decisions legal systematisations judicial interpretations judicial classifications legal concepts |
| <i>Ontological status layers</i> | existence constitution recognition | legal efficacy legal validity legal recognition |

| Type | Legally-relevant | Legal |
|------------------------|---|---|
| <i>Epistemic roles</i> | reasons defeaters factual knowledge practical knowledge | factual legal knowledge practical legal knowledge |
| <i>Relations</i> | causation counting as recognition | legal causation legal counting as legal recognition |
| <i>Acts</i> | applying rules making decisions making systematisations making interpretations making classifications | applying legal rules making legal decisions making legal systematisations making judicial interpretations making judicial classifications |
| <i>Facts</i> | brute facts recognised facts conventional facts institutional facts | recognised legal facts conventional legal facts institutional legal facts |

Although I will not go into all individual elements of the ontology, some words on its main types ought to clarify the model. Entities are basic objects that are encountered in the legal domain. They may be assigned certain characteristics in the form of ontological status layers and epistemological roles. Ontological status layers are the existence characteristics of legally-relevant and legal entities, acts, and facts. Epistemic roles are claims regarding objects, signifying their function in acquiring or justifying knowledge. Relations express interdependencies among phenomena. A relation may state the consequences of some event, or impose new roles on existing objects. Acts indicate the operations of individuals and institutions in the legal domain. Facts involve objects, the characteristics of those objects, characteristics of characteristics, and relations between objects and between characteristics. They express the attributes of entities, individuals and institutions, or the relations between them. The core of the ontology is found in the ontological status layers and epistemic roles, as they represent the characteristics regarding the existence and knowledge status of entities.

3.3 Epistemic roles

As explained before, ontological status layers and epistemic roles form the core of the ontology described in this paper. As the ontology aims to accommodate different views on existence and knowledge in the legal domain, it has to provide for the means to represent these views. In this section, I discuss epistemic roles, as they play a major role in the practical application proposed in section 4. Epistemic roles are claims regarding objects. They have two functions. Either they signify the function an object has in granting the knowledge predicate to a different object, or they signify the knowledge predicate itself. The former function is fulfilled by the epistemic roles *reason* and *defeater*, the latter by the roles *factual knowledge* and *practical knowledge*. If an object (e.g., a belief) has *reason* as its epistemic role, it supports the content of a statement, i.e., the object functions as a means to make us believe the statement. Therefore, it helps to turn the statement into knowledge by contributing to its justification di-

mension. Thus, the epistemic role of one item may help to establish a different epistemic role for another item.

Reasons – Reasons are statements, propositions or facts that are employed for the explanation or justification of some other statement, proposition or fact (cf. [6]). Each reason has a content (its meaning relative to its subject and object), a subject (a person, a group of persons or an authority, or there is no subject at all), an object (a belief, an action, a decision, a classification, an interpretation, or another reason), and a specific relation between subject and content (believe, constitute), and between content and object (explanatory, guiding).

Defeaters – A subclass of reasons is formed by defeaters. Defeaters are negative reasons, i.e., they attack some belief or reason in such a way that it is no longer correct. A special class of reasons is formed by defeaters. Defeaters undermine reasons. Defeaters that directly attack the conclusions of an argument are called ‘rebutting defeaters’. Defeaters that attack the relation between a reason and its conclusion are called ‘undercutting defeaters’. With an undercutting defeater, the assumption is challenged that some statement or fact is indeed a reason for a conclusion ([12], p. 196). Just as reasons, defeaters can be classified according to the distinctions made above. A defeater has a content, a subject, an object, and there is a specific relation between subject and content, and between content and object. The specification of a defeater in terms of these characteristics is thus comparable to the specification of a reason.

Factual knowledge – The epistemic role ‘factual knowledge’ is granted to an entity if that entity complies with certain so-called knowledge criteria. Suitable entities are beliefs, statements and propositions. Knowledge criteria regard the acquisition, object and justification of knowledge. Reliability of acquisition, the truth relation between knowledge and its object, the coherence of a system of beliefs, and the justification of the content of knowledge together support the granting of the knowledge predicate. Factual knowledge concerns those parts of knowledge whose content can be expressed in a natural language. For a discussion of knowledge criteria, cf. [9], [10].

Practical knowledge – The epistemic role ‘practical knowledge’ is granted to those entities that comply with certain demands. Unlike factual knowledge, practical knowledge does not apply to well-described entities. Instead, it applies to certain skills and competences, for instance to the assessment capabilities of a judge, or the pleading skills of a lawyer. Criteria for such knowledge are somewhat harder to determine, as the acquisition, object and justification dimensions are unclear. Rather than an existing object, against which knowledge can be tested, practical knowledge often produces new objects. The acquisition dimension thus becomes a production dimension, which can still rely on the reliability criterion. This applies especially to the legal domain, in which the ability to defend or assess a case, or to make a judgement, heavily depends on the experience of a legal professional.

4. PRACTICAL RELEVANCE OF A KNOWLEDGE-BASED ONTOLOGY

The link between legal theory and legal practice is not made very often, and maybe even less so in AI-and-law research. The ontology described above offers such a link – to a certain extent. It describes how basic roles of knowledge are accommodated in a conceptual model of the legal domain. Thereby, it helps contextu-

alising knowledge – to provide relevant background information on the content of legal information systems. The relevance of the distinctions explained in this paper is summarised in the following elements:

(1) The distinction, within the ontology, between factual knowledge, practical knowledge and the legal domain caters for the need to maintain, as far as possible, a clear dividing line between knowledge and its object, which applies to the content of information systems.

(2) The relevance of a view on knowledge is to acquire and process knowledge in the legal domain in an effective manner. A clear concept of knowledge is a prerequisite for using and processing knowledge in legal information systems as well.

(3) The main dimensions of knowledge are relevant to provide useful contextual meta-information on acquisition, object and justification. In most cases, knowledge in legal information systems is provided without such information, so that the user has no opportunity to assess its quality.

The different types of information on the nature of knowledge and the status of objects can thus help to fulfil the information needs of individual users. They can also provide a more natural embedding of functions in a legal information system with respect to a given legal tradition. Epistemic roles are translated into practical criteria that connect to a legal tradition: criteria for the practical status of legal rules, and the usability of knowledge.

The relevance of distinctions, metadata and criteria relating to the knowledge-based ontology covers part of the range of legal information systems (*cf.* [8]): authoring systems, database systems, and knowledge-based systems. Systems that process or make available information generally offer the opportunity of making use of meta-information. I distinguish between two types of meta-information. The first type enables unambiguous (automated) communication about elements, such as issuing information about legal rules, and is defined in, for instance, the MetaLex standard (for Dutch legal information). The second type is aimed at the content of elements, and concerned with the way in which these elements may be used in practice. Below, I discuss an application type in which the analysis of knowledge can be usefully employed (subsection 4.1), and a functional outline of such a system (subsection 4.2).

4.1 Collaborative workspaces

A potential field of application for meta-information is formed by collaborative workspaces. If we take a closer look at the development of such applications, we can discern a development towards mechanisms to value individual contributions and contributors. The attitude of workspace participants towards a contribution may be expressed in valuations and justifications of those valuations. These valuations may be backed by profiling information on a collaborative workspace member, establishing a reliability profile for that member. This profile can be used by others to determine whether they are inclined to believe and use the contribution.

In a legal context, much of the work on doctrine may well benefit from the interaction among different academic lawyers and practitioners – where it is now almost exclusively the domain of specialists making individual contributions to a relatively small number of journals. Interaction opportunities are present, but they are slow and reserved for a limited number of legal professionals. The combination of collaborative workspace techniques with the ele-

ments of the knowledge-based ontology may form a fruitful environment for knowledge development and enhancement in the field of legal doctrine.

With respect to the three dimensions of knowledge, the opportunities take the following form. The acquisition dimension may, for instance, require participants to indicate how they have acquired the information they use in their arguments (the origination source of the information), so that other participants can establish the reliability of that information. The object dimension may, for instance, require a clear indication of the content source of the information, enabling other participants to check such sources and to assign value to them. The justification dimension requires participants to argue their positions and their comments on other participants' contributions.

The justification dimension has been subject of extensive research (*cf.* [4], [6], [13], [14]). A collaborative workspace environment offers the opportunity to use meta-information on the acquisition, object and justification of knowledge to direct the interaction between participants towards a satisfactory result, in fact, towards the *construction* of knowledge. Implementing criteria relating to the three dimensions of knowledge thus enables the support of procedural and substantive justification, while taking into account both the truth, reliability and coherence of the knowledge content of a system. As such, knowledge criteria may act as a guidance in the exchange of ideas about a certain legal issue, and form the main reference points for assigning value to those ideas.

4.2 Outline of functionality

The outline of a collaborative workspace system based on the three dimensions of knowledge is as follows. The basic elements distinguished are reasons, defeaters, conclusions (which may also be intermediate conclusions), annotations and participants. An annotation is the full text that is constructed from combinations of the other elements. Knowledge criteria can be valued with respect to each of the elements.

Table 2 (see next page) indicates the way in which the value for a knowledge criterion with respect to an element is determined. With respect to the reliability and justification criteria, elements are assigned a value between 0 and 1. With respect to the truth and coherence criteria, one of three values is assigned: for truth, the values are *true*, *false* and *not applicable*, and for coherence, the values are *coherent*, *incoherent* and *not applicable*. A brief explanation of the ways in which the values are determined follows below.

The reliability of an element (except for participants) is determined directly on the basis of the reliability value for the participant who introduced the element. Reliability is measured as a value between 0 and 1. The initial reliability of a new participant can be set by the other participants. Participants can earn a higher (or lower) score by the evaluation of their contributions by other participants. The reliability of a participant is calculated from (1) the number of positive and negative valuations and (2) the relevance of the elements for which the valuations are determined.

The value *true* or *false* can be assigned to an element (a reason, defeater or conclusion) by individual contributors under two conditions. These conditions are: the truth or falsity of an element ought not be disputed by a different participant with a certain minimum reliability score, and the reliability of the element itself ought to have a certain minimum value. Of course, the assignment

of the value *true* to an element only establishes the *assumption* that the element is true. If the assignment of the value is not disputed, this adds to the reliability of the participant.

Table 2. Valuations within a collaborative workspace

| criteria → ↓ elements | reliability | truth | coherence | justification |
|--------------------------|--|---|---|--|
| <i>reason</i> | equals reliability of the participant who introduced the element | assigned by participant | not applicable | valuation of justifying force with respect to a conclusion |
| <i>defeater</i> | equals reliability of the participant who introduced the element | assigned by participant | not applicable | valuation of rebutting force with respect to a conclusion |
| <i>conclusion</i> | equals reliability of the participant who introduced the element | assigned by participant if no defeaters present | not applicable | valuation of justification status |
| <i>annotation</i> | equals the average reliability of the participants | not applicable | valuation of coherence between the elements of the annotation | valuation of justification status |
| <i>participant</i> | equals the average valuation of participant's contributions | not applicable | valuation of coherence across annotations | valuation of being justified in taking a stance |

The value *coherent* or *incoherent* can be assigned to an element by individual contributors under two conditions. These conditions are: the postulated coherence or incoherence of an element ought not be disputed by more participants than it is supported by, and there ought to be a minimum value for the justification status of the element. If the assignment of the value is not disputed, this adds to the reliability of the participant.

The value for the justification criterion is either an initial value, equal to the reliability value for the participant who contributed it, or a derived value, based on the presence of reasons or defeaters for a conclusion. In both cases, the value can be adjusted by participants. In the latter case, the system calculates a justification value on the basis of justification values of reasons and defeaters pointing to the element at hand. In addition, the value of individual elements, and the justifying or rebutting force an elements exerts towards a different element, can be valued by participants by increasing or decreasing the assigned value.

An example of a calculation for a justification value is as follows. There are two reasons and one defeater for a conclusion. Reasons p and r have justification values with respect to a conclusion of respectively 0.8 and 0.7, defeater q has a 'negative' justification (rebutting) value of 0.3 towards the same conclusion. The initial justification value for the conclusion is calculated by a simple division of $(0.8 + 0.7 - 0.3)$ by 3 is 0.4. Because the combination of reasons does not necessarily lead to a higher degree of justifi-

cation, this is only an indicative value. Justification values can be adjusted by individual participants, but only to a certain degree, depending on their reliability value. The higher a participant's reliability, the more he or she can influence the justification value of an item.

On the basis of the valuation of different criteria with respect to a given element, the knowledge predicate can be assigned to those elements that comply with a certain fixed set of criteria, for instance a sufficient degree of reliability and justification. The knowledge predicate functions as a simple identifier for those elements that form the consolidated core of content of the collaborative workspace.

The work on an annotation is enabled by a number of possible moves: participants can introduce subjects, they can introduce reasons, defeaters and conclusions, they can comment on any of these, they can value an element, and they can recall an element. The value and predicate assignment guidelines described above constitute only a rough idea of an actual collaborative workspace, as such an environment should include a rule set that provides a stable discussion environment, in which new participants and participants with dissenting opinions still have a say.

5. FURTHER RESEARCH

Further research on the applicability of epistemological insights to collaborative workspaces in a legal context has to include an engineering component and an empirical evaluation, as the feasibility and practicability of a complex collaboration framework have to be proved in a test environment. The presence of a rewarding system (found in the valuation of contributions by peers) inevitably leads to strategic behaviour, which may induce the necessity to remodel the rule set. Additionally, other issues have to be addressed, such as whether participants should remain anonymous.

6. CONCLUSION

In this paper, I have explained the ideas on which the knowledge-based ontology of the legal domain is based. Starting from two disciplines, namely ontology and epistemology, I explained three dimensions of knowledge. The acquisition, object and justification dimensions of knowledge constitute a framework that lets us (1) distinguish between knowledge and its object, (2) determine criteria to assess the quality of knowledge, and (3) distinguish ontological status layers and epistemic roles to accommodate different views on legal knowledge. On the basis of an overview of the model of the legal domain, I gave an example of its potential application in a collaborative workspace environment.

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