

Views to Legal Information Systems and Legal Sublevels

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Abstract. This paper concerns the legal system and legal documentation systems, as well as their interconnectedness and introduces the idea of legal sublevels. Examples of legal sublevels are legal terms, ontologies, annotations, commentaries, etc. A sublevel is treated as a representation level of the legal domain. In terms of software engineering, a sublevel can be defined as a level of infrastructural services for several domains. This paper is a kind of exploratory research; an abstract theory is being developed. A key question is “What are the sublevels in law and legal informatics?” We also examine the concept of view and project the core and peripheral areas around the legal system onto Schweighofer’s 8 views/4 methods/4 syntheses model. We link the idea of sublevel with the notion of view.

Keywords: Interdisciplinarity · Legal data science · Legal documentation system · Legal meaning · Legal visualization · Visual navigation · View

1 Introduction

This paper is about (1) the legal system, (2) legal documentation and (3) their interconnectedness. A legal sublevel can be defined as a representation level of the legal system. Examples of legal sublevels are legal terms, thesauri, taxonomies, legal ontologies, annotations, commentaries, etc. Hans Kelsen, a prominent scholar of law, viewed legal terms from the standpoint of legal theory and denoted them ‘legally indifferent substrate’ (cf. Kelsen 1991, Chap. 16). Nowadays, particularly in the context of legal ontologies research (see e.g. Guarino et al. 2009), legal terms can be viewed from the standpoint of legal informatics and shared vocabularies.

From the standpoint of software engineering, a sublevel can be defined as a layer of infrastructural services for several domains (Fig. 1). The domains may be different representations of the legal system. Sublevels are horizontal layers and, therefore, contrast from vertical slices. A sublevel corresponds to a subsystem and leads to a framework that comprises horizontal and vertical interfaces. Sublevels can be compared

with horizontal layers of a more general matrix-shaped model, where vertical slices denote the branches of engineering such as aerospace engineering, automotive engineering, electrical engineering, chemical engineering, mechanical engineering, etc., and horizontal layers correspond to the features such as quality engineering, reliability engineering, safety engineering, etc.

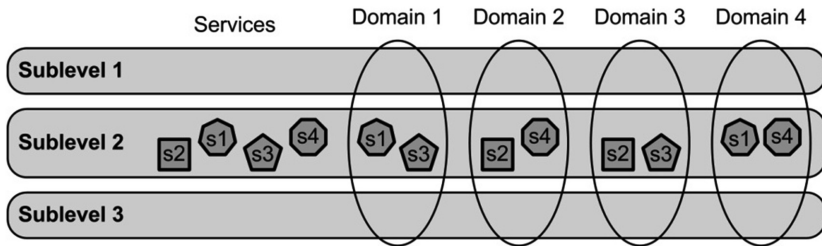


Fig. 1. A sublevel is defined as a layer of infrastructural services

Both systems – the legal system and the legal documentation system – have their own sublevels and metadata. The subject matter of this article can be split into two parts: sublevels in the law and sublevels in legal documentation. Section 2 introduces the granularity problem in legal documentation systems. Section 3 describes a shift from a legal hierarchy to a network. Section 4 links the idea of legal sublevels with the notion of view. We think about the sublevels in light of views in Schweighofer’s 8 views/4 methods/4 syntheses model. Therefore we devote Sect. 5 to survey the notion of view. Further, Sect. 6 describes the Schweighofer’s approach in more detail. Section 7 draws conclusions.

2 Granularity

We derive the idea of the legal sublevels from the granularity problem. Legal documentation does not reproduce a legal source one-to-one, and the granularity has to be taken into account (Fig. 2). A law does not need to be represented as a single document, e.g. a file in Word or PDF. Granularity raises the question, “What is the smallest entity?” In legal documentation, this question can have different answers: the whole text of a law, an article, a paragraph, a sentence, or even a word (legal term). In the Austrian Legal Information System (www.ris.bka.gv.at), a paragraph is the smallest entity. Smaller entities provide flexibility in legal information systems. A big document can be synthesized from its parts. However, making entities too small significantly increases the amount of metadata, because each entity type has its own metadata.

The granularity theme remains aside from the norm-institution relationship, but emerges in the law–legal informatics relationship. There are structures in the background that are independent from the norm-institution relationship, but that are important for the functioning of legal documentation, namely, for back-office software systems. The granularity could produce structures that differ from the current documentary structures.

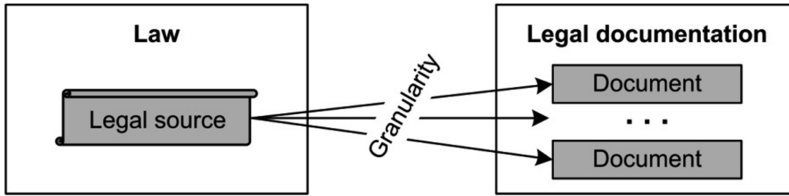


Fig. 2. Representing a legal source in a legal documentation system

The idea of legal sublevel was used in structural legal visualization (Čyras et al. 2015). Visual navigation through citizens’ legal information systems was concerned. Legal visualization issues in law are assigned to a separate view, namely, the visualization view in Schweighofer’s 8 views/4 methods/4 syntheses model (see Sect. 4). Communicating legal meanings is a problem in law because of the complexity of the legal system. Mastering this complexity is an issue in legal informatics (Schweighofer 2008). The concept of views is a means to master the complexity of a system and can be extended to the engineering of legal document systems.

3 A Shift from a Hierarchy to a Network

Our target is to explicate the network of legal sublevels. Constitution, law, statute and decision form a hierarchy; see Kelsen (1967, part V, especially Sect. 35). A hierarchical model of the legal system is presently too simple and strict. A network would be better suited (Fig. 3). Such a network would be partially hierarchical and contain horizontal links. In addition to explicit links, implicit links are important.

A network is a graph, and therefore, is a simple structure for reasoning in comparison with other formalizations such as formal logic. Paraphrasing Van Hoecke and Ost (1993, p. 1),¹ we see a task for legal informatics to transform the network of sublevels into a more “scientific” discipline by mathematical means.

The shift from a hierarchy also applies to legal document systems. Peripheral areas – sublevels – can be separated from the core, both in the legal system and in the document system (Fig. 4). We relate the idea of a network with the interdisciplinary approach and a pluralist epistemological perspective to legal science which is advocated by Van Hoecke and Ost (1993); see also Ost and van de Kerchove (1993).

Multi-stakeholder governance model. The idea of non-hierarchical relations is inherent in the multi-stakeholder governance model; cf. (Schweighofer 2015b, p. 53). The international players (or stakeholders) are states, international organizations, the business sector (companies, professional associations, funds) and non-state organizations (religions, NGOs, trade unions, think tanks). Global standards consist of “hard” law, e.g. legal instruments with binding force or “soft” law, e.g. quasi-legal instruments with or without a compliance mechanism but formally not legally binding.

¹ “Econometrics, for example, attempts to transform economic science into a more ‘rigorous’ and hence more ‘scientific’ discipline by mathematical means.” Van Hoecke and Ost (1993).

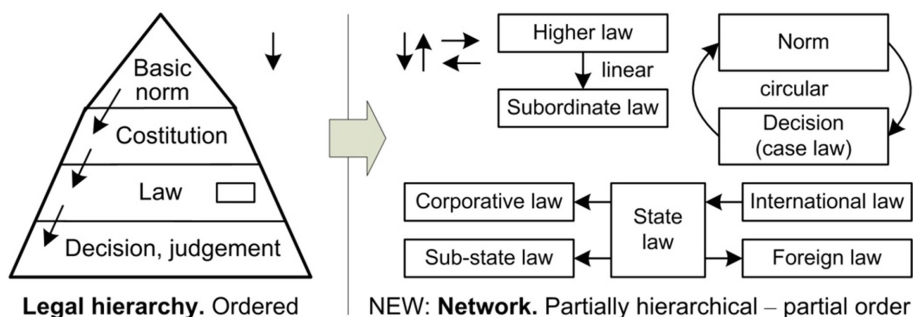


Fig. 3. A shift from a legal hierarchy to a network in the law

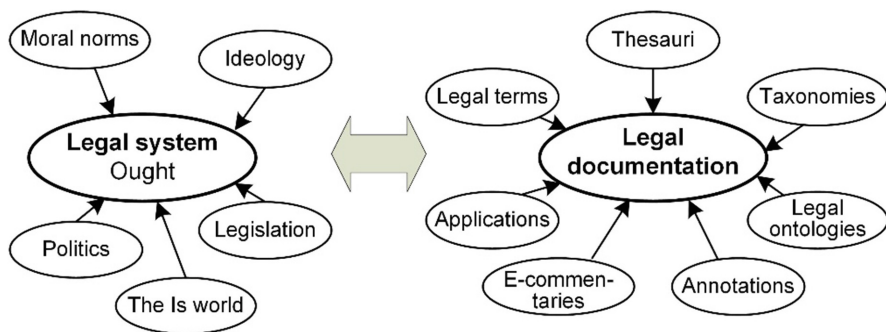


Fig. 4. Core-periphery subsystems around the legal system and the legal documentation system

The future “matrix of law” is discussed by Martin-Bariteau (2014), p. 11–18. He comments about Ost, although it has been 15 years since Ost’s original predictive work, and points out the distinctions of law-making in the Information Society.

4 The 8 Views/4 Methods/4 Syntheses Approach in a Nutshell

Schweighofer’s 8 views/4 methods/4 syntheses approach to legal data science (Schweighofer 2015a) is a methodological framework to investigate legal sublevels. He has structured newly developed methods for the representation, analysis and synthesis of legal materials as legal data science. His model describes the eight different representations of a legal system and four computer-supported methods of analysis, which lead to a synthesis, a consolidated and structured analysis of a legal domain, either (1) a commentary, an electronic legal handbook, or (2) a dynamic electronic legal commentary DynELC (Schweighofer 2011), or (3) a representation for citizens, or (4) a case-based synthesis (Fig. 5). The eight views (or representations of law) are: (1) text corpus, (2) metadata view, (3) citation network view, (4) user view, (5) logical view, (6) ontological view, (7) visualization view, and (8) argumentation view. The four

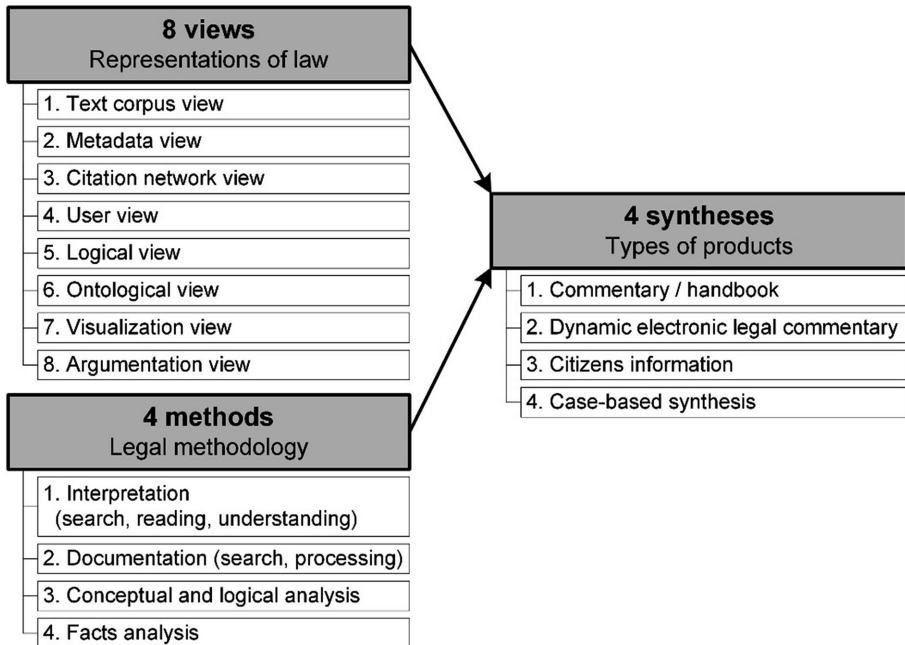


Fig. 5. Schweighofer's 8 views/4 methods/4 syntheses model to legal data science

methods are: (1) interpretation (search, reading and understanding), (2) documentation (search and processing), (3) structural analysis (conceptual and logical), and (4) fact analysis.

Schweighofer considers Lu and Conrad's "4 views theory" (2012, 2013) and extends it with four more views (representations of the law). It should be noted that in the knowledge representation of law, it is not solely about the documentation; each view represents further insights on the law itself (Schweighofer 2015a, p. 16).

5 The Notion of a View

Lu and Conrad (2012, 2013) view the system of legal documents from the standpoint of legal search engines. However, the legal system (in a broad sense) can also be viewed from other standpoints, e.g. a software engineer's or a legal philosopher's. Thus, different perspectives (a synonym for the term 'view') emerge.

Both the legal system and the legal documentation system are systems. They can be described from the outside and the inside. A system can be described from the outside as a black box: inputs, outputs and their relation. A system is described from the inside perspective by its elements and the relationships between them. Figure 6 can serve as such a description.

We will compare the concept of view in Lu and Conrad's 4 views and Schweighofer's 8 views with the concept of view in software engineering. The term 'view'

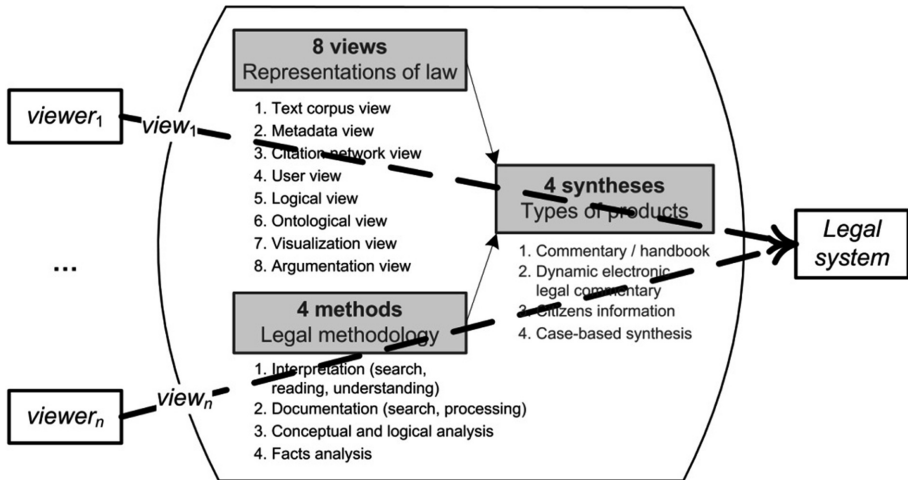


Fig. 6. Different perspectives of the legal system through a “lens”, which comprises the 8 representations of law, the 4 methods and the 4 products

denotes a representation of the law in the works by Lu and Conrad, as well as Schweighofer. Each viewer looks through a “lens”, which comprises the 8 representations of law, the 4 methods, and the 4 products (Fig. 6). Each viewer has his own perspective and projects the legal system onto the landscape of legal data science differently.

5.1 Views of an Enterprise System

Further, we consider an enterprise system in the role of a viewed object. Six views – the planner’s, the owner’s, the designer’s, the builder’s, the integrator’s and the user’s – are concerned in the Zachman framework (Sowa and Zachman 1992), which supposes that it is possible to manage an enterprise system using a multiperspective approach. Zachman’s idea to decompose the system into a number of perspectives and focus areas serves as a theoretical basis for the *vision-driven approach* proposed by Čaplinskis (2009). Zachman decomposes each perspective into six focus areas to be answered: what (data)? how (function)? where (network)? who (people)? when (time)? and why (motive)? Čaplinskis calls it the H3W decomposition. The concept of views is driven by the separation of concerns principle.²

Five perspectives (views, levels) of the Čaplinskis’ vision-driven methodological framework are: (1) business level requirements (the view of a business analyst);

² “The “separation of concerns” principle is realized by the concept of views. ...The separation of concerns principle refers to the description of different characteristics of a software system that may or may not relate to the later execution of those systems. The principle will be applied in the division of complex description of even small portions of software into hopefully better understanding partial descriptions – that we call views – that must later be superimposed to form a complete description.” (Goedicke 1990, p. 5).

(2) user level requirements (the view of stakeholders); (3) IS (information system) requirements (the view of an IS analyst); (4) the requirements of IS subsystems (the view of an IS engineer); (5) software requirements (the view of a software analyst). More perspectives can also be concerned.

5.2 Four Views by Lu and Conrad

Lu and Conrad (2012, 2013) view the system of legal documents from the standpoint of legal search engines. However, legal search engines are not legal entities, and therefore, cannot be treated as stakeholders. Stakeholders are comprised of judges, document authors (e.g. West editors), search engine users (e.g. attorneys), etc.

The document view comprises the documents of traditional legal searches such as cases, statutes, regulations, law reviews and other forms of primary and secondary legal publications, see Fig. 7. The basis is the triad of norms, court decisions and legal literature; however, this can be extended by the now huge body of ‘soft law’.

'Views' Available to Search & Reranking Functions

Document View (Judges, Clerks, Leg, Attys, Profs)	Annotation View (West Editors)	Citation Network View (Judges, Clerks, Leg, Attys, Profs)	User View (Westlaw Users)
Text — Cases, Briefs, Statutes, Regulations, Law Reviews ...	Synopses Points of Law (Headnotes) Taxonomy Classifications (Topic + Key No.)	Citations In-bound (citing) and Out-bound (cited) Topic-based granularity	Queries Session Data Clicks, Prints, Key Cite, ... Preferences
Search Engine (Text Similarity +)			
Key Cite (which legal issue, and is it still good law?)			
Judges, West editors and Westlaw users have generated a wealth of information. When combined with domain expertise and technology resources, R&D can build a best of breed solution			

Fig. 7. The set of evidence (views) that can be used by modern legal search engines; see (Lu and Conrad 2013) at <http://blog.law.cornell.edu/voxpath/2013/03/28/next-generation-legal-search-its-already-here/>

The annotation view comprises “attorney-editor generated synopses, points of law (a.k.a. headnotes), and attorney-classifier assigned topical classifications that rely on a legal taxonomy such as West’s Key Number System”.³ The annotation view is based on metadata, which can be formidable, e.g. EUR-Lex⁴ metadata system. A sample headnote is shown in Fig. 8.

³ West’s Key Number System: <http://info.legalsolutions.thomsonreuters.com/pdf/wln2/L-374484.pdf>. This is a classification system for American law.
⁴ Access to European Union law, <http://eur-lex.europa.eu/>.

The citation network view comprises out-bound (cited) sources and in-bound (citing) sources with respect to the document in question. The citations are very different: basis of the act, acts cited in the document, citations in the operative part of the judgment, document amending other documents, document is amended by other acts, etc.

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| <ul style="list-style-type: none"> ↪ 24 Aliens, Immigration, and Citizenship ↪ 24V Denial of Admission and Removal ↪ 24V(G) Judicial Review or Intervention ↪ 24k396 Standard and Scope of Review ↪ 24k403 Fact Questions ↪ 24k403(2) k. Substantial evidence in general. Most Cited Cases | <ul style="list-style-type: none"> ↪ 24 Aliens, Immigration, and Citizenship KeyCite Citing ↪ 24V Denial of Admission and Removal ↪ 24V(G) Judicial Review or Intervention ↪ 24k396 Standard and Scope of Review ↪ 24k403 Fact Questions ↪ 24k403(3) k. Credibility. Most Cited Cases |
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Substantial evidence test, which is used in reviewing an immigration judge's (IJ's) factual findings and credibility determinations as to whether the government presented clear and convincing evidence of removal, is highly deferential and requires reversal of factual findings only if the evidence presented compels a contrary conclusion. Immigration and Nationality Act, § 212(a)(6)(C)(i), [8 U.S.C.A. § 1182\(a\)\(6\)\(C\)\(i\)](#).

Fig. 8. An example of a headnote with its assigned key number (Lu and Conrad [2012](#))

The user view considers ‘aggregated user behavior’, for example, how often a document was opened, document popularity through citatory services, the jurisdiction in which a particular attorney-user practices, and the kinds of sources that a user has historically preferred. In contrast to data (documents) and metadata (citations, annotations), “the aggregated user behavior data represented in the user view is produced by the professional researchers who interact with the system.”

6 Views in the Schweighofer’s Approach

Schweighofer considers Lu and Conrad’s “4 views theory” and extends it with 4 more views (representations of the law): the logical view, the ontological view, the visualization view, and the argumentation view. Further in this section we describe only the latter views. It should be noted that in the knowledge representation of law, it is not just about the documentation itself; each view represents further insights on the law itself (Schweighofer [2015a](#), p. 16).

6.1 The Logical View

The logical view is based on predicate logic. An example is implementing a big number of legal rules, e.g. rOWler, a rule engine by Scharf ([2016](#)), which models legal norms with JAVA and OWL 2. Business rules management systems such as JBoss Enterprise BRMS is also a kind of a product. The logical view is restricted to “standard cases” (i.e. normal cases) leaving hard cases to the argumentation view.

The works by Monica Palmirani on modeling legal rules with LegalRuleML language are assigned to this view. LegalRuleML functionalities comprise modeling different types of rules, representing normative effects, defeasibility, correspondence between collections of rules in the formal model and natural language texts of legislation, alternative interpretations, etc. (Athan et al. [2015](#)). Palmirani also contributes to

making semantic Web the next step for the legal domain (Casanovas et al. 2016). Since 2005 she contributed to the Akoma Ntoso project that was devoted to access African parliamentary proceedings and currently followed by LegalRuleML (Palmirani 2012). Her contribution is related with the semantic Web and the law topic and also the text corpus view. These works produced an ontology for managing legislative text's evolution over time and its linguistic variants.

6.2 Ontological View

The ontological view considers legal ontologies, shared vocabularies, advanced thesauri, concepts and relations. A starting point of any legal ontology is the terminology of the law. Since the 19th century substantial preparatory work has been done in the concept jurisprudence. Reusing this work, the respective elements of the concepts have to be transposed into a computer-readable structure, e.g. header, definition, relations, presubsumption (relation between the normative concept of law and a factual element). In the 1990s, ontologies as a conceptualization of a domain have been recognized as a way to knowledge representation in the Semantic Web; cf. (Guarino et al. 2009). The main components of ontologies are terms that are connected with links such as upper/lower term, synonymy, antonymy, etc. (Peters et al. 2007). For example, the formalization of the norm graph concept is the starting phase in the approach of Oberle et al. (2012) to engineering compliant software.

6.3 The Legal Visualization View

The legal visualization view concerns the use of graphics, images and videos, cf. (Brunschwig 2014). The structural legal visualization (SLV) approach by Lachmayer concerns visualizing legal meanings (cf. Lachmayer 2002; Čyras et al. 2015).⁵ These methods are human-oriented. The reason is that legal visualization is primarily a means of information visualization and serves humans. Therefore a challenge is computer-readable visualizations (i.e. computer-oriented) as well as computer-generated visualizations (human-oriented). Graphical notations should also support the formalization of the law similarly as UML supports software development.

6.4 The Legal Argumentation View

In recent years, the field of AI and Law has strongly concentrated on the formalization of arguments. This case-based reasoning approach started in the 1980s and culminated in Ashley's book (1990). Taking into account the dialectical nature of the legal process – thesis (plaintiff), antithesis (respondent), synthesis (judge) – a representation of possible arguments is important.

⁵ See also www.legalvisualization.com and <http://jusletter-it.weblaw.ch/visualisierung.html>.

6.5 The 4 Methods and 4 Syntheses

We briefly describe the legal methods and the methods of synthesis.

Method 1 – Searching, Reading, Interpreting, Understanding. The basic methodology is to locate, read, interpret and understand the “legal stuff”, taking into account the legal interpretation and reasoning methods in a dynamic world of concepts. The most significant ad-on of legal informatics is the revolution in legal search by the use of search engines. “Legal Googling” now belongs to the recognized methods.

Method 2 – Legal Documentation and Search. Due to the abundance of the material, legal documentation has become an independent method. However, this task is no longer done primarily by the users, but by the services of legal information providers.

Method 3 – Conceptual and Logical Analysis. Here the fundamental statement by John Sowa (2000) applies again: the terminology has to be developed and be brought into a convenient logical structure.

Method 4 – Factual Elements and Their Links to Law. In the practice of conflict resolution it is often argued about the existence of elements of the situation. Therefore it is helpful to make use of existing world ontologies. The automated generation of factual elements from pictures, videos, websites, intelligent forms, etc. is important. Successful practice can be found in tax law and e-Justice intelligent forms.

Synthesis 1 – Commentary/Handbook or Manual. Presently such handbooks are written traditionally. Due to the dynamics of the legal system, this task is getting difficult. Therefore authors favor a more documentary approach with extensive notes.

Synthesis 2 – Dynamic Electronic Legal Commentary (DynELC). The idea is simple – a change from the traditional to an electronic commentary. The 8 views and 4 methods are presented in a structured format and the basis for further analysis by legal experts is provided. The methods to be used: document categorization, multilingual thesaurus, citations, temporal relations, ranking, text summary, and multilingualism. The DynELC consists of a structured representation of the metadata and the text corpus. An advantage is taking into account the dynamics of the law.

Synthesis 3 – Citizens Information. Citizen-focused description of the legal system is provided. The focus is on authority structure and citizen’s participation.

Synthesis 4 – Case-Based Synthesis. Contrary to a representation “legal system for all” a specific case is a standpoint. Relevant arguments and counter arguments are presented taking into account the claimant, the defendant or the judge.

7 Conclusions

The idea of core and periphery in law leads to the idea of legal sublevels. This idea contributes to the conceptualization of the legal domain from the technological viewpoint. Such conceptualization will contrast from the jurisprudential outlines of law, where the branches of law or the functions of law (legislative, executive and judicative)

play the key role. Soft law in the information society challenges “black-letter” law. To represent data and services in the legal domain, a proper conceptualization is required. The views to a legal documentation system constitute a proper beginning.

The sublevels of legal information should be taken into account in the engineering of legal information systems (LISs). Explicating legal sublevels contributes to the evaluative synthesis of legal decisions. Thus, explicit visual navigation through a legal information system would support the wandering back and forth of the glance between the normative and the factual.

We tackle the granularity problem and take into account that legal documentation does not reproduce a legal source one-to-one. The periphery of the law can emerge in the core of legal document systems. Software engineers are the keypersons in the process of designing legal machines. To program institutional decision making, these engineers should interpret properly software requirements, which tackle the law.

The 8 views/4 methods/4 syntheses model is abstracted from decades of experience in the legal domain. This model is validated by numerous applications, some of which are cited in Sect. 6.

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