Communications of the Association for Information Systems

Volume 34 Paper

1-2014

Conceptual Modeling in Law: An Interdisciplinary Research Agenda

Ralf Knackstedt
University of Hildesheim, Germany, ralf.knackstedt@uni-hildesheim.de

Marcel Heddier
University of Münster—European Research Center for Information Systems (ERCIS)

Jörg Becker
University of Münster—European Research Center for Information Systems (ERCIS)

Recommended Citation
Knackstedt, R., Heddier, M., & Becker, J. (2014). Conceptual Modeling in Law: An Interdisciplinary Research Agenda. Communications of the Association for Information Systems, 34, pp-pp.
https://doi.org/10.17705/1CAIS.03436

Communications of the Association for Information Systems

CAIS

Conceptual Modeling in Law: An Interdisciplinary Research Agenda

Ralf Knackstedt

University of Hildesheim—Institute for Economics and Information Systems

ralf.knackstedt@uni-hildesheim.de

Marcel Heddier

University of Münster—European Research Center for Information Systems (ERCIS)

Jörg Becker

University of Münster—European Research Center for Information Systems (ERCIS)

Abstract:

The article describes how different approaches from the IS field of conceptual modeling should be transferred to the legal domain to enhance comprehensibility of legal regulations and contracts. It is further described how this in turn would benefit the IS discipline. The findings emphasize the importance of further interdisciplinary research on that topic. A research agenda that synthesizes the presented ideas is proposed based on a framework that structures the research field. Researchers from both disciplines, IS and Law, that are interested in this field should use the research agenda to position their research and to derive new and innovative research questions.

Keywords: conceptual modeling; information modeling; research agenda; law; contracts; interdisciplinarity.

Editor's Note: The article was handled by the Department Editors for Information Technology and Systems.

Volume 34, Article 36, pp. 711–736, January 2014

Communications of the Association for Information Systems

I. INTRODUCTION

Communication between legal experts and legal laypersons is characterized by a legal professional jargon (legalese) that bears a lot of potential for misunderstandings and errors. Visualizations that support the communication processes may help to improve the overall communication results. Conceptual modeling techniques in the field of information systems (IS) design are well established visualization methods that are used to support communication processes in the IS domain. These same techniques should be transferred to the legal domain in order to support communication between legal experts and legal laypersons. While exploring the specific requirements and originalities of the legal domain in the context of conceptual modeling, it is expected that not only jurisprudence but also the IS discipline benefits from a mutual interdisciplinary exchange of ideas and concepts.

Defective communication between legal experts and legal laypersons negatively affects the performance of democratic legal systems. Purpose-built professional jargon informs communication among legal experts themselves, but the legal system also depends on effective communication between legal experts and legal laypersons [Fagen, 1967; Gifford, 1971]. The exclusive use of legalese renders legal decision processes inexplicable for many people, although higher transparency in these processes positively influences societal acceptance of a democratic legal system, which is important for a well-performing society [Tyler, 1997]. For example, communication takes place in the political discussion about draft laws, contract negotiations, or the judicial and extrajudicial settlement of legal disputes. People without distinct knowledge of legalese, such as many politicians, businessmen, citizens, or jurors in a courtroom, are involved in creating and applying laws and contracts. The following examples show that communication between legal experts and laypersons fails on a regular basis. A legal expert may overestimate his communication partner's knowledge of legal technical terms and thereby impute a comprehension of legal regulations that does not exist [Bromme, Rambow and Nückles, 2001]. Laws and contracts that contradict the original intention of political representatives or contractual partners are possible consequences. Non-compliant behavior or unresolved liability issues (e.g., in information systems development or business process design) can be the result of defective communication about laws and contracts [Longdin, 2000]. Lawyers have problems communicating effectively with their clients [Trudeau, 2012]. Complex laws and contracts require many people to transfer dealing with legal texts to legal experts, leaving them dissatisfied with this transmission of responsibility. Communication problems between legal experts and legal laypersons that result in misunderstandings during the design or interpretation of laws and contracts can lead to expensive lawsuits. For example, different interpretations caused by a single comma in the text of a business contract resulted in an eighteen-month dispute, additional payment of $2.13 million, and a lot of distrust between the contracting parties [Austen, 2006]. The challenge here is to avoid disputes in the first place. A better comprehension of laws and contracts may help to avoid unlawful behavior and unnecessary disputes *a priori* and thereby reduce companies' legal expenses. This approach is mainly discussed under the headwords "preventive law" and "proactive law" [Berger-Walliser, Bird and Haapio, 2011; Brown, 1970, 1986; Siedel, 1992; Siedel and Haapio, 2010; Wahlgren, 2006].

Improving mutual understanding in communication between legal experts and legal laypersons should be an object of future research. A special research field concerning communication is the field of expert-layperson communication. An expert is "a person with training in a particular field who is able to tackle complex problems because of this training and additional practical experience" [Bromme et al., 2001, p. 371]. Laypersons, therefore, are people who do not have this training or experience in a particular field. Legal expert-layperson communication takes place when communication does not happen exclusively among legal experts. In most cases, this type of communication is a matter of *mutual* expert-layperson communication. The expert in the field of IT, business, politics, or any other field is usually not a legal expert. The legal expert usually is a layperson in the field of his communication partner. Ultimately, every lawyer's client is an expert in his own case, which the lawyer can't assess without him. It is a complex but necessary task for experts to adopt the perspective of laypersons in order to understand the communication partner [Clark and Marshall, 1992]. Adaptation to and anticipation of the communication partners' knowledge and way of thinking is essential for successful communication, but not always achieved easily [Bromme, Nückles and Rambow, 1999]. Experts often over- or underestimate the communication partners' knowledge, which could lead to defective communication (False Consensus Effect) [Bromme et al., 2001; Wittwer, Nickles and Renki, 2007]. As George Bernard Shaw said, "The single biggest problem in communication is the illusion that it has taken place."

Successful communication and collaboration between legal experts and legal laypersons requires the creation of a common ground of mutual understanding. Clark's "Contribution Theory" states that whenever people are

Communications of the Association for Information Systems

communicating, they do so on the basis of background assumptions (Figure 1). “Two people’s common ground is, in effect, the sum of their mutual, common, or joint knowledge, beliefs, and suppositions” [Clark, 1996, p. 93]. The process of negotiating this shared reference framework between different communication partners is called “grounding” [Clark and Brennan, 1996]. If two communication partners communicate on the basis of different background assumptions and therefore have a small or even no common ground, the communication will probably fail and they will talk at cross purposes [Bromme, Jucks and Runde, 2003]. Grounding is explicitly not aiming at making laypersons into experts in the communication partner’s field of expertise. Instead, grounding intends to create exactly the common ground necessary for making informed decisions, no more, no less. Grounding is, therefore, subject to the principle of economic efficiency.

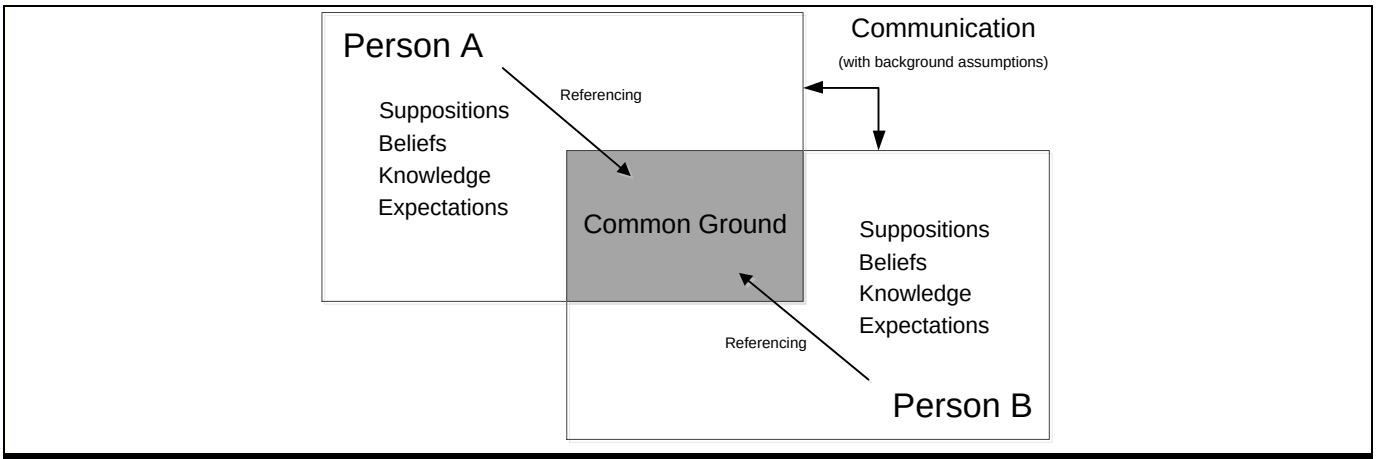

Figure 1. Common Ground of Communication [Clark, 1996]

Conceptual models in IS support the formation of a common ground for communication. Conceptual models are “mostly graphic, [and] are used to represent both static phenomena (e.g., things and their properties) and dynamic phenomena (e.g., events and processes) in some domain” [Wand and Weber, 2002]. Conceptual modeling can help to understand a domain, support communication, provide input for the design process, and document original requirements for future reference [Kung and Solvberg, 1986]. Clark’s Contribution Theory states that communication partners make use of several heuristics when creating a common ground [Clark and Carlson, 1982; Clark and Marshall, 1981]. Besides actively signaling comprehension with gestures or requests, one of the most effective heuristics is making references to commonly accessible items. Conceptual models support this heuristic by providing (visual) items to which the communication partners can refer.

IS research has developed numerous conceptual modeling approaches (e.g., business modeling, business process modeling, or data modeling) and modeling techniques (e.g., Entity-Relationship model, Unified Modeling Language, or Data Flow Diagrams) [Fettke, 2009] that allow IT experts and IT laypersons to communicate about business processes or software specifications. Well-established modeling methods resulted from this successful research, such as UML [Booch, Jacobson and Rumbaugh, 1998] and OMT [Rumbaugh et al., 1991] for software modeling, BPMN [OMG, 2006] for process modeling, or ERM [Chen, 1976] and ORM [Nijssen and Halpin, 1989] for data modeling. These approaches are aiming at controlling the complexity of information systems specifications and providing a communication ground that is both sufficiently formal for later implementation and sufficiently comprehensible for IT laypersons. It was shown that communication between different stakeholders is the main reason why practitioners use conceptual models [Davies et al., 2006; Fettke, 2009]. For example, business process designers may communicate with managers, IS developers, or other employees about business requirements, workflows, processes, and the respective IT support or IT integration. They do so on the basis of process models [Recker, Rosemann, Indulska and Green, 2009]. Prerequisite to this are modeling languages that contain the necessary language constructs that allow for modeling facts relevant for certain communication situations. For that reason, a common understanding of the modeling language has to be elaborated during an act of meta communication. Tarski differentiates in this context between object language and meta language [Tarski, 1944]. Thereby, modeling languages are introduced on the basis of examples.

Meta models explicate the constructs, rules, and procedures of a modeling technique [OMG, 2011b]. A cross-discipline reference to ontologies, such as that of Wand and Weber [Wand and Weber, 1989, 1993], may support a concordant perception of fundamental constructs. For example, the meta model of a process modeling language may contain the constructs “function,” “event,” and “input/output.” The communication partners now have to create a common ground about the meaning of these constructs and their symbols based on the language’s meta model. In addition, the natural language used in semi-formal models can be standardized with the help of glossaries of

Communications of the Association for Information Systems

important terms or concepts. In the case of business process modeling, for example, it could be useful to predetermine a basic vocabulary of verbs for the function's denotations, such as "revise," "check," and so on. Thus, the specification of basic assumptions about the communication object helps to systematically build the common ground of the parties involved in model-based communication.

Conceptual modeling should be adopted to the legal context. It is not argued for an abandonment of legal professional jargon, which is well established and efficiently applied among legal experts themselves. Instead, this professional jargon should be complemented with additional representational forms that support the creation of shared domain knowledge between legal experts and legal laypersons—analogously to the approach of IS and business. Although there is still little empirical work on the value and applicability of conceptual models for facilitating communication between *legal* experts and *legal* laypersons (as opposed to IT experts and IT laypersons), some examples provide first supporting evidence. A comparative study on the comprehensibility of jury instructions, for example, proved that a flow chart of the legal situation in combination with the usual verbal instructions helped to significantly improve the comprehensibility and the quality of the judgment, compared to the instruction-only group [Semmler and Brewer, 2002]. In the previously mentioned example of Austen [2006], where a single comma caused a costly dispute, a conceptual model (e.g., a timeline or an activity sequence diagram) "would have resulted in mutual clarification and prevented the dispute" [Passera and Haapio, 2011, p. 59]. Visualizations of legal options, probabilities, and outcome alternatives in lawyer-client situations can prevent non-promising lawsuits [Siedel, 1992]. We think that the theoretical and methodological foundations of conceptual modeling and the respective research results should be the bases for developing these representational forms in law.

The remainder of this article is as follows: Section II outlines previous research at the intersection of IS and law. Section III describes the state-of-the-art of legal visualization research and provides evidence why most current approaches in this field are not convenient regarding interdisciplinary communication between IS and law. The goal of the article is to structure the research field of conceptual modeling in law so that researchers from both disciplines (IS and Law) can position their research and get inspiration and guidance for the development of new research questions. A framework of three dimensions provides the structure for the proposed research field from which a research agenda is derived in Section IV. It is shown how theoretical principles, concepts, methods, and techniques of conceptual modeling can be applied in law and how this interdisciplinary transfer would positively reverberate on IS research. The article concludes with a suggestion on how to proceed as a researcher in this field in Section V, a critical discussion on opportunities and obstacles for the realization of the research agenda in Section VI, and a conclusion in Section VII.

II. PREVIOUS RESEARCH ON THE INTERSECTION OF IS AND LAW

Inspired by IS research, initiatives for mastering communication problems in law are often aiming at increasing a legal text's degree of formalization. Such formalizing intends to increase the legal text's accuracy and tries to make it computable. Defective communication triggered by *unintentionally* allowed room for interpretation may thus be avoided. The intention of legal formalization is to standardize legal discourse and thereby make it more effective and comprehensible. Important influences on this came particularly from argumentation theory [Brockriede and Ehninger, 1960; Toulmin, 1969], case-based reasoning [Aamodt and Plaza, 1994; Ashley, 1991], deontic logic [Ryu and Lee, 1995], defeasible logic [Verheij, 2003], temporal logic [Clarke, Emerson and Sistla, 1986; Emerson, 1990], logic programming [McCarthy, 1960], and symbolic logic [Henzinger, Nicollin, Sifakis and Yovine, 1994]. Legal reasoning is basically the question on how judges should decide a case. There are two major principles that influence the way of legal reasoning—case law and code law, depending on the legal system of a country. However, there are different viewpoints on legal reasoning in legal theory. Prominent theorists in this field are Dworkin, Hart, Kelsen, and Raz [Dworkin, 1986; Hart, 1994; Kelsen, 2002; Raz, 1979]. Several projects were aiming at automating the process of legal reasoning by using rule-based languages to describe legal regulations. Thereby law, which is generally written in natural language, is modeled as a set of rules to make it computable. The vision of those projects often has been an electronic judge [Bain, 1989; Hogarth, 1989; Simon and Gaes, 1989] or a legal expert system [Sergot et al., 1986; Susskind, 1987]. The LEGOL project led by Ronald K. Stamper, for example, developed a rule-based formalism called LEGOL that can be used to implement a system for defining, interpreting, and testing legal regulations automatically [Stamper, 1977]. LEGOL was refined further to handle routine administrative legislation [Jones, Mason and Stamper, 1979]. McCarthy introduced a rule-based computer program for taxation called TAXMAN that is capable of a rudimentary form of legal reasoning. It classifies a specific legal case into different concepts on the basis of facts and rules [McCarthy, 1977].

This formalization of legal texts has limitations that originate from fundamental legal concepts and are therefore difficult to overcome. Legal regulations usually do not refer to a specific case but to many (subsumption) and this over a long period of time. Some of today's laws have been in force for several hundred years. The legislators who created these laws could not anticipate all of today's modern technologies and business models. Therefore, it is inevitable that legal texts contain some *intentional* room for interpretation, which is difficult to formalize. "A word is

not a crystal, transparent and unchanged, it is the skin of a living thought and may vary greatly in color and content according to the circumstances and the time in which it is used" [Holmes, 1918]. Words are interpreted in their context of meaning. Dworkin's Interpretative Theory of Law states that determining a law's specific meaning involves an interpretative reasoning and that legal interpretation always involves evaluative judgment. Along with rules, principles are also considered [Dworkin, 1986]. Therefore, laws are intentionally formulated with vague legal concepts such as "appropriate" or "sufficient," allowing different interpretations that depend on the actual case and its underlying circumstances. Legal expert systems are, therefore, flawed in their legal reasoning. "At best they can be called 'bureaucratic expert systems,' which is not to deny their potential value, only to recognize honestly their limitations" [Stamper, 1991, p. 220]. Stamper thinks that expert systems should rather serve as an additional aid for a lawyer when trying to solve a legal case. Legal hermeneutics involve much more than just deduction from specific rules [Brasil, 2001]. Different aspects, such as a norm's original intention in its historical context, the purpose of a norm as intended by the legislator, or whether a norm contradicts other norms, have to be considered [Leyh, 1992]. Legal deduction is just "a relatively trivial part of his [the lawyer's] skill" [Stamper, 1991, p. 220]. The conception of law being "a set of general rules which solve any given case in advance has to be given up" [Aguilo-Regla, 2005, p. 23].

Maybe because of these limitations, the focus of current research at the intersection of IS and law lies on the development of so-called legal information systems, which support legal practice. Legal information systems basically "depend […] on an exhaustive search through the full text of a body of legal materials and a retrieval of documents by key-words or combinations of key-words" [McCarthy, 1977, p. 839]. Therefore, they resort to the field of information retrieval. Information retrieval is a major topic when applying IT in law [Erdelez and O'Hare, 1997]. Research has been done on how text analysis methods can represent legal knowledge [Schweighofer, 1999], how the process of searching for legal information and sharing the results can be facilitated [Komlodi, 2002], and what impact modern information technologies like the Internet with its easy access to information have on the legal domain [Martin, 1999]. Legal information systems increase the efficiency of legal knowledge work. However, legal information systems are mostly designed for conventional legal texts. One can apply additional meta-data to the texts to facilitate a context-sensitive retrieval, which can be seen as an approach to formalization, but the benefits are limited to the work of a single jurist or of jurists among themselves. Alternative representational forms of legal texts that are aiming at supporting communication between legal experts and legal laypersons are not captured in this concept of legal information systems.

III. STATE-OF-THE-ART OF LEGAL VISUALIZATION

A notable research stream focuses on the question of how to visualize law and legal principles. This question is mainly discussed under the headword "legal visualization." Research in this field can be allocated to different application areas. These areas comprise the visualization of *laws and legal principles in general*, *contract* visualization, visualization in an *e-government* context, and the use of visualizations in *legal education*.

Visualizing *laws and legal principles in general* is addressed from various angles. On the one hand, there are *(semi-) structured* approaches. Tobler et al. developed and used flow charts to visualize essential EU (European Union) law and EU competition law in a (semi-)structured way [Tobler and Beglinger, 2010; Tobler, Beglinger and Geursen, 2011]. A business process modeling method was created by combining the Event-driven Process Chain (EPC) with the Computational Tree Logic (CTL). This method is called G-CTL and can be used to analyze business process models in a formalized and rule-based approach, e.g., in the context of legal compliance checking [Speck et al., 2011]. Darimont and Lemoine propose a goal-oriented approach using a goal modeling technique to model regulations. They claim that their approach can be used "for analysing an existing regulation" and "for writing new regulations with the benefits of obtaining more complete, more robust, more verifiable and well-defined regulation documents" [Darimont and Lemoine, 2006, p. 844]. The Nomos modeling language is a goal-oriented method created to represent legal requirements and to integrate legal compliance considerations into information systems design [Siena, Mylopoulos, Perini and Susi, 2009]. Ghanavati et al. propose to model legal concepts with the Goal-oriented Requirements Language (GRL) in order to align organizational objectives with legal requirements. In their work they show the exemplary visualization of a specific paragraph in the Health Insurance Portability and Accountability Act (HIPAA) using a GRL actor model [Ghanavati et al., 2009].

On the other hand, there are pictographic approaches. Of late, pictographic visual means are used to communicate legal regulations to citizens. A brochure was developed for the New York City Administrative Code that visualizes the law and regulations for setting up a stall in front of shops [Chang, 2011]. Those visualizations are created by a professional designer and specifically address people with lower English language skills. Brunschwig suggests comic-like visualizations that are custom tailored for specific laws or legal principles (e.g., the principle of a contract between two persons) [Brunschwig, 2001, 2011].

A trend in using visualizations in *contracts* can be observed. This trend is mostly fueled by a group of Scandinavian researchers and practitioners that follow a "proactive approach" to law. They propose to complement contracts and contract negotiations with selected visualizations. Depictions of timelines are used to demonstrate periods of cancellation or extension described in contracts [Berger-Walliser et al., 2011; Haapio, 2008; Passera and Haapio, 2011]. In the sense of "proactive law" [Siedel and Haapio, 2010; Wahlgren, 2006], these measures can help to avoid later disputes that result from misconceptions and fallacy. An approach based on BPMN is suggested to visualize contract knowledge and to align obligations in business contracts with an organization's business processes [Kabilan, 2005; Zdravkovic and Kabilan, 2005].

E-government is a research area with a strong relation to legal regulations. Processes and organizational structures in government and public administrations are almost always highly regulated by laws and legal acts. Therefore, numerous approaches depict administrative regulations with process modeling techniques [Alpar and Olbrich, 2005; Becker, Pfeiffer and Räckers, 2007; Olbrich and Simon, 2008] to integrate them into the workflow of public administrations. A method called Semantic Process Language (SPL) was created by combining two different process modeling methods, petri nets and a language for formal specifications, to describe legal regulations [Olbrich and Simon, 2008]. The authors provide a model of the Swiss Obligation Law, which depicts the different elements of this law (like, e.g., "First party makes offer") in a time-logical sequence. Another interesting approach is to use mind maps in an e-government context, which is discussed by Brunschwig [Brunschwig, 2006].

A further area, where legal visualizations are already used, is the area of *legal education*. In teaching, the advantages of visual means in the communication of law and legal principles have been more or less recognized. Different learning styles (e.g., the visual learner) can be addressed by using visualizations [DeGroff and McKee, 2006]. Teaching legal argumentation can be supported by using computer-supported collaborative argumentation techniques that include the visualization of legal argument structures [Ashley, 2009; Carr, 2003; Pinkwart, Tuunanen, Rothenberger and Chatterjee, 2004]. Ashley [2009] provides a model based on the Toulmin model of argumentation [Toulmin, 1969] and depicts hypothetical arguments in the law case *California v. Carney*, 471 U.S. 386 (1985). This law case elaborated the question whether motor homes have to be treated as vehicles or as homes (from a legal perspective). Ashley [2009] showed that using such models helps law students (especially novices) to improve their legal reasoning skills. There are several other approaches and tools to visualize (legal) argumentation, such as the gIBIS method [Conklin and Begeman, 1989].

None of these approaches is aiming at replacing textual law in principle. It is rather argued that law should build up the necessary competencies for developing and using additional forms of representation to improve its comprehensibility—particularly in interdisciplinary constellations. These approaches—despite their usefulness—are rather unknown, have been developed rather independently from each other, and are, therefore, rather heterogeneous. This illustrates that law still faces the challenge to establish a general theoretical and methodological foundation for legal visualizations. Drawing on theoretical and methodological foundations of conceptual modeling in IS would be a valuable contribution to these developments. The systematic construction of representational forms and their documentation with meta models, for example, are approaches that have not attracted the full attention of legal visualization researchers, although it would be of great help to them. Beyond meta modeling, there exist numerous other concepts in the field of conceptual modeling that qualify for usage and improvement in the legal domain, as discussed in the following sections.

IV. STRUCTURING THE RESEARCH FIELD

Research Framework

The research field of conceptual modeling in law can be structured by using a framework that is spanned by three dimensions (Figure 2). In the following section, the theoretical foundations for these dimensions are given. Based on the framework, an interdisciplinary research agenda in the field of conceptual modeling in law is introduced that shows new research and application opportunities for conceptual modeling research, gives structure and guidance for researchers in this field, and may serve as a source for further inspiration and idea generation.

Legal Field of Activity

Expert-layperson communication is prevalent in both parts of law, its creation and its application. Creation of law and application of law are the two fundamental concepts in legal theory to classify legal acts. The Pure Theory of Law states that a legal act is an act by means of which a legal norm is created or applied [Kelsen, 2002]. It has to be mentioned that these two concepts are not necessarily absolute opposites. Creation of law may also be an act of application of law [Kelsen, 2007]. This differentiation is used in this article to structure the legal field. Special emphasis is put on legislation and contract design (as parts of the creation of law) and jurisdiction and legal interpretation (as parts of the application of law). These fields of activity are fields where expert-layperson communication with and about legal texts seems to be very important. Legislation, among other things, includes the

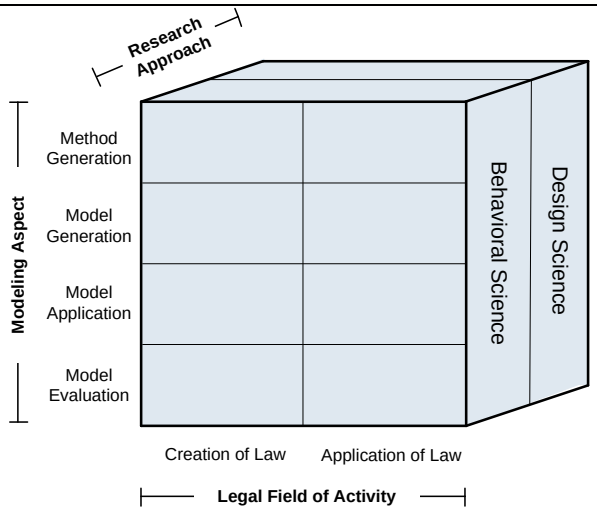

Figure 2. Research Framework for Conceptional Modeling in Law

design and negotiation of new laws as well as the modification of existing laws. Usually, a group of politicians, domain experts, and jurists is involved in this iterative process. Due to this heterogeneity of stakeholders, effective communication is very important here. Contract design, among other things, includes the negotiation and creation of contracts in the economic system (or other domains). The special interest here lies in the design of complex contracts for large projects or interorganizational relationships, where many actors such as managers, engineers, and lawyers are involved [Argyres and Mayer, 2007]. During the interpretation of laws or contracts that is mostly done at courts (jurisdiction), the law or contract in question has to be interpreted and understood by different stakeholders. This implies that legal experts and legal laypersons have to communicate about laws and contracts (confer with, for example, Dattu [1998] or Semmler and Brewer [2002] for communication problems between judges and jurors). Legal interpretation can also occur in companies when business processes are checked for their legal or contractual compliance (e.g., Braganza and Desouza [2006]; Panko [2006]; and Volonino, Gessner and Kermis [2004] discuss approaches to ensure compliance with SOX regulations). The application of law, therefore, includes every activity where laws or contracts are applied to a real-world situation. This requires a comprehension and legal interpretation of the relevant laws or contracts.

Modeling Aspect

Conceptual modeling is well established in the IS discipline. Numerous different approaches and methods have been developed and a lot of empirical research has been conducted on this topic, like Kettinger, Teng and Guha [1997]. Based on literature on business process modeling and information modeling, four categories of conceptual modeling are proposed and subsumed under the framework's dimension "modeling aspect." These categories are not in every case selective, but they help to structure the different views and areas connected to conceptual modeling. The categories are method generation, model generation, model application, and model evaluation. Method generation contains aspects that are aiming at designing a modeling method or modeling language. This involves, for example, method engineering approaches [Brinkkemper, 1996; Heym and Österle, 1993; Song and Osterweil, 1992; White Baker, 2011] or meta modeling methods and languages [Dawson and Dawson, 1995; Nissen et al., 1996; Tveit, 2009]. Model generation stands for approaches regarding the construction of conceptual models like argumentation-based modeling approaches [Andrade et al., 2004; Jin and Geslin, 2010; Karacapilidis and Papadias, 2001], or the generation of multi-perspective models [Recker, Rosemann, Indulska and Green, 2009; Rosa, Dumas, Hofstede and Mendling, 2011; Sommerville and Sawyer, 1997]. Aspects, where conceptual models are actually put in use, are subsumed under the category model application. These could be, for example, instantiating domain-specific reference models [Becker, Delfmann and Knackstedt, 2004; Brocke, 2006; Fettke and Loos, 2003, 2007; Rosemann and van der Aalst, 2007], model version control [Altmanninger, Seidl and Wimmer, 2009; Monk and Sommerville, 1992; Rittgen, 2009], or transforming models into code or vice versa with model-driven architecture approaches [Czarnecki and Helsen, 2006; Frankel, 2003; Koschke, 2003; Sendall and Kozaczynski, 2003; Suss et al., 2006]. Finally, model evaluation subsumes techniques and approaches that deal with, for example, model design quality [Becker, Rosemann and Uthmann, 2003; Gemino and Wand, 2004; Moody, 2005] or with model analysis [Boehm, 1984; Vergidis, Tiwari and Majeed, 2008].

Research Approach

Research in the context of conceptual modeling in law could follow either a design science or a behavioral science approach [Baskerville, 2008; Hevner, March, Park and Ram, 2004; March and Smith, 1995]. Design science in IS

research is aiming at developing artifacts that provide an effective and innovative contribution to the solution of a certain problem [Hevner et al., 2004; Peffers, Tuunanen, Rothenberger and Chatterjee, 2007]. These IT artifacts can be typologies of terms, methods, models, and implementations [Hevner et al., 2004]. Design science includes the iterative development of suitable artifacts or classes of artifacts and the evaluation of their effectiveness [Peffers et al., 2007]. Several guidelines on how to conduct design science have been proposed [Hevner et al., 2004; Walls, Widmeyer and El Sawy, 1992]. While design science tries to modify the existing situation by providing new instruments and solutions, behavioral science intends to observe and describe the status quo or to present a prognosis for certain developments. Both research approaches are directly related to each other. Behavioral science contributes to the identification of relevant problem domains for which artifacts can be developed. It furthermore can help to explain the effectiveness of those artifacts [Baskerville and Pries-Heje, 2010].

Research Agenda

The framework's orthogonal dimensions can be used to derive a research agenda for conceptual modeling in law (Table 1). The following research fields are related to the framework and show the high potential of an integrative view on IS and law that is aiming at increasing the comprehensibility of legal regulations and contracts in certain communication situations. Specific modeling aspects, namely method engineering, meta modeling, argumentation-based modeling, multiperspective modeling, reference modeling, model version control, model transformation, model design quality, and model analysis are selected from the huge field of information modeling and conceptually transferred to the legal domain. The agenda describes for every modeling aspect its relevance in the legal domain and in IS. By transferring IS concepts to the legal context (and vice versa), it is shown how future research from a design science perspective and from a behavioral science perspective should be conducted when aiming at establishing conceptual modeling in law. It is further shown how law can benefit from IS and especially how this transfer benefits IS in return with novel and interdisciplinary concepts, ideas, and impulses.

Table 1: Research Agenda for Conceptual Modeling in Law

Modeling aspect \ Field of activity		Creation of law	Application of law
Method generation	Method engineering	Developing and extending modeling methods to support the creation of laws or contracts	Developing and extending modeling methods to support the application of laws or contracts
	Meta modeling	Creating and applying meta modeling approaches in order to design and adapt modeling languages to support the creation of laws or contracts	Creating and applying meta modeling approaches in order to design and adapt modeling languages to support the application of laws or contracts
Model generation	Argumentation-based modeling	Supporting collaborative law-making or collaborative contract design	Supporting interpretation of law through traceability of a law's or contract's chain of reasoning
	Multiperspective modeling	Designing and managing model variants of laws or contracts for different stakeholders and purposes	Using role-specific model variants of laws in different legal communication situations
Model application	Reference modeling	Creating reference models of guidelines or policies that have to be instantiated as laws; creating reference models for model contracts	Taking model reuse into account while interpreting laws or contracts (e.g., legal decisions on similar contracts that are based on the same reference model)
	Model version control	Managing different versions of laws or contracts during the design phase	Reconstructing relevant versions of laws or contracts during legal interpretation
	Model transformation (particularly model-driven architecture)	Creating legal text in laws or contracts on the basis of models; creating models out of laws or contracts	___
Model evaluation	Model design quality	Ensuring high quality in the design of laws or contracts	Ensuring high quality in jurisdiction and verdict creation
	Model analysis	Preventing defective law-making or defective legal design	Subsequently validating laws or contracts in jurisdiction, Ensuring legal compliance

Conceptual modeling in the creation and application of law faces challenges that are distinctive of law and legal communication. It is necessary to describe how the different modeling aspects of the framework address these specific challenges in the context of the creation and application of law. Table 2 describes six requirements of legal communication that are derived from the literature.

Table 2: Requirements of Legal Communication

Requirements of legal communication	Explanation
REQ-D: Deontic logic	Deontic logic involves the concepts of obligation, prohibition, and permission. It "refers to a study of the normative use of language in which statements of 'it is obliged .... ' 'it is permitted .... ' etc. occur" [Ryu and Lee, 1995]. "Deontic logic is one of [the] most suitable tools of the modelling of normative concepts" [Ryu and Lee, 1995]. It can be used to "provide automatic inference in, say, contract arbitration or the interpretation of bureaucratic regulations" [Lee and Ryu, 1995]. It has been applied in Bureaucracies [Lee, 1988]. It is also used in Philosophy of Law as a basis for legal theory [Alchourrón and Bulygin, 1971].
REQ-R: Legal Reasoning/ Argumentation	Legal reasoning [or legal argumentation] can be "(a) reasoning to establish the existing content of the law on a given issue, (b) reasoning from the existing content of the law to the decision which a court should reach in a case involving that issue which comes before it, and (c) reasoning about the decision which a court should reach in a case, all things considered." [Dickson, 2010]. One important aspect of legal argumentation (besides the theoretical and philosophical aspects) is the reconstruction of legal arguments. "The object of such a reconstruction is to get a clear view of the stages of the argumentation process, the explicit and implicit arguments, and of the structure of the argument" [Feteris, 1999].
REQ-T: Time-Dependency	Law is time-dependent. New laws or amendments to existing laws lead to different versions of law. "The citizen, the economic planner, and even the specialist in the law are faced with mounting difficulties in working through the incessant flow of normative innovation and finding the law applicable to the time frames covered by the events subject to regulation" [Palmirani and Brighi, 2002]. Law can only be applied if it was in force at the time of the affected event [Vitali, 1999].
REQ-A: Accuracy	Accuracy is an important feature in legal language. "Legal writers must aim for precision" [Kimble, 1994-1995]. Legal language "is accurate if the expressions in it are used so as to forbid, authorize or require (the functions performed by the vast majority of statutes) exactly the behaviour that the requester wants to forbid, authorize or require, or otherwise to fulfill the requester's intent" [Stark, 1994]. If a law is not accurately phrased, it may fail to carry the legislator's original intent.
REQ-V: Vague Legal Concepts/Terms	Legal texts often contain vague legal concepts, such as the term "appropriate." A widely accepted view in legal research is that vague concepts have to be interpreted [Jónsson, 2009]. Dworkin is one famous representative of this view [Dworkin, 1986]. Vague concepts are often used intentionally by legislators in laws or by judges in legal standards to retain the ability of law to be applied to situations that are new or that have changed without losing its original underlying intention. "Crystal clear language would misrepresent a truly fuzzy reality" [Enquist and Oates, 2001].
REQ-E: Economic Efficiency	Law is often subject to economic efficiency. On the one hand, in the so called "economic analysis of law," legal researchers apply economic theory to consider economic implications in legislation [Calabresi, 1961; Coase, 1960]. On the other hand, research observes economic efficiency in legal processes, such as in legislation or contract design [Backer, 2007; Fix-Fierro, 2004].

Method Engineering

A lot of IS research has been conducted on how to construct appropriate and applicable methods for IS development [Brinkkemper, 1996; Heym and Österle, 1993; Song and Osterweil, 1992; White Baker, 2011]. A lot of these methods are graphical (or diagrammatic) modeling languages, like UML or BPMN. So, when thinking about conceptual modeling in law it would be wise to follow established method engineering approaches in order to develop new conceptual modeling methods or to extend existing methods for the representation of laws or contracts.

That's where IS and law have more in common than it seems on first sight. Legal and IS researchers are both looking for methods to visualize laws or legal contracts using, for example, structure diagrams or metaphorical pictures (see Section III). However, these approaches of legal visualization are currently rather isolated from each

other and relatively unstructured. Method engineering approaches could help in this context to structure the development process of conceptual representation forms in law. IS researchers could learn in turn from legal visualization approaches, when trying to represent and integrate legal concepts into existing conceptual modeling methods.

Most modeling methods are currently not able to express deontic logic (*REQ-D,* cf. Table 2). Process modeling techniques like BPMN, EPC, or Petri nets are aiming at representing as-is or to-be processes. They do not e.g. describe process operations that are prohibited. Implementing the concept of deontic logic into these modeling methods would not only be necessary for modeling legal concepts but would also improve existing IS modeling methods. Another aspect, which is often not sufficiently considered in information systems models, is time dependency (*REQ-T*). A lot of conceptual modeling techniques for data warehouse (DWH) modeling (e.g., ADAPT [Bulos, 1988], ME/RM [Sapia, Blaschka, Höfling and Dinter, 1998], DFM [Golfarelli, Maio and Rizzi, 1998]) do not explicitly consider historization of DWH analysis dimensions. Integrating time-dependency in conceptual modeling methods could, for example, help to describe and conceptualize different versions of DWH dimensions over time. On the one hand, using conceptual modeling methods in the context of laws and contracts can help to describe certain legal situations more accurately (*REQ-A*). The differentiation between an "inclusive or" and an "exclusive or" (like in BPMN or EPC) can stimulate or even force the drafter of a legal text to think about a more unambiguous formulation. On the other hand, the law requires concepts for generalization and vagueness in a conceptual modeling method (*REQ-V*). Applying IS modeling methods that are adapted to a legal context saves jurists the need for developing visualization approaches on their own, which contributes to the economic efficiency of legal visualizations (*REQ-E*). Figure 3 illustrates in a simple example how an existing modeling method could be extended with legal constructs by extending the meta model. The figure shows an extract from a ME/RM model and the respective meta model extract. The model depicts elements that are necessary in a data warehouse due to the "Markets in Financial Instruments Directive" (MiFID). Model (1) shows three different attributes for the DWH while Model (2) also provides the legal foundations for each of these attributes, which might help to better understand the legal requirements for the DWH. The following illustrations are partly based on the work of Goeken and Knackstedt [2007, 2008].

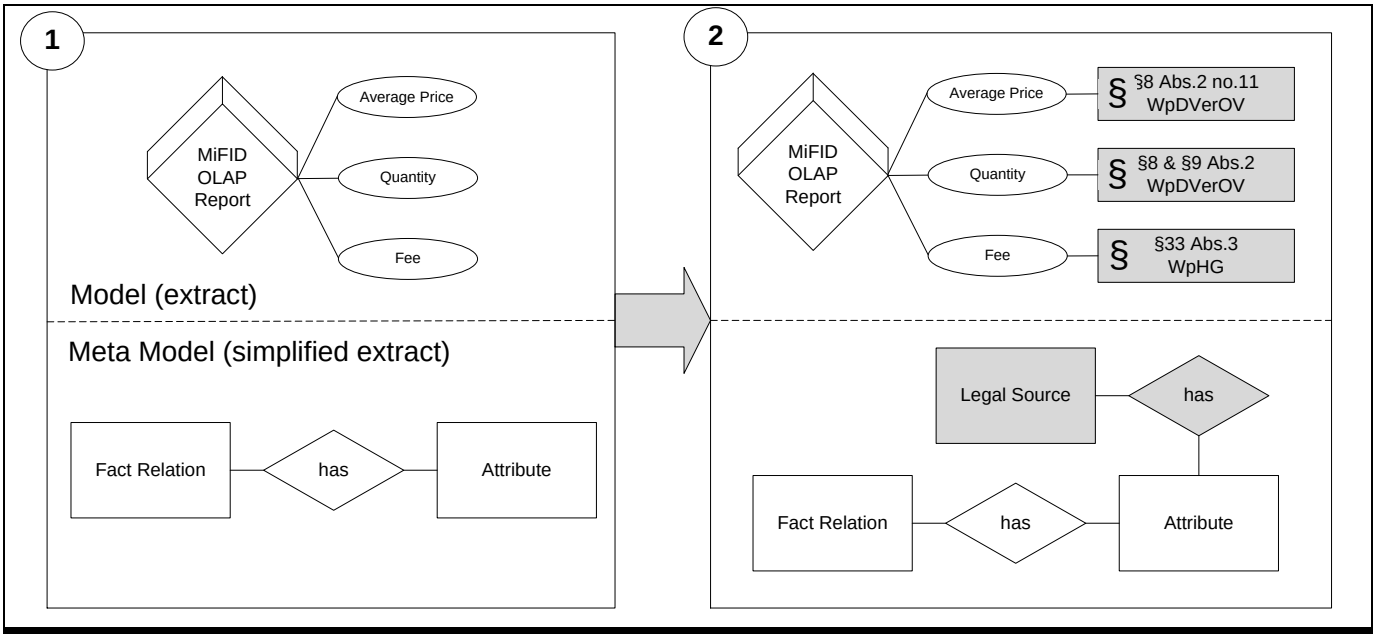

Figure 3. Example for a ME/RM Modeling Method Extension

From a design science perspective, the research agenda suggests creating new and adopting existing modeling methods for modeling laws and contracts using method engineering approaches. From a behavioral science perspective, relevant questions are "What method engineering approaches can be used to create new methods in the field of legal conceptual modeling?" or "What modeling methods exist that can be used or adapted to model legal regulations or contracts and what is their usability and acceptance?"

Meta Modeling

Meta models describe the building blocks of modeling methods. For example, they enable the flexible use and know-how transfer of different modeling techniques during information systems development [Dawson and Dawson, 1995] or the more productive integration of different software requirements perspectives [Nissen et al., 1996]. Language-based meta models describe fundamental linguistic constructs and their relationships that are basic for a model's

language. They also describe the visual representation of language constructs by assigning a set of symbols and their topology of arrangement to specific language constructs [Tveit, 2009]. Meta modeling techniques themselves can also be described by meta models, which are then called meta-meta models.

Meta modeling has not attracted the interest of legal researchers so far. Current approaches often lack a formal description of the visualization method or language. Meta modeling could provide the basis for legal conceptual modeling approaches. For example, concepts like the representation of uncertainty or risk, that already have been described in IS meta models [Strecker, Heise and Frank, 2010], could be transferred to the legal domain. The description of modeling methods with meta models in the legal context in turn challenges IS researchers. When certain legal concepts cannot be described with traditional means, it could lead to the development of new meta modeling constructs or techniques.

Meta models can be used to verify the syntactical and grammatical correctness of conceptual models. This contributes to the overall accuracy of conceptual models (*REQ-A*). Different modeling techniques will be necessary for different legal areas (e.g., modeling laws vs. modeling contracts). The development of meta modeling techniques and the development/use of meta modeling tools that are based on these techniques would decrease the effort of developing modeling languages and thereby contribute to the economic efficiency of legal conceptual modeling (*REQ-E*). A meta modeling language that is mainly focused on specifying "is a" and "is part of" relations for a modeling language will face problems in specifying relations as prohibitions, permissions, or obligations (*REQ-D*) and should be extended in this way. In cases where time-dependency is important in conceptual models, it might be necessary to think about whether meta modeling techniques should incorporate constructs that enable the developer of a modeling language to easily specify time-dependent elements (*REQ-T*).

From a design science perspective, the research agenda suggests to adapt and use meta modeling techniques to describe new modeling and representation methods for the different legal fields of activity. This includes the enhancement of existing meta modeling techniques with additional constructs. From a behavioral science perspective, an upcoming question is to determine what meta modeling techniques and constructs already exist that address the requirements of legal communication. Are certain communication situations of legal experts and legal laypersons related with certain types of language constructs and representations? In addition to the status quo analysis, one should examine what design principles of conceptual modeling are effective for the communication of law. This effectiveness manifests through, for example, an early detection of possible legal violations, cost reduction of legal communication, or an improvement of the cooperation between legal experts and IT experts.

Argumentation-Based Modeling

It is important for a legislator, contract designer, or law-interpreting person to know the rationale behind a certain norm, contract, or law [Dworkin, 1986]. Therefore, it is important that its creation process can be traced back. Nearly every legal rule in a democracy is crafted collaboratively and runs through a tedious creation process. Besides the different document versions that originate in the creation process, it is crucially important that the chain of reasoning and the argumentation process that led to the norm, contract, or law are explicated and supported. The interpretations of laws or legal norms require evaluative judgment and, therefore, also rely on the contextual situation and the reasons and arguments for the creation of a certain norm, contract, or law [Dworkin, 1986].

It is equally important for an IS developer or business process designer to know the rationale behind an information systems architecture, a specific program part, or a business process. Argumentation-based modeling is an existing IS approach that enables IS or process designers to integrate the argumentation and reasoning for models or model elements into information models and thereby explicate the rationale behind certain elements of a conceptual model [Andrade et al., 2004; Jin and Geslin, 2010; Karacapilidis and Papadias, 2001].

Argumentation-based modeling should be considered in the legal domain. Argumentation and discourse are central aspects in law. Habermas' Discourse Theory of Law [Habermas, 1998] is just one example for this. Questions are on the one hand how to model the process of argumentation and discourse (in court as well as during legislation) and on the other hand how to integrate models of argument and legal reasoning into conceptual models of laws or contracts (*REQ-R*). Figure 4 depicts two ME/RM model variants with the time dimensions "day," "month," and "quarter." The models are combined with an exemplary gIBIS model [Conklin and Begeman, 1989] to visualize the economic and legal arguments for the implementation of the term "periodic" in a financial directive. Some (rule-based) approaches exist in the fields of legal informatics, artificial intelligence, and computer-supported argument visualization [Ashley, 2009; Carr, 2003; Pinkwart et al., 2004; Reed and Rowe, 2004] that may serve as bases for integrating argumentation into conceptual models. Argumentation-based collaborative construction of laws or contracts based on conceptual models would lead to more transparent and comprehensible creation processes. This improvement of documentation may help to reduce the effort in searching and reconstructing the argumentation or reasoning behind a legal text (*REQ-E*).

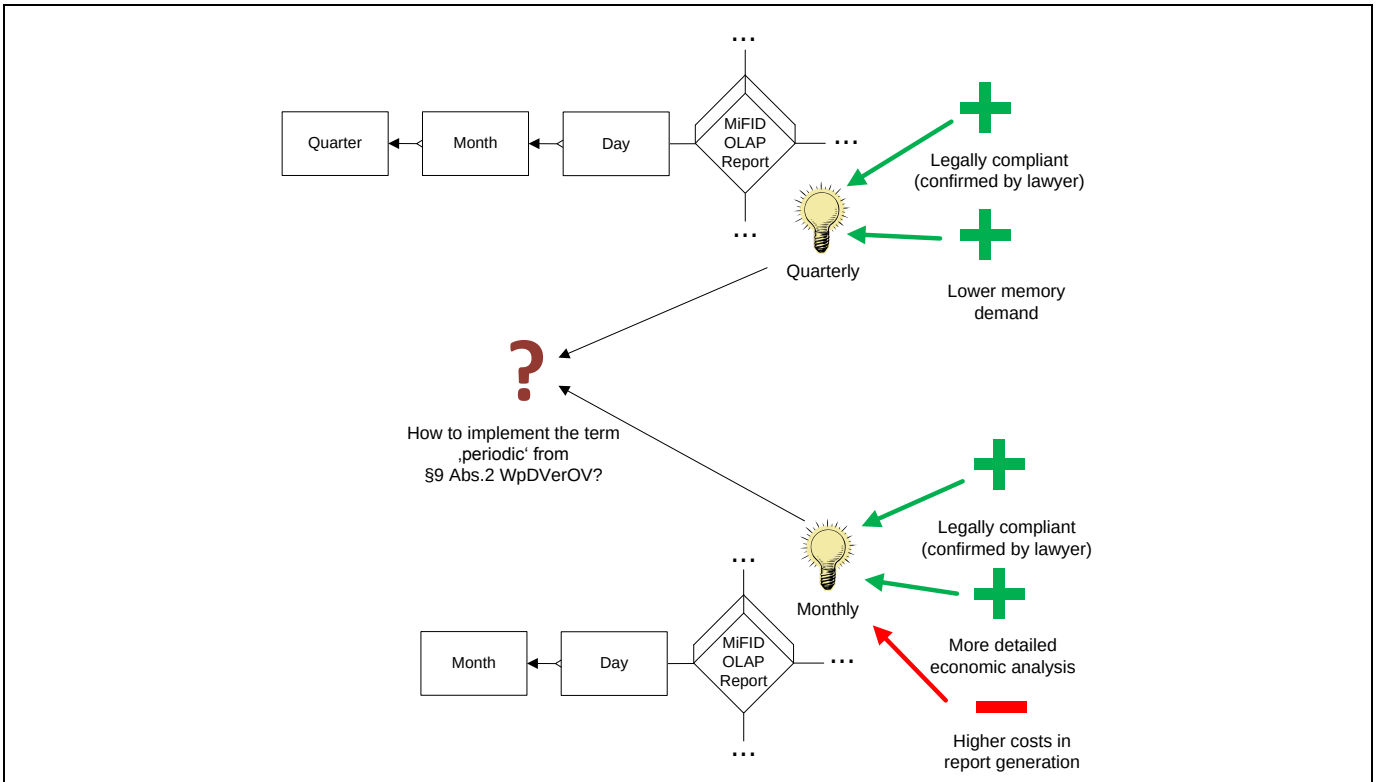

Figure 4. Example for an gIBIS [Conklin and Begeman, 1989] Argument in a ME/RM Model

The challenge from a design science perspective is to create IT artifacts that facilitate argumentation-based conceptual modeling in the legal domain or to enhance existing modeling methods with respective constructs. IS in turn can learn from theoretical concepts of legal argumentation and integrate them into existing IS approaches of argumentation-based modeling in order to support argumentation in IS models. Behavioral research should examine the usefulness and the positive or negative effects of such (software-supported) argumentation-based modeling approaches in collaborative legal creation processes and in legal interpretation.

Multiperspective Modeling

Different people with different roles (e.g., managers, software engineers, or lawyers) often use a law or contract for different purposes [Argyres and Mayer, 2007]. The manager is interested in the implications that a legal rule has on his business. A software engineer needs to understand what he is permitted or prohibited to include in an information system. Lawyers, judges, or the jury use laws or contracts in order to reach decisions at court. Although all of these stakeholders have different views on laws and contracts, the fundamental source of information remains the same—the legal text.

Conceptual models in IS are also used by different people with different roles for different purposes [Recker et al., 2009]. Multiperspective modeling is the approach in IS research that handles these requirements. It is particularly important to look upon a system from different viewpoints [Sommerville and Sawyer, 1997]. Business processes can be modeled multiperspectively to provide role-specific or purpose-specific variants [Rosa et al., 2011].

Multiperspective modeling can benefit conceptual modeling in law. A conceptual model of a law or contract could be configured for legislation, contract design, jurisdiction, management, or any other purpose in such a way that only those aspects that are relevant for the respective communication situation remain visible while all other elements remain hidden. This would help to manage the complexity of laws and contracts and thereby contribute to a better transparency and comprehensibility in legislation, contract design, or jurisdiction. This reduction of cognitive effort together with the fact that IS research already provides several software tools to automate the generation of multiperspective models (e.g., Rosa et al. [2011]) may contribute to the economic efficiency of dealing with different perspectives on laws and contracts (*REQ-E*). Multiperspective modeling may also be of use when describing different perspectives of a legal argument during the interpretation of laws and contracts (e.g., lawyer, prosecutor, and judge) or different perspectives of argumentation during the creation of laws and contracts (*REQ-R*). Stakeholder-specific conceptual modeling in turn teaches IS research about another promising group of customers.

The demands and wishes of managers, IS developers, and programmers are well known in IS research—those of lawyers, judges, privacy officers, and so on, rather less.

Design science research should develop modeling techniques and respective software-supported tools or similar IT artifacts that allow for modeling configurable conceptual models of laws and legal contracts. Behavioral research should examine the specific information need that each stakeholder group has and determine the exact amount of information necessary for successfully supporting specific communication situations.

Reference Modeling

During the design of law, subordinate authorities often have to instantiate guidelines or drafts of a superordinate legislative authority. Guidelines of the European Union, for example, have to be instantiated with national laws by EU member states. The U.S. Constitution and U.S. federal law apply for all U.S. states and have to be implemented by the governing authorities and public administrations. In the context of contract design, universal model contracts exist that can be adjusted to specific situations.

Reusable and universally applicable conceptual models, so-called reference models, usually describe the best practice structures or concepts of specific domains. These structures and concepts can be adapted and used in a specific context. Reference modeling is a well-established field in IS research [Brocke, 2006; Fettke and Loos, 2003, 2007; Rosemann and van der Aalst, 2007]. Configurative reference modeling enables the creation of context-dependent model variants by defining configuration terms [Becker et al., 2004; Delfmann and Knackstedt, 2007]. This can reduce costs for model generation and is, therefore, an important economic measure (*REQ-E*).

The concept of reference modeling can be beneficial in the legal domain when, for example, guidelines of the European Union (EU) are additionally provided in forms of legal reference models (such as Tobler and Beglinger [2010]). The respective EU member states could reuse and adapt these reference models when designing national laws. In the same way, a reference model of a model contract could be used when designing complex contracts. This could be achieved by creating contracts in a “construction kit”-like way on the basis of parameterized reference models of model contracts. Furthermore, the possibility to track whether certain parts of a contract have been adopted from model contracts would be advantageous in the field of jurisdiction. Previous cases, where similar model contracts were involved, could be consulted. This would be especially important in legal areas where case law is applied. Current reference models from the IS domain, such as the workflow reference model [Hollingsworth, 1995] or the SCOR model [Council, 2010], are often lacking a legal perspective. The SCOR model, for example, does provide good and best practices for supply chain processes but it does not describe the processes that are legally prohibited or obligatory (*REQ-D*). In this regard, IS could learn from conceptual modeling approaches in law how to extend existing reference models with legal regulations and concepts.

Research should follow a design science approach to extend existing reference models with a legal perspective or to develop new reference models for specific legal regulations or contracts. From a behavioral science perspective, it should be examined what organizations, under what conditions, actually use which reference models for communication in the different legal fields of activity. One should further ask how missing or existing reference models impact legal communication between legal experts and other disciplines. The impacts of these models could be evaluated with different methods like field experiments, surveys, case studies, or feature comparison [Siau and Rossi, 2011]. It could be measured with different parameters such as cost, duration of creation and usage, satisfaction of the communication partners, perceived ease of use, or perceived benefit [Davis, 1989; Davis, Bagozzi and Warshaw, 1989; Schalles, Creagh and Rebstock, 2011].

Model Version Control

Different versions of laws and contracts play important roles in the legal domain. When judging a case, for example, the judge or the jury often faces a situation “where the law to be applied is the one that was valid at the moment of the affected event, although its content may have changed in the meantime” [Vitali, 1999]. At the same time, the law is “under increasing pressure to keep pace with social change: normative texts and amendments follow one another in time and get overlapped” [Grandi, Mandreoli and Tiberio, 2005]. Approaches exist to formalize legal documents in order to handle different versions over time (*REQ-T*) [Grandi et al., 2005] or to manage legal documents and their IT-based versioning [Palmirani and Brighi, 2002]. Version control of contracts also plays a vital role for companies in auditing situations, where it is important to provide comprehensive information on all business activities for a certain period of time.

It is equally important that different versions of conceptual information systems models or process models are created and managed. Model version control subsumes approaches in IS that can handle various aspects, such as

comparison, conflict detection, or conflict resolution (for an overview on model version control approaches cf. Altmanninger et al. [2009]).

Conceptual models of laws or contracts should be managed with similar model version control methods. Different versions of legal artifacts (e.g., rough drafts of laws) lead to a more transparent and replicable legal design process. Furthermore, version control would support collaboration activities in the design of laws or contracts. When creating or interpreting laws or contracts, model version control should be used to reconstruct a historic legal situation. Model version control in conceptual models of law leads to a better documentation of time-dependent variants of laws and contracts (*REQ-T*), which could reduce the search effort and facilitate efficient reuse of former versions of laws and contracts (*REQ-E*).

Existing conceptual modeling tools should be extended with aspects of legal versioning, or new IT artifacts for legal model versioning should be developed in a design science approach. The fact that IS and law are confronted with similar problems regarding version control creates mutual learning and interdisciplinary synergy potential in the process. Behavioral science research should be conducted on the question of what level of detail is necessary for versioning laws or models of law and how effective a combination of existing model version control approaches from the IS domain and legal document version control approaches can be.

Model Transformation (Particularly Model-Driven Architecture)

The additional effort that comes with creating legal conceptual models might be too high for many stakeholders. Therefore, the construction of conceptual models of laws and contracts should be automated to be as cost- and time-efficient as possible in order to rise acceptance in legal practice (*REQ-E*).

IS research provides methods that enable a (partly) automated transformation of conceptual models into e.g. software code and vice versa. Model transformation and model-driven architecture (MDA) are research approaches that are aiming at facilitating this process [Czarnecki and Helsen, 2006; Frankel, 2003; OMG, 2011a; Sendall and Kozaczynski, 2003]. The automated reverse transformation of software code into conceptual models is the object of reverse-engineering research [Koschke, 2003; Soffer, Golany and Dori, 2003; Suss et al., 2006; Systä, Koskimies and Müller, 2001].

The methods of model transformation, MDA and reverse engineering, should be used during the model-based design of laws and contracts. In this case, it would be the legal text that is created out of conceptual models. This would be of use in situations where people work collaboratively in model-based crafting processes on laws or contracts. In a reverse engineering approach, conceptual models could be derived from legal texts, which could be applied when existing laws or contracts have to be communicated to legal laypersons. Automating the process of transforming conceptual models into legal text and vice versa comes along with a decrease of effort in drafting and creating legal texts and legal conceptual models (*REQ-E*).

The development and evaluation of techniques and algorithms that can transform laws or contracts into models and vice versa are future challenges for IS design science research. Behavioral research in this area should focus on questions like what types of legal documents are or are not suitable for model transformation methods and how the (economic) value of such methods could be measured.

Model Design Quality

Design quality in law comprises questions of what constitutes a good law or a good contract and how to measure quality in legal documents. Quality Management in law becomes more and more important in times where legal systems are shifting toward a more customer-oriented perspective [Mixon and Otto, 1994]. This also includes higher quality requirements for the design of laws and contracts, which can be supported by the use of diagrammatic representations [Mixon and Otto, 1994]. Numerous guidelines and handbooks have been published on good legal drafting and in particular legislative drafting [Adams, 2001; Butt, 2006; Dorsey, 2010; Haggard and Kurney, 2007].

Then again, the question of what constitutes a good model is subject to IS research and computer science. Model quality may depend on completeness, consistency, correctness, testability, unambiguity, clarity, relevance, comparability, comprehensibility, economic efficiency, or systematic design [Becker et al., 2003; Krogstie, Sindre and Jorgensen, 2006; Lindland, Sindre and Solvberg, 1994]. Moody defines model quality as “the totality of features and characteristics of a conceptual model that bear on its ability to satisfy stated or implied needs” [Moody, 2005].

Conceptual models of laws or contracts would have similar demands on quality as conceptual models of information systems or business processes. The challenge for IS design science research would be to integrate model quality aspects with quality aspects of legal drafting and develop appropriate IT artifacts. This would create better legal

conceptual models, which would eventually lead to better legal drafting and a reduction in maintenance and revision costs (*REQ-E*). Questions from a behavioral science perspective are what quality characteristics of legal drafting can and should be incorporated in the conceptual model design processes and in the final product (the model). How can quality principles of conceptual modeling positively influence the quality of legal drafting? This would be a chance for the legal domain to reconsider current quality criteria from an IS model quality perspective and vice versa, which could lead to new ideas and knowledge in both disciplines.

Model Analysis

New laws sometimes contradict existing and superordinate law and are therefore invalid from the start. There are also inconsistencies and errors within laws and other legal documents. If a law does not express what a legislative authority had in mind when crafting it, a subsequent modification may become very expensive and time-consuming (*REQ-E*). During contract design processes, such as in business collaboration situations, it is important that every business requirement is incorporated in the contract document. Otherwise, invalid parts in contracts or simply parts that are not in the interest of the contractual partners threaten these collaborations.

IS research has developed several model analysis approaches to satisfy naming conventions and to ensure consistent grammar and semantic correctness in conceptual models. These approaches can be summarized under the terms "model validation" or "model checking" and are parts of model analysis research. Model analysis in general is aiming at identifying flaws, weaknesses, and potential for improvement in information models and tries to make improvement suggestions and corrections [Vergidis et al., 2008]. Model analysis can be used, for example, to detect model parts that are not legally compliant [Awad, Weidlich and Weske, 2010; Holzmann, 1997; Ly, Rinderle-Ma, Göser and Dadam, 2009; Sadiq, Governatori and Namiri, 2007] or to ensure naming conventions [Delfmann, Herwig, Lis and Stein, 2009]. Figure 5 depicts an EPC model extract of a process in which customer data is stored. The pattern to the left is defined with the modeling language G-CTL [Speck, Feja, Witt and Pulvermüller, 2011; Witt, Feja, Speck and Prietz, 2012] and ensures automatically that every time personal data is stored, it will also get deleted after a certain period of time. In this way, data privacy requirements can be met and verified.

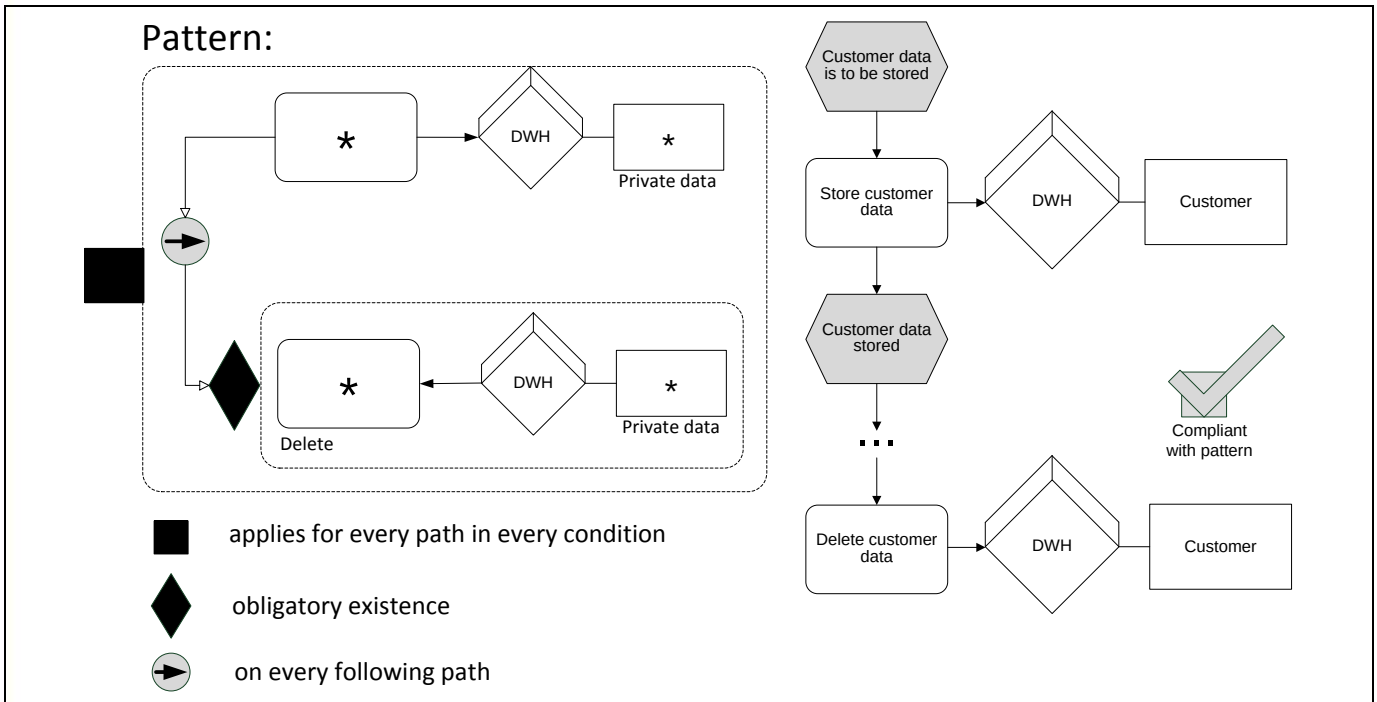

Figure 5. Checking Data Privacy Regulations in an EPC Model [Speck et al., 2011; Witt et al., 2012]

These approaches could be transferred to the legal domain. An automated consistency check during the model-based design of laws and contracts would contribute to preventing defective law making or defective contract design, which would lead to a more accurate legal design (*REQ-A*). An automated analysis of weakness patterns and of compliance with requirements, for example, should lead to better models and lower maintenance and adjustment costs (*REQ-E*). Furthermore, laws and contracts could be checked for validity during jurisdiction or legal interpretation. Deontic logic would be a basic concept during the definition of these rules and algorithms (*REQ-D*) like, for example, in Ryu and Lee [1995]. The IS discipline in turn could learn from these insights and broaden the knowledge about limitations of its own formalization approaches.

Design science research can build on existing model analysis approaches and develop or extend methods and algorithms to analyze legal conceptual models. From a behavioral science perspective, one should examine the possible extent and purpose of using various model checking approaches for conceptual modeling in law. The (economic) value of their application in specific legal fields of activity under specific circumstances should be examined. Types of (automated) analysis that are particularly effective in the legal domain should be explored. This could be the analysis of legal regulations that are affected in contracts or laws when the overall legal situation changes.

V. NEXT STEPS

The previous section described the different aspects that constitute the research agenda. In order to give some guidance for researchers on how to structure their research in this field, this section proposes an iterative three-step approach to research in the field of legal conceptual modeling.

The first step should be the identification of those legal application areas that show the highest potential for applying conceptual modeling techniques. These are expected to be primarily areas that are already accustomed to using conceptual models. A first example is the legal regulation of the financial sector. Process compliance and reporting compliance are major issues for banks, especially in the wake of the financial crisis. Process models or data warehouse models provide a good basis to communicate legal requirements in the financial sector (e.g., Knackstedt, Eggert and Fleischer [2012]). A second example is the field of e-government. Governmental processes are strongly regulated by laws or directives. These processes are often described with process models. This provides a good basis for research on how to communicate and integrate legal requirements in governmental process models.

The second step should be the development and evaluation of modeling methods and modeling languages for these application areas. Therefore, it may sometimes be necessary to create totally new modeling methods and sometimes to adjust and modify existing methods (*Method Generation* in the research agenda). In this step it will be useful to draw from existing IS knowledge in method engineering/method generation and meta modeling techniques. Aspects of model evaluation (*Model Evaluation* in the research agenda) should already be considered during the creation and/or modification of legal modeling methods so that, for example, model design quality can be integrated into the method.

The third step should be the identification and development of those aspects of model generation and model application (*Model Generation* and *Model Application* in the research agenda) that are useful in the specific application areas and for the specific modeling methods. This can be, for example, model version control for governmental process models, since different versions of the law are often related to different governmental processes. Another example is reference modeling in the field of contract visualization. The results of this research approach should be efficient and novel conceptual modeling techniques or modeling technique extensions for specific legal application areas.

After the third step, the procedure should be repeated, now addressing those legal application areas that may prove more difficult in implementing the idea of conceptual modeling (e.g., legislation). Each iteration should always build upon the insights and results of the previous iteration(s).

VI. DISCUSSION

Knowledge and insights from the IS research field of conceptual modeling should be used to approach the problem of grounding, regarding communication between legal experts and legal laypersons. Nevertheless, certain aspects could interfere with these goals. The following section discusses obstacles and further potential of conceptual modeling in law.

A prerequisite for the acceptance of conceptual models in law is the idea that the currently widespread abstinence from graphical depictions in law can be overcome. The preconception that jurists don't use images is still prevalent. Visualizations are often frowned upon by legal experts because they are perceived as non-serious and unprofessional. A general iconoclastic attitude predominates in law. One exception to this, with a long tradition, is traffic law. Fast conceptions of prohibitions, prescriptions, permissions, and exceptions are particularly important in traffic situations. "An image is (at least in theory) decipherable and immediately comprehensible" [Wagner, 2006]. This example indicates that there are at least some situations in which legal experts do accept visual representations of legal regulations. This might be a starting point. Moreover, visualizing law has historical roots as proven by the famous "Sachsenspiegel," [Opitz, 1990], which described the common law of the thirteenth century [Olbrich and Simon, 2008]. At a time when the literacy rate was very low it was common to complement legal texts with images. Nowadays, a model-based representation of law wouldn't be used for those who can't read. It would be used as an addition to the interdisciplinary discussion of complex issues in law. The existing presence of multimedia

contents and information visualization in our society, which has led to a visualization habituation and even to a dependency on such representation forms [Ball-Rokeach and DeFleur, 1976; Kraidy, 2002], underlines the need for such graphical representations.

It could be argued against improving legal regulations' comprehensibility that such innovation collides with the interests of some legal experts who are concerned about the exclusiveness of their work. Here, it has to be stated that building common ground between experts and laypersons does not imply that laypersons become experts. Instead, the creation of a mutual understanding is limited to those aspects that are necessary for an informed decision in a specific communication situation. The legal texts in traditional expert-to-expert communication situations are by no means meant to be replaced. Model-based approaches should rather be an additional representation variant for illustrating legal aspects. Legal experts, therefore, do not have to fear becoming dispensable.

The developments and uses of additional representation forms in a legal system are, however, dependent on an actual paradigm shift in legal thinking [Barton, 2008]. Some effort has already been invested in the prevention of legal disputes that result from fallacy and misunderstandings in communication. This new understanding of legal work, which is aiming at preventing disputes and thereby goes beyond the retroactive assessment of legal cases, is appropriately named proactive law [Siedel and Haapio, 2010; Wahlgren, 2006]. An analogous goal of IS research is to avoid mistakes in the early stages of software development by using methods of requirements engineering. Such mistakes would lead to disproportionate costly modifications during the implementation and maintenance of software systems. Due to this similarity of structures, it seems reasonable, in this regard, that law orients itself by IS research during its cultural change.

It is difficult to answer the question of how interdisciplinary research can be institutionalized. Interdisciplinary research in the fields of IS and law is, institutionally, relatively weak. This reality clashes with the prospering interdisciplinary collaboration between business economics and IS. Companies demand knowledge and insights of interdisciplinary IS and business research. Governments strongly fund this research. At first glance, it seems rather unlikely that research on conceptual modeling will turn away from the business domain and toward the transfer of knowledge and insights to the legal domain.

However, the dissemination of conceptual modeling-based proactive law would also benefit IS. IT innovations often come to naught or are not even developed at all because their underlying legal conditions have been insufficiently aligned with IT requirements. Intellectual property law, for example, often slows down innovation because engineers are not allowed to build upon the work of others but instead have to constantly reinvent the wheel [Haynes, 1999]. In other cases, IT innovations have to be withdrawn from the market because of legal violations. Subsequent modifications of software systems in order to incorporate relevant legal regulations are often expensive. In the worst case, they are related to public scandals that damage a company's image. A well-matched advancement of IT and law, supported by conceptual modeling methods, should replace the subsequent legal validation of IT solutions. This includes political processes that lead to societal legitimating of IT solutions, which have to be initiated early and in parallel to IS development. Both disciplines should learn from each other in this interdisciplinary process, harness synergy effects, obtain inspirations, and widen their common knowledge base.

VII. CONCLUSION

We argue for enhancing comprehensibility of legal regulations, laws, and contracts by using conceptual models. The idea is to transfer established methods and theoretical concepts from the IS discipline to the legal domain. It is expected that besides the obvious benefits for the legal domain, the IS discipline will also benefit when reflecting on its existing methods from a new and interdisciplinary perspective. This transfer is structured in a framework-based research agenda. It focuses on the different modeling aspects, namely method engineering, meta modeling, argumentation-based modeling, multiperspective modeling, reference modeling, model version control, model transformation (particularly model-driven architecture), model design quality, and model analysis. The proposed research agenda can be used by IS researchers as well as legal researchers to derive new research questions, explore new fields of application for existing IS methods and theoretical concepts, and position their own research. Therefore, it provides a basis for future studies in this field.

REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.

Aamodt, A. and E. Plaza (1994) "Case-Based Reasoning—Foundational Issues, Methodological Variations, and System Approaches", *AI Communications,* (7)1, pp. 39–59.

Adams, K.A. (2001) *Legal Usage in Drafting Corporate Agreements,* Westport, CN: Greenwood Publishing Group.

Aguilo-Regla, J. (2005) “Introduction: Legal Informatics and the Conceptions of the Law” in Benjamins, R., P. Casanovas, J. Breuker and A. Gangemi (eds.) *Law and the Semantic Web*, Berlin, Germany: Springer, pp. 18–24.

Alchourrón, C.E. and E. Bulygin (1971) *Normative Systems,* Vienna, Austria: Springer-Verlag.

Alpar, P. and S. Olbrich (2005) "Legal Requirements and Modelling of Processes in e-Government", *Electronic Journal of e-Government,* (3)3, pp. 107–115.

Altmanninger, K., M. Seidl and M. Wimmer (2009) "A Survey on Model Versioning Approaches", *International Journal of Web Information Systems,* (5)3, pp. 271–304.

Andrade, J., J. Ares, R. Garcia, J. Pazos, S. Rodriguez, A. Silva (2004) "A Methodological Framework for Viewpoint-Oriented Conceptual Modeling", *IEEE Transactions on Software Engineering,* (30)5, pp. 282–294.

Argyres, N. and K.J. Mayer (2007) "Contract Design as a Firm Capability: An Integration of Learning and Transaction Cost Perspectives", *The Academy of Management Review,* (32)4, pp. 1060–1077.

Ashley, K.D. (1991) "Reasoning with Cases and Hypotheticals in HYPO", *International Journal of Man-Machine Studies,* (34) Special Issue: AI and Legal Reasoning, pp. 753–796.

Ashley, K.D. (2009) "Teaching a Process Model of Legal Argument with Hypotheticals", *Artificial Intelligence and Law,* (17)4, pp. 321–370.

Austen, I. (2006) “Costly Sentence Imposed on Cable Company”, *The New York Times,* Tuesday, October 24, 2006.

Awad, A., M. Weidlich and M. Weske (2010) "Consistency Checking of Compliance Rules", *Business Information Systems—Lecture Notes in Business Information Processing,* (47)4, pp. 106–118.

Backer, L.C. (2007) "Economic Globalization and the Rise of Efficient Systems of Global Private Lawmaking: Wal-Mart as Global Legislator", *University of Connecticut Law Review,* (39)4, pp. 1–41.

Bain, W.M. (1989) “JUDGE” in Riesenbeck, C.K., and R. Schank (eds.) *Inside Case-Based Reasoning*, Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 141–163.

Ball-Rokeach, S.J. and M.L. DeFleur (1976) "A Dependency Model of Mass Media Effects", *Communication Research,* (3)1, pp. 3–21.

Barton, T.D. (2008) “A Paradigm Shift in Legal Thinking” in Haapio, H. (ed.) *A Proactive Approach to Contracting and Law*, Turku, Finland: Turku University of Applied Sciences.

Baskerville, R. (2008) "What Design Science Is Not", *European Journal of Information Systems,* (17)5, pp. 441–443.

Baskerville, R. and J. Pries-Heje (2010) "Explanatory Design Theory", *Business & Information Systems Engineering,* (2)5, pp. 271–282.

Becker, J., P. Delfmann and R. Knackstedt (2004) "Construction of Reference Modeling Languages—A Framework for the Specification of Adaptation Mechanisms for Conceptual Information Models", *Wirtschaftsinformatik,* (46)4, pp. 251–264.

Becker, J., D. Pfeiffer and M. Räckers (2007) "Domain Specific Process Modelling in Public Administrations—The PICTURE-Approach", *Lecture Notes in Computer Science,* (4656)1, pp. 68–79.

Becker, J., M. Rosemann and C. Uthmann (2003) “Guidelines of Business Process Modeling” in van der Aalst, W.M.P. and D.J. Oberweis (eds.) *Business Process Management. Models, Techniques, and Empirical Studies*, Berlin, Germany: Springer, pp. 30–49.

Berger-Walliser, G., R.C. Bird and H. Haapio (2011) "Promoting Business Success Through Contract Visualization", *Journal of Law, Business, and Ethics,* (17)1, pp. 55–75.

Boehm, B.W. (1984) "Verifying and Validating Software Requirements and Design Specifications", *IEEE Software,* (1)1, pp. 75–88.

Booch, G., I. Jacobson and J. Rumbaugh (1998) *The Unified Modeling Language Users Guide,* Reading, MA: Addison Wesley.

Braganza, A. and K.C. Desouza (2006) "Implementing Section 404 of the Sarbanes Oxley Act: Recommendations for Information Systems Organizations", *Communications of the Association for Information Systems,* (18) Article 22, pp. 464–487.

Brasil, S.M. (2001) "Rules and Principles in Legal Reasoning. A Study of Vagueness and Collisions in Artificial Intelligence and Law", *Information & Communications Technology Law,* (10)1, pp. 67–77.

Brinkkemper, S. (1996) "Method Engineering: Engineering of Information Systems Development Methods and Tools", *Information and Software Technology,* (38)1, pp. 275–280.

Brocke, J.v. (2006) “Design Principles for Reference Modelling. Reusing Information Models by Means of Aggregation, Specialisation, Instantiation, and Analogy” in Fettke, P. and P. Loos (eds.) *Reference Modelling for Business Systems Analysis*, Hershey, PA: Idea Group Publishing, pp. 47–75.

Brockriede, W. and D. Ehninger (1960) "Toulmin on Argument: An Interpretation and Application", *Quarterly Journal of Speech,* (46)1, pp. 44–54.

Bromme, R., R. Jucks and A. Runde (2003) “Barriers and Biases in Computer-Mediated Expert-Layperson-Communication” in Bromme, R., F.W. Hesse and H. Spada (eds.) *Barriers and Biases of Computer-Mediated Knowledge Communication and How They May Be Overcome*, Heidelberg, Germany: Springer, pp. 89–118.

Bromme, R., M. Nückles and R. Rambow (1999) “Adaptivity and Anticipation in Expert-Laypeople Communication” in Brennan, S.E., A. Giboin, and D. Traum (eds.) *Psychological Models of Communication in Collaborative Systems*, Menlo Park, CA: AAAI, pp. 17–24.

Bromme, R., R. Rambow and M. Nückles (2001) "Expertise and Estimating What Other People Know: The Influence of Professional Experience and Type of Knowledge", *Journal of Experimental Psychology,* (7)4, pp. 317–330.

Brown, L.M. (1970) *Preventive Law,* VA: Greenwood Press.

Brown, L.M. (1986) *Lawyering Through Life: The Origin of Preventive Law,* Littleton, CO: F.B. Rothman & Co.

Brunschwig, C. (2001) *Visualisierung von Rechtsnormen, Legal Design*, Zurich, Switzerland: Schulthess Juristische Medien.

Brunschwig, C.R. (2006) "Visualising Legal Information: Mind Maps and E-Government", *Electronic Government,* (3)4, pp. 386–403.

Brunschwig, C.R. (2011) “Multisensory Law and Legal Informatics—A Comparison of How These Legal Disciplines Relate to Visual Law” in Geist, A., C.R. Brunschwig, F. Lachmayer and G. Schefbeck (eds.) *Structuring Legal Semantics*, Bern, Switzerland: Weblaw AG Edition.

Bulos, D. (1988) “OLAP Database Design. A New Dimension” in Chamoni, P. and P. Gluchowski (eds.) *Analytische Informationssysteme. Data Warehouse, On-Line Analytical Processing, Data Mining*, Berlin, Germany: Springer, pp. 251–261.

Butt, P. (2006) *Modern Legal Drafting: A Guide to Using Clearer Language, 2nd edition,* Cambridge, England: Cambridge University Press.

Calabresi, G. (1961) "Some Thoughts on Risk Distributions and the Law of Torts", *The Yale Law Journal,* (70)4, pp. 499–553.

Carr, C.S. (2003) “Using Computer Supported Argument Visualization to Teach Legal Argumentation”, in Kirschner, P.A., S.J.B. Shum and C.S. Carr (eds.) *Visualizing Argumentation*, London, England: Springer-Verlag, pp. 75–96.

Chang, C. (2011) "Street Vendor Guide. Accessible City Regulations", http://candychang.com/street-vendor-guide (current July 3, 2013).

Chen, P.P.-S. (1976) "The Entity-Relationship Model—Toward a Unified View of Data", *ACM Transactions on Database Systems (TODS),* (1)1, pp. 9–36.

Clark, H.H. (1996) *Using Language,* Cambridge, England: Cambridge University Press.

Clark, H.H. and S.E. Brennan (1996) “Grounding in Communication”, in Resnick, L.B., J.M. Levine and S.D. Teasley (eds.) *Perspectives on Socially Shared Cognition*, Washington, DC: American Psychological Association.

Clark, H.H. and T.B. Carlson (1982) "Experts' Audience Design in Internet-Based Communication", *Language,* (58)1, pp. 332–373.

Clark, H.H. and C.R. Marshall (1981) "Definite Reference and Mutual Knowledge" in Joshi, A.K., B.L. Webber and I.A. Sag (eds.) *Elements of Discourse Understanding*, Cambridge, England: Cambridge University Press, pp. 10–63.

Clark, H.H. and C.R. Marshall (1992) "Definite Reference and Mutual Knowledge" in *Arenas of Language Use*, Chicago, IL: Chicago University Press, pp. 9–59.

Clarke, E.M., E.A. Emerson and A.P. Sistla (1986) "Automatic Verification of Finite-State Concurrent Systems Using Temporal Logic Specifications", *ACM Transactions on Programming Languages and Systems,* (8)2, pp. 244–263.

Coase, R.H. (1960) "The Problem of Social Cost", *Journal of Law and Economics,* (3)1, pp. 1–44.

Conklin, J. and M.L. Begeman (1989) "gIBIS: A Tool for All Reasons", *Journal of the American Society for Information Science,* (40)3, pp. 200–213.

Council, S.C. (2010) *Supply Chain Operations Reference (SCOR®) Model—Overview Version 10.0,* Cypress, TX: Supply Chain Council, Inc.

Czarnecki, K. and S. Helsen (2006) "Feature-Based Survey of Model Transformation Approaches", *IBM Systems Journal,* (45)3, pp. 621–645.

Darimont, R. and M. Lemoine (2006) "Goal-Oriented Analysis of Regulations", CAISE Workshop on Regulations Modelling and their Validation and Verification ReMo2V '06, Luxembourg, Luxembourg, pp. 838–844.

Dattu, F. (1998) "Illustrated Jury Instructions: A Proposal", *Law and Psychology Review,* (22)1, pp. 67–102.

Davies, I., P. Green, M. Rosemann, M. Indulska, and S. Gallo (2006) "How Do Practitioners Use Conceptual Modeling in Practice?", *Data & Knowledge Engineering,* (58)1, pp. 358–380.

Davis, F.D. (1989) "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology", *MIS Quarterly,* (13)3, pp. 318–340.

Davis, F.D., R.P. Bagozzi and P.R. Warshaw (1989) "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models", *Management Science,* (35)8, pp. 982–1003.

Dawson, C.W. and R.J. Dawson (1995) "Towards More Flexible Management of Software Systems Development Using Meta-Models", *Software Engineering Journal,* (10)3, pp. 79–88.

DeGroff, E.A. and K.A. McKee (2006) "Learning Like Lawyers: Addressing the Differences in Law Student Learning Styles", *Brigham Young University Education and Law Journal,* (2006)2, pp. 499–550.

Delfmann, P., S. Herwig, L. Lis and A. Stein (2009) "Supporting Distributed Conceptual Modelling through Naming Conventions—A Tool-Based Linguistic Approach", *Enterprise Modelling and Information Systems Architectures,* (4)1, pp. 3–20.

Delfmann, P. and R. Knackstedt (2007) "Towards Tool Support for Information Model Variant Management—A Design Science Approach", European Conference on Information Systems, St. Gallen, Switzerland, pp. 2098–2109.

Dickson, J. (2010) "Interpretation and Coherence in Legal Reasoning", http://plato.stanford.edu/archives/spr2010/entries/legal-reas-interpret/ (current July 3, 2013).

Dorsey, T.A. (2010) *Statutory Construction and Interpretation: General Principles and Recent Trends; Statutory Structure and Legislative Drafting Conventions; Drafting Federal Grants Statutes; and Tracking Current Federal Legislation and Regulations,* Washington, DC: The Capitol Net Inc.

Dworkin, R. (1986) *Law's Empire,* London, England: Fontana Press.

Emerson, E.A. (1990) "Temporal and Modal Logic" in Leeuwen, J.V. (ed.) *Handbook of Theoretical Computer Science—Volume B: Formal Models and Semantics*, Cambridge, MA: MIT Press, pp. 995–1072.

Enquist, A. and L.C. Oates (2001) *Just Writing: Grammar, Punctuation, and Style for the Legal Writer*, New York, NY: Aspen Law & Business.

Erdelez, S. and S. O'Hare (1997) "Legal Informatics: Application of Information Technology in Law", *Annual Review of Information Science and Technology,* (32)1, pp. 367–402.

Fagen, R. (1967) “Politics and Communication” in Aubert, V. (ed.) *Elements of Sociology*, Boston, MA: Little, Brown, pp. 35–39.

Feteris, E.T. (1999) *Fundamentals of Legal Argumentation—A Survey of Theories on the Justification of Judicial Decisions,* Dordrecht, Netherlands: Kluwer Academic Publishers.

Fettke, P. (2009) "How Conceptual Modeling Is Used", *Communications of the Association for Information Systems,* (25) Article 43, pp. 571–592.

Fettke, P. and P. Loos (2003) "Classification of Reference Models: A Methodology and Its Application", *Information Systems and e-Business Management,* (1)1, pp. 35–53.

Fettke, P. and P. Loos (2007) *Reference Modeling for Business Systems Analysis,* Hershey, PA: Idea Group Publishing.

Fix-Fierro, H. (2004) *Courts, Justice and Efficiency: A Socio-Legal Study of Economic Rationality in Adjudication,* Portland, OR: Hart Publishing Ltd.

Frankel, D.S. (2003) *Model Driven Architecture: Applying MDA to Enterprise Computing,* Indianapolis, IN: Wiley Publishing.

Gemino, A. and Y. Wand (2004) "A Framework for Empirical Evaluation of Conceptual Modeling Techniques", *Requirements Engineering,* (9)1, pp. 248–260.

Ghanavati, S., A. Siena, A. Perini, D. Amyot, L. Peyton, and A. Susi (2009) "A Legal Perspective and Business: Modeling the Impact of Law", *Lecture Notes in Business Information Processing,* (26)1, pp. 267–278.

Gifford, D.J. (1971) "Communications of Legal Standards, Policy Development, and Effective Conduct Regulation", *Cornell Law Review,* (56)1, pp. 409–410.

Goeken, M. and R. Knackstedt (2007) “Multidimensional Reference Models for Data Warehouse Development”, International Conference on Enterprise Information Systems, Funchal, Madeira, Portugal, pp. 347–354.

Goeken, M. and R. Knackstedt (2008) "Referenzmodellgestütztes Compliance Reporting am Beispiel der EU-Finanzmarktrichtlinie MiFID", *HMD,* (45)263, pp. 220–234.

Golfarelli, M., D. Maio and S. Rizzi (1998) “Conceptual Design of Data Warehouses from E/R-Schemes”, 31st Hawaii International Conference on System Sciences (HICSS'98), Kohala Coast, HI, pp. 334–343.

Grandi, F., F. Mandreoli and P. Tiberio (2005) "Temporal Modelling and Management of Normative Documents in XML Format", *Data & Knowledge Engineering,* (54)3, pp. 327–354.

Haapio, H. (ed.) (2008) *A Proactive Approach to Contracting and Law*. *Course material*, Turku, Finland: Turku University of Applied Sciences.

Habermas, J. (1998) *Between Facts and Norms: Contributions to a Discourse Theory of Law and Democracy,* Cambridge, MA: MIT Press.

Haggard, T.R. and G.W. Kurney (2007) *Legal Drafting: Process, Techniques, and Exercises*, *2nd edition,* Eagan, MN: Thomson Reuters/West.

Hart, H.L.A. (1994) *The Concept of Law*, *2nd edition*, Oxford, England: Clarendon Press.

Haynes, M.A. (1999) "Commentary: Black Holes of Innovation in the Software Arts", *Berkeley Technology Law Journal,* (14)1, p. 567.

Henzinger, T.A., X. Nicollin, J. Sifakis and S. Yovine (1994) "Symbolic Model Checking for Real-Time Systems", *Information and Computation,* (111)2, pp. 193–244.

Hevner, A.R., S.T. March, J. Park and S. Ram (2004) "Design Science in Information Systems Research", *MIS Quarterly,* (28)1, pp. 75–105.

Heym, M. and H. Österle (1993) "Computer-Aided Methodology Engineering", *Information and Software Technology,* (35)6/7, pp. 345–354.

Hogarth, J. (1989) *Sentencing Database Systems,* Vancouver, Canada: List Foundation.

Hollingsworth, D. (1995) *Workflow Management Coalition—The Workflow Reference Model,* Winchester, UK: Workflow Management Coalition.

Holmes, O.W. (1918) Case: *Towne v. Eisner*, 245 U.S. 418, New York, http://caselaw.lp.findlaw.com/cgi-bin/getcase.pl?court=us&vol=245&invol=418 (current Aug. 27, 2013).

Holzmann, G.J. (1997) "The Model Checker SPIN", *IEEE Transactions on Computer Engineering,* (23)5, pp. 279–295.

Jin, Y. and M. Geslin (2010) "A Study of Argumentation-Based Negotiation in Collaborative Design", *Artificial Intelligence for Engineering Design, Analysis and Manufacturing,* (24)1, pp. 35–48.

Jones, S., P. Mason and R.K. Stamper (1979) "LEGOL 2.0: A Relational Specification Language for Complex Rules", *Information Systems,* (4)4, pp. 293–305.

Jónsson, Ó.P. (2009) "Vagueness, Interpretation, and the Law", *Legal Theory,* (15)3, pp. 193–214.

Kabilan, V. (2005) “Contract Workflow Model Patterns Using BPMN”, Proceedings of the 10th International Workshop on Exploring Modeling Methods in Systems Analysis and Design (EMMSAD 05), Porto, Portugal pp. 557–568.

Karacapilidis, N. and D. Papadias (2001) "Computer Supported Argumentation and Collaborative Decision Making: The Hermes System", *Information Systems,* (26)4, pp. 259–277.

Kelsen, H. (2002) *Pure Theory of Law,* Clark, NJ: The Lawbook Exchange, Ltd.

Kelsen, H. (2007) *General Theory of Law and State,* Clark, NJ: The Lawbook Exchange, Ltd.

Kettinger, W., J. Teng and S. Guha (1997) "Business Process Change: A Study of Methodologies, Techniques, and Tools," *MIS Quarterly,* (21)1, pp. 55–80.

Kimble, J. (1994–1995) "Answering the Critics of Plain Language", *The Scribes Journal of Legal Writing,* (5)1, pp. 51–85.

Knackstedt, R., M. Eggert and S. Fleischer (2012) “The Legal Perspective on Business to Government Reporting—A Conceptual Modeling Approach and Its Application in the Financial Sector, 45th Hawaii International Conference on System Sciences (HICSS 2012), Maui, Hawaii.

Komlodi, A. (2002) "The Role of Interaction Histories in Mental Model Building and Knowledge Sharing in the Legal Domain", *Universal Computer Science,* (8)1, pp. 557–566.

Koschke, R. (2003) "Software Visualization in Software Maintenance, Reverse Engineering, and Re-engineering: A Research Survey", *Journal of Software Maintenance and Evolution: Research and Practice,* (15)1, pp. 87–109.

Kraidy, U. (2002) "Digital Media and Education: Cognitive Impact of Information Visualization", *Learning, Media and Technology,* (27)3, pp. 95–106.

Krogstie, J., G. Sindre and H.D. Jorgensen (2006) "Process Models Representing Knowledge for Action: A Revised Quality Framework", *European Journal of Information Systems,* (15)1, pp. 91–102.

Kung, C.H. and A. Solvberg (1986) “Activity Modeling and Behaviour Modeling” in Olle, T.W., H.G. Sol and A.A. Verrijn-Stuart (eds.) *Information System Design Methodologies: Improving the Practice*, Amsterdam, Netherlands: North-Holland Publishing Company, pp. 145–171.

Lee, R.M. (1988) "Bureaucracies as Deontic Systems", *ACM Transactions on Office Information Systems,* (6)2, pp. 87–108.

Lee, R.M. and Y.U. Ryu (1995) "DX: A Deontic Expert System", *Journal of Management Information Systems,* (12)1, pp. 145–169.

Leyh, G. (ed.) (1992) *Legal Hermeutics—History, Theory, and Practice*, Berkeley, CA: University of California Press.

Lindland, O.I., G. Sindre and A. Solvberg (1994) "Understanding Quality in Conceptual Modeling", *IEEE Software,* (11)2, pp. 42–49.

Longdin, L. (2000) "Liability for Defects in Bespoke Software: Are Lawyers and Information Scientists Speaking the Same Language?", *International Journal of Law and Information Technology,* (8)1, pp. 1–24.

Ly, L.T., S. Rinderle-Ma, K. Göser and P. Dadam (2009) "On Enabling Integrated Process Compliance with Semantic Constraints in Process Management Systems", *Information Systems Frontiers,* (14)2, pp. 195–219.

March, S.T. and G.F. Smith (1995) "Design and Natural Science Research on Information Technology", *Decision Support Systems,* (15)4, pp. 179–212.

Martin, P. (1999) "The Internet: 'Full and Unfettered Access' to Lawsome Implications", *Northern Kentucky University Law Review,* (26)1, pp. 181–209.

McCarthy, J. (1960) "Recursive Functions of Symbolic Expressions and Their Computation by Machine", *Communications of the ACM,* (3)4, pp. 184–195.

McCarthy, L.T. (1977) "Reflections on Taxman: An Experiment in Artificial Intelligence and Legal Reasoning", *Harvard Law Review,* (90)5, pp. 837–893.

Mixon, J. and G. Otto (1994) "Applying Quality Management Concepts to the Law", *Emory Law Journal,* (43)2, pp. 393–505.

Monk, S.R. and I. Sommerville (1992) "A Model for Versioning Classes in Object-Oriented Databases", *Lecture Notes in Computer Science,* (618)1, pp. 42–58.

Moody, D.L. (2005) "Theoretical and Practical Issues in Evaluating the Quality of Conceptual Models: Current State and Future Directions", *Data & Knowledge Engineering,* (55)3, pp. 243–276.

Nijssen, G.M. and T.A. Halpin (eds.) (1989) *Conceptual Schema and Relational Database Design: A Fact Oriented Approach*, Upper Saddle River, NJ: Prentice-Hall.

Nissen, H.W., M.A. Jeusfeld, M. Jarke, G.V. Zemanek, and H. Huber. (1996) "Managing Multiple Requirements Perspectives with Metamodels", *IEEE Software,* (13)2, pp. 37–48.

Olbrich, S. and C. Simon (2008) "Process Modelling towards E-Government—Visualisation and Semantic Modelling of Legal Regulations as Executable Process Sets", *Electronic Journal of e-Government,* (6)1, pp. 43–54.

OMG (2006). *Business Process Modeling Notation (BPMN) Version 1.0—OMG Final Adopted Specification,* Needham, MA: Object Management Group.

OMG (2011a). "MDA® Specifications", http://www.omg.org/mda/specs.htm (current Nov. 11, 2011).

OMG (2011b). "OMG's MetaObject Facility", http://www.omg.org/mof (current Nov. 11, 2011).

Opitz, U.-D. (1990) *Deutsche Rechtsbücher des Mittelalters*, Vienna, Austria: Böhlau.

Palmirani, M. and R. Brighi (2002) "Norma-System: A Legal Document System for Managing Consolidated Acts", *Lecture Notes in Computer Science,* (2453)1, pp. 295–314.

Panko, R.R. (2006) "Spreadsheets and Sarbanes-Oxley: Regulations, Risks, and Control Frameworks", *Communications of the Association for Information Systems,* (17)29 , pp. 646–677.

Passera, S. and H. Haapio (2011) “Facilitating Collaboration through Contract Visualization and Modularization”, European Conference on Cognitive Ergonomics ECCE, Rostock, Germany, pp. 57–60.

Peffers, K., T. Tuunanen, M.A. Rothenberger and S. Chatterjee (2007) "A Design Science Research Methodology for Information Systems Research", *Journal of Management Information Systems,* (24)3, pp. 45–77.

Pinkwart, N., V. Aleven, K. Ashley and C. Lynch (2004) "Toward Legal Argument Instruction with Graph Grammars and Collaborative Filtering Techniques", *Lecture Notes in Computer Science,* (4053)1, pp. 227–236.

Raz, J. (1979) *The Authority of Law,* Oxford,England: Clarendon Press.

Recker, J., M. Rosemann, M. Indulska and P. Green (2009) "Business Process Modeling—A Comparative Analysis", *Journal of the Association for Information Systems,* (10)4, pp. 333–363.

Reed, C. and G. Rowe (2004) "Araucaria: Software for Argument Analysis, Diagramming and Representation", *International Journal of AI Tools,* (14)1, pp. 961–980.

Rittgen, P. (2009) “Collaborative Modeling—A Design Science Approach”, Hawaii International Conference on System Sciences, Big Island, HI.

Rosa, M.L., M. Dumas, A.H.M.T. Hofstede and J. Mendling (2011) "Configurable Multi-Perspective Business Process Models", *Journal of Information Systems,* (36)2, pp. 313–340.

Rosemann, M. and W. van der Aalst (2007) "A Configurable Reference Modelling Language", *Information Systems,* (23)1, pp. 1–23.

Rumbaugh, J., M. Blaha, W. Premerlani, F. Eddy, and W. Lorensen (1991) *Object-Oriented Modeling and Design,* Upper Saddle River, NJ: Prentice-Hall.

Ryu, Y.U. and R.M. Lee (1995) "Defeasible Deontic Reasoning and Its Applications to Normative Systems", *Decision Support Systems,* (14)1, pp. 59–73.

Sadiq, S., G. Governatori and K. Namiri (2007) “Modeling Control Objectives for Business Process Compliance”, International Conference on Business Process Management, 2007, pp. 149–164.

Sapia, C., M. Blaschka, G. Höfling and B. Dinter (1998) “Extending the E/R Model for the Multidimensional Paradigm”, International Workshop on Data Warehouse and Data Mining (DWDM’98), Singapore, Singapore, 1998, pp. 105–116.

Schalles, C., J. Creagh and M. Rebstock (2011) “Usability of Modelling Languages for Model Interpretation: An Empirical Research Report”, Internationale Tagung Wirtschaftsinformatik, Zurich, Switzerland, pp. 787–796.

Schweighofer, E. (1999) *Legal Knowledge Representation: Automatic Text Analysis in Public International and European Law,* Hague, Netherlands: Kluwer Law International.

Semmler, C. and N. Brewer (2002) "Using a Flow-chart to Improve Comprehension of Jury Instructions", *Psychiatry, Psychology and Law,* (9)2, pp. 262–270.

Sendall, S. and W. Kozaczynski (2003) "Model Transformation: The Heart and Soul of Model-Driven Software Development", *IEEE Software,* (20)5, pp. 42–45.

Sergot, M.J., F. Sadi, R. Kowalski, R. A. Kriwaczek, P. Hammond, and H.T. Cory (1986) "The British Nationality Act as a Logic Program", *Communications of the ACM,* (29)5, pp. 370–386.

Siau, K. and M. Rossi (2011) "Evaluation Techniques for Systems Analysis and Design Modelling Methods—A Review and Comparative Analysis", *Information Systems Journal,* (21)1, pp. 249–268.

Siedel, G.J. (1992) "Interdisciplinary Approaches to Alternative Dispute Resolution", *Journal of Legal Studies Education,* (10)2, pp. 141–169.

Siedel, G.J. and H. Haapio (2010) *Proactive Law for Managers—A Hidden Source of Competitive Advantage,* Farnham, UK: Gower.

Siena, A., J. Mylopoulos, A. Perini and A. Susi (2009) “Designing Law-Compliant Software Requirements”, International Conference on Conceptual Modeling (ER), Gramado, Brazil, pp. 472–486.

Simon, E. and G. Gaes (1989) “ASSYST—Computer Support for Guideline Sentencing”, Conference on AI and Law, Edinburgh, Scotland, pp. 195–200.

Soffer, P., B. Golany and D. Dori (2003) "ERP Modeling: A Comprehensive Approach", *Information Systems,* (28)9, pp. 673–690.

Sommerville, I. and P. Sawyer (1997) "Viewpoints: Principles, Problems and a Practical Approach to Requirements Engineering", *Annals of Software Engineering,* (3)1, pp. 101–130.

Song, X. and L.J. Osterweil (1992) "Toward Objective, Systematic Design Method Comparisons", *IEEE Software,* (9)3, pp. 43–53.

Speck, A., S. Feja, S. Witt, E. Pulvermüller, and M. Schulz (2011) "Formalizing Business Process Specifications", *Computer Science and Information Systems,* (8)2, pp. 427–446.

Stamper, R.K. (1977) "The LEGOL 1 Prototype System and Language", *The Computer Journal,* (20)2, pp. 102–108.

Stamper, R.K. (1991) "The Role of Semantics in Legal Expert Systems and Legal Reasoning", *Ratio Juris,* (4)2, pp. 219–244.

Stark, J. (1994) "Should the Main Goal of Statutory Drafting Be Accuracy or Clarity?", *Statute Law Review,* (15)3, pp. 207–213.

Strecker, S., D. Heise and U. Frank (2010) "RiskM: A Multi-Perspective Modeling Method for IT Risk Assessment", *Information Systems Frontiers,* (13)4, pp. 595–612.

Suss, J.G., T. McComb, S.-K. Kim, L. Wildman, and G. Watson (2006) "MDA-Based Re-engineering with Object-Z", *Lecture Notes in Computer Science,* (4199)1, pp. 291–305.

Susskind, R.E. (1987) *Expert Systems in Law,* Oxford, England: Oxford University Press.

Systä, T., K. Koskimies and H. Müller (2001) "Shimba—An Environment for Reverse Engineering Java Software Systems", *Software—Practice and Experience,* (31)1, pp. 371–394.

Tarski, A. (1944) "The Semantic Concept of Truth and the Foundation of Semantics", *Philosophy and Phenomenological Research,* (4)3, pp. 341–376.

Tobler, C. and J. Beglinger (2010) *Essential EU Law in Charts, Vol. 2*, Budapest, Hungary: HVG-ORAC.

Tobler, C., J. Beglinger and W. Geursen (2011) *Essential EU Competition Law in Charts—A Field Manual,* Budapest, Hungary: HVG-ORAC.

Toulmin, S.E. (1969) *The Uses of Argument,* Cambridge, England: Cambridge University Press.

Trudeau, C.R. (2012) "The Public Speaks: An Empirical Study of Legal Communication", *Journal of Legal Writing,* (14)1, pp. 1–27.

Tveit, M.S. (2009) "A Meta-Model-Based Approach for Specification of Graphical Representations", *Electronic Communications of the EASST,* (18), pp. 1–15.

Tyler, T. R. (1997) "Citizen Discontent with Legal Procedures: A Societal Science Perspective on Civil Procedure Reform," *The American Journal of Comparative Law* (45) 4, pp. 871–904.

Vergidis, K., A. Tiwari and B. Majeed (2008) "Business Process Analysis and Optimization: Beyond Reengineering", *IEEE Transactions on Systems, Management, and Cybernetics,* (38)1, pp. 69–82.

Verheij, B. (2003) "Artificial Argument Assistants for Defeasible Argumentation", *Artificial Intelligence for Engineering Design, Analysis and Manufacturing,* (150)1/2, pp. 291–325.

Vitali, F. (1999) "Versioning Hypermedia", *ACM Computing Surveys,* (31)4, pp. 1–7.

Volonino, L., G.H. Gessner and G.F. Kermis (2004) "Holistic Compliance with Sarbanes-Oxley", *Communications of the Association for Information Systems,* (14) Article 11, pp. 219–233.

Wagner, A. (2006) "The Rules of the Road, a Universal Visual Semiotics", *International Journal for the Semiotics of Law,* (19)3, pp. 311–324.

Wahlgren, P. (ed.) (2006) *A Proactive Approach*. *Law Libraries (Scandinavian Studies in Law)*, Stockholm, Sweden: Stockholm Inst for Scandinavian Law.

Walls, J.G., G.R. Widmeyer and O.A. El Sawy (1992) "Building a System Design Theory for Vigilant EIS", *Information Systems Research,* (3)1, pp. 36–59.

Wand, Y. and R. Weber (1989) “An Ontological Evaluation of Systems Analysis and Design Methods” in Falkenberg, E.D. and P. Lindgreen (eds.) *Information Systems Concepts: An In-Depth Analysis*, Amsterdam, Netherlands: North-Holland Publishing Company, pp. 79–107.

Wand, Y. and R. Weber (1993) "On the Ontological Expressiveness of Information Systems Analysis and Design Grammars", *Journal of Information Systems,* (3)4, pp. 217–237.

Wand, Y. and R. Weber (2002) "Research Commentary: Information Systems and Conceptual Modeling—A Research Agenda", *Information Systems Research,* (13)4, pp. 363–376.

White Baker, E. (2011) "Why Situational Method Engineering Is Useful to Information Systems Development", *Information Systems Journal,* (21)2, pp. 155–174.

Witt, S., S. Feja, A. Speck and C. Prietz (2012) “Integrated Privacy Modeling and Validation for Business Process Models”, 2012 Joint EDBT/ICDT Workshops, Berlin, Germany, pp. 196–205.

Wittwer, J., M. Nickles and A. Renkl (2007) "Is Underestimation Less Detrimental than Overestimation? The Impact of Experts’ Beliefs about a Layperson’s Knowledge on Learning and Question Asking", *Instructional Science,* (36)1, pp. 27–52.

Zdravkovic, J. and V. Kabilan (2005) "Enabling Business Process Interoperability Using Contract Workflow Models", *Lecture Notes in Computer Science,* (3760)1, pp. 77–93.

ABOUT THE AUTHORS

Ralf Knackstedt is full professor for information systems at the University of Hildesheim, Germany. From 2005 to 2013, he has been assistant professor at the Department of Information Systems at the University of Muenster, Germany. His main research interests include conceptual modeling, business process management, business information systems, business intelligence, knowledge management, and compliance management. His research has been published in several peer-reviewed academic journals including the *Scandinavian Journal of Information Systems*, the *IEEE Transactions on Engineering Management*, the *International Journal of Knowledge Management*, *Electronic Markets*, and *Wirtschaftsinformatik*. He presented his work at major international conferences including the European Conference on Information Systems (ECIS), Americas Conference on Information Systems (AMCIS), and the Wirtschaftsinformatik Tagung (WI).

Marcel Heddier has been research assistant and doctorate candidate at the European Research Center for Information Systems (ERCIS), University of Muenster, Germany, since 2010. His research areas comprise information modeling, conceptual modeling, legal visualisation, e-government, and (process) compliance analysis. His work has been presented at several international conferences including the European Conference on

Information Systems (ECIS) and the Hawai'i International Conference of System Sciences (HICSS) and the Pacific-Asian Conference on Information Systems (ACIS).

Jörg Becker is full professor for information systems at the department of information systems at the University of Muenster, Germany, and academic director of the European Research Center for Information Systems (ERCIS). His research interests include information management, management information systems, information modelling, e-government, and data management. His research has been published in several peer-reviewed academic journals including the *Journal of the Association for Information Systems*, *Communications of the Association for Information Systems*, the *Scandinavian Journal of Information Systems*, the *Business Research*, *IEEE Transactions on Engineering Management*, *International Journal of Knowledge Management*, and the *Business Process Management Journal*. He also presented his work at major international conferences including the International Conference on Information Systems (ICIS) and the European Conference on Information Systems (ECIS), as well as at several major international conferences.

Communications of the Association for Information Systems

ISSN: 1529-3181

Communications of the Association for Information Systems