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Sileno, G.; Boer, A.W.F.; van Engers, T.M.

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On the Interactional Meaning of Fundamental Legal Concepts

Giovanni SILENO [a,1], Alexander BOER [a] and Tom VAN ENGERS [a]
[a] *University of Amsterdam, Leibniz Center for Law, The Netherlands*

Abstract. Rather than as abstract entities, jural relations are analyzed in terms of the bindings they create on the individual behaviour of concurrent social agents. Investigating a simple sale transaction modeled with Petri Nets, we argue that the concepts on the two Hohfeldian squares rely on the implicit reference to a "transcendental" collective entity, to which the two parties believe or are believed to belong. From this perspective, we observe that both liabilities and duties are associated to obligations, respectively of an epistemic or practical nature. The fundamental legal concepts defined by Hohfeld are revisited accordingly, leading to the construction of two Hohfeldian prisms.

Keywords. Jural relations, Normative Systems, Power, Duty, Social Affordances, Hohfeldian prisms.

Introduction

The existence of alternative accounts of jural relations and deontic concepts—and the continuous introduction of new ones—shows that the quest towards the "fundamental legal concepts" is far from being concluded. Considering just the analytical investigations that followed Hohfeld's work [10] (1917), the best known in our field are those of Kanger and Kanger [13] (1966), further extended by Lindahl [14] (1977), the analysis of Makinson [16] (1986), Saunders [25] (1989), the works of Jones and Sergot [12,26] (1995, 2001), Allen and Saxon (1995) [1], and the teleological interpretation given by Sartor [23] (2006). A more recent example, presented at the JURIX conference, is by Pace and Schapachnik [19] (2012).

From a broader perspective, the difficulty of underpinning the *essence* of legal relations supports the legal realist position, illustrated by Ross with the famous *tû-tû* example [22]. In this, the Scandinavian jurist presents an imaginary tribe, whose language includes the word *tû-tû*, used with both descriptive (to identify a "non-purified" member) and prescriptive functions (to discipline the purification process). This double nature makes the term functionally similar to legal terms as rights, ownership, etc. However, as we are aware that there is nothing more than superstition behind the *tû-tû*, the example is intended to show the existential vacuity of legal concepts as well, and that "they serve a purpose only as a technique of presentation".

Sartor [24] partially agrees with Ross, but defends the latter component, arguing that terms expressing legal qualifications have still an *inferential meaning*. He then provides

[1] Corresponding author: g.sileno@uva.nl.

several reasons in support of such an inferential dimension of legal concepts, rather than an *ontological* dimension. However, he observes that, in order to make sense of textual sources and to synthesize our knowledge in expressible form, we need to have available common terminological information, even if this ontology is to a certain extent locally and contextually characterized, and evolves in time. The focus of Sartor is in particular on *intermediate legal concepts*, i.e. concepts like ownership or contract, which are constructed as combinations of multiple norms. Ross's critique, however, targets concepts defined as fundamental in Hohfeld's theory.

In sum, on the one hand, we observe competing and debated (formal) semantics, on the other, we recognize the *constructivist* nature of (legal) normative systems. Is the quest for a fundamental common ontological ground for legal concepts therefore doomed to fail? Probably yes, but, without pretension of exhaustiveness, the present paper aims to shed light on some of the issues from a different perspective.

In general, the concept of normative system refers either to a system of norms, or to a system of components (e.g. agents) whose behaviour is guided by certain norms. If Sartor's contribution, amongst others, takes the first as domain of reference, in order to define the inferential meaning of legal concepts, we focus on the second to scope their *interactional meaning*, or better, the practical meaning they have for the participants in a social setting. In other words, rather than modeling institutions as abstract, *hors contexte* structures, we consider them as knowledge components describing and operating at the cognitive level of agents, resulting or not resulting in a certain action. The fundamental mechanisms we are trying to capture are related to an *in-context* application of norms, explaining and guiding behaviour.

Related works Research on normative systems has already proposed several agentic and organizational semantics.[2] Traditionally, most of the proposed frameworks insist on the deontic positions of *obligation*, *permission* and *prohibition*, and, as observed amongst others by [3], neglect the dimension of *power*,[3] which is relevant to the creation/modification of positions and thus defining the positional dynamics. In other words, such contributions consider normative systems essentially as mere control structures, a metaphor which works quite well when considering systems with non-adaptive components. However, our objective is slightly different, as we aim to provide legal analysts with a framework to be used both for policy design and for collecting explanations of observed (human) social behaviour. Beside control, normative systems provide agents with a predictable space for action and therefore with opportunities, created via the production and consumption of institutional positions (e.g. markets). Therefore, proceeding along Hohfeld's contribution, we target fundamental reusable components related both to *duty* and to *power*, and power concepts are considered as first-class citizens in our framework.

Strangely enough, power concepts are neglected as well in frameworks currently used for institutional analysis, like, for instance, the ADICO syntax, introduced by Crawford and Ostrom in the *Grammar of Institutions* [5]. Despite recognizing the "shared linguistic constraint or opportunity" transported by *institutional statements*, the proposed syntax accounts only for their deontic dimension.

[2]For the interested reader, the Dagstuhl Workshop series on Normative Systems provides an updated overview of the field.

[3]Important exceptions are the second part of the Lindahl's thesis [14] and Jones and Sergot [12].

Contracts are important sources of legal relations, and are therefore relevant to our research as well. Contract modeling has been investigated in the domain of automatic contract management, e.g. [6]. In distinction from these works, however, we consider also the requirement of easy access to non-IT/mathematics experts by supporting the introduction of visual programming methods, to mediate between natural and formal languages, in the tradition of *scenario-based modeling* [9].[4]

The paper proceeds as follows. First, we start from a simple sale contract, and we construct a Petri net model of the related transaction. Second, we reflect on power and duties positions, investigating their essential nature from an interactional perspective. With this in mind, we reconsider the deontic concepts, and introduce the two *Hohfeldian prisms* of legal concepts, briefly analyzing their relation with motivational positions.

1. Jural positions in an interactional process

Two requirements emerge from modeling normative systems as social systems: *local causation*, and *communication between concurrent components*, creating an overlap with process modeling theory and practice. Taking advantage of this, we choose as ground computational model the formalism of Petri nets (a general introduction can be found in [17]).[5] The choice of Petri nets as representational model has positive outcomes in itself. First, allowing for descriptions in terms of localized states rather than a global state as in other logical framework (e.g. Kripke's models), they are not vulnerable to frame/ramification problems. Second, adequately exploiting their topological characterization, they can easily model the institutional dynamic, i.e. timing/synchronization aspects. Third, Petri nets, while executed, offer a direct visualization both of the causal structure, of the current state, and of the behaviour of the system, and this can be useful for validation purposes.

Modeling a sale transaction as a Petri net

In general terms, a *bilateral contract* arises from the exchange of mutual *promises* (the offer and the acceptance) between two persons which *require* the (non-)performance of some act by both parties. In the case of a *sale contract*, the two parties are the buyer and the seller, respectively bound to the performance of payment and of delivery. Suppose that in our case the seller is the offeror, and the offer is about a certain good.

Process The sale process is basically characterized by the actions *offer*, *accept*, *pay* and *deliver*, performed by one of the parties. In addition, each action is coupled with the acknowledgment by the other party. As the contract is protected by law, when a mandatory action is not executed, the party who was expected to benefit of the act can *enforce* on failed performance. Fig. 1 reports on this perspective, neglecting what happens after the

[4] For space reasons, we will refer here only to Petri nets, but we are working on a progressively constructed diagramming methodology, including simpler diagrams [27], whose output can be exported as agent programs for simulation purposes.

[5] Other authors, as Raskin et al. [21], have already proposed the formalization of contracts via Petri Nets. In general, the granularity of such models neglects to consider the actors as sub-systems, thus overlooking the communication process constructing the transaction.

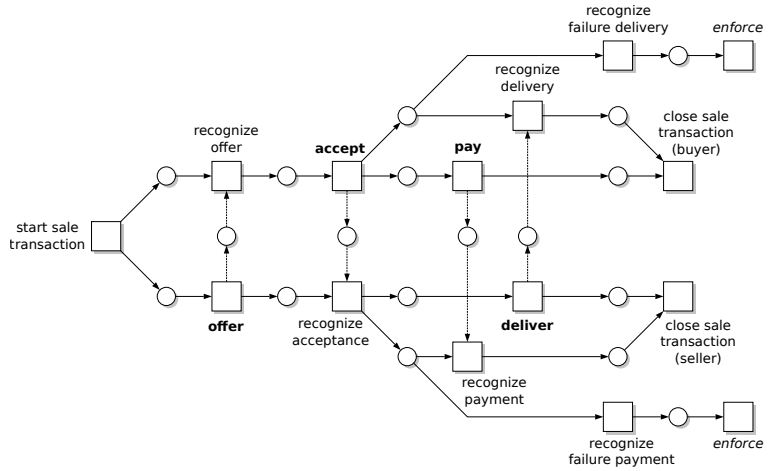

Figure 1. The sale process as interaction between concurrent processes.

enforcement. Synchronization places connect all four main actions with the other party; differently, there is no synchronization place for the recognitions of failures.[6]

Normative positions The process diagram can be enriched as in Fig. 2 with jural positions referring to Hohfeld's terminology.[7] Evidently, in order to make an offer, the seller must have the *power* to offer. On the other side, the buyer recognizes the offer, only if he is *liable* to the offer action by the seller. Such positions refer both to practical and to institutional powers; the next section will better frame this point. Once the buyer recognizes the offer, he acknowledges that he has acquired the power to accept, and he possibly uses it. Once the acceptance is performed/recognized, the related *duties* and *claims* are created by each party, and, having such claims, the agents wait to acknowledge the expected performances. The figure takes into account as well that duty alone is not sufficient to successfully perform an action. The agent needs at least the associated power (of payment or delivery). Interestingly, the transitions generating such powers may be fired after the offer is accepted. Consider a scenario in which the seller starts the sale before he possesses the good, or even before the good comes into existence (e.g. a future harvest).

2. Power and duty

So far, we have used the terms power and duty without further specifying their meaning. Starting from the former, Hohfeld himself presented an important warning: "it is necessary to distinguish carefully between the *legal power*, the *physical power* to do the things necessary for the 'exercise' of the legal power, and, finally, the *privilege* of doing these things." Makinson [16], amongst others, supports this claim, and notices how Kanger made an unfortunate choice in using the term that Hohfeld introduced for the power concept to identify a specific deontic position.

[6] Here, failure-related events are triggered only internally, as a consequence of the *non-occurrence* of the expected events. A more refined model should include a synchronization for the case of *misalignment* of the perceived outcomes with the expected ones.

[7] As we are focusing on causation, for simplicity we neglect to model the persistence of positions.

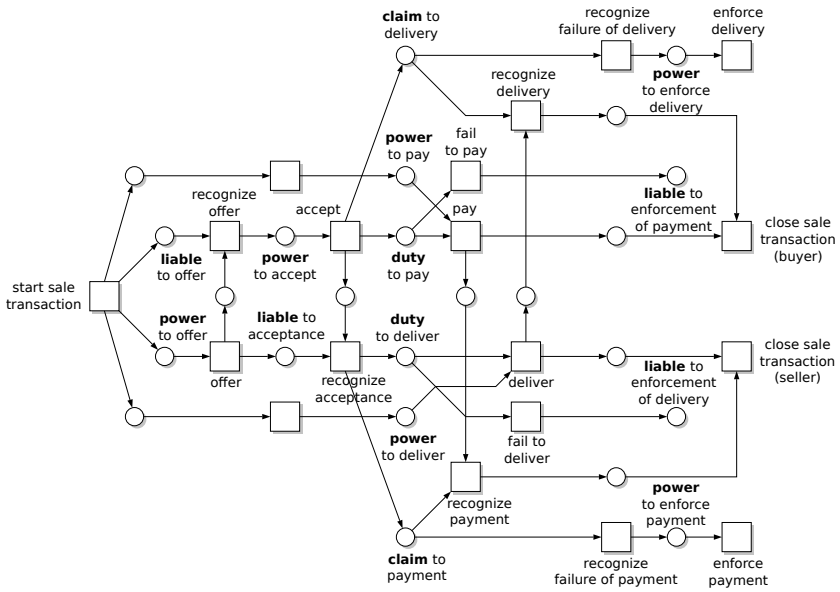

Figure 2. The sale process enriched with jural positions.

Practical power Let us focus for a moment on the physical or *practical power*. In ecological psychology, the cognitive relation between an agent and the environment is traditionally investigated via the theory of *affordances*, introduced by Gibson [8].[8] For example, a chair *affords* that we sit on it, because our body can bend at the level of the knees. Following Chemero [4], this relation can be modeled in terms of a certain *ability* of the agent and some characteristic *features* of the environment. For instance, in order to offer, the seller should be able at least to *emit* the message. This is not sufficient, however: a medium is required to *transport* the communication, and at the opposite end, a buyer should be able to *receive* the message. The *affordance* of offering—as mere pronunciation of the offer—can be therefore related to the ability of the seller to emit the offer, and the transportation and reception features of the sale context.

Institutional power and duties The physical act of pronouncing is not enough to have a successful transportation: we need as well a correct alignment of the *signification* process. A sale process requires that the buyer correctly interprets the offer as granting him the power of accepting, but, before that, it requires that the buyer ascribes to the seller the power of offering—offering as an institutionally meaningful action, i.e. modifying jural positions—or, equivalently, that he accepts being subjected to this power. This interactional relation supports the introduction of a theory of *social affordances*, integrating *institutional powers* (or *abilities*) [28]. In practice, the institutional power of an agent is necessarily coupled with a correspondent *recognition* feature of the social environment.

Thus, taking the perspective of the one who is recognizing, *liabilities* (or *institutional subjections*) can be seen as **epistemic obligations** prescribed by the current normative frame: obligations to acknowledge the change of institutional positions and to revise them, every time that social participants make use of their institutional powers.

[8]The underlying concepts were however already matter of investigation in philosophy since Plato (with the theory of perception) and more recently in phenomenology.

As obligation does not correspond to necessity, normative dispositions concerning liabilities may be in conflict with what is holding in the mental domains of the participants. However, if the buyer does not consider himself to be liable to be confronted with the offer (e.g. he considers the seller not reliable, or he does not recognize the other as a seller)[9], nothing special will happen, as no duty will be generated without acceptance. On the other hand, if the seller does not recognize the buyer as such, thus considering himself not liable to his acceptance, there is an explicit failure in the sale process. This example explains the greater attention to **practical obligations** or *duties* in the literature: violations can be directly monitored only at behavioural level. In this sense, duties always concern actions to be undertaken. The underlying *reason for action* can be found in the misalignment between reality and normative indication (e.g. the duty of paying holds as long as the buyer has not paid). However, such a reason is not sufficient, as the buyer has to additionally *intend* to do it.[10] How and why this intent is generated is probably one of most critical questions concerning social behaviour.

Systematic meaning A simplistic, but yet successful answer can be derived from the proposed interactional model. A sale contract can be seen as the creation of a collective intentional entity, ontologically expressed by the buyer plus the seller, aiming to the exchange of ownerships. The initiation part of the process (offer and acceptance) corresponds to the *consolidation* of this entity, via the correlative epistemic recognition between the parties (see Fig. 2). Once the entity is created, it imposes duties on its components. Generalizing this pattern, we could say that all obligations (practical and epistemic) presuppose the existence of some "transcendental" entity, to which social agents commit, believe or are believed to belong, as result of an implicit or explicit recognition.[11] From this construction, it is clear that any violation of obligations is expected to be eventually detrimental to the transcendental entity. Both conformance to norms and enforcement actions can therefore be related to maintenance goals aiming to *keep* and *cure*[12] the integrity of the transcendental entity.[13]

3. Deontic and potestative concepts

In his seminal contribution [10], Hohfeld presented a detailed analysis of the legal positions binding two parties. His taxonomy of legal concepts is traditionally illustrated on two squares, as in Fig. 3. The vertical axis separates *correlative* concepts: e.g., considering the first square, when a party has a *duty* towards a second party, the latter has a *claim* towards the former. From top to bottom, we encounter *opposite* concepts: e.g. if duty corresponds to the institutional obligation to perform an action, *privilege* is the entitlement of discretion to perform that action (i.e. the absence of duty). Considering the second

[9] In accordance to Hohfeld's terminology, not ascribing a power to a certain party is equivalent to a *disability*.

[10] The intentional characterization adds another layer in the model, see [27].

[11] For instance, the power of offering, existing *before* the sale, relies on a collective market entity.

[12] Cf. the *prevent-acquire-cure-keep* (PACK) framework introduced by Ogilvie and Rose [18].

[13] From this perspective, Ross's observation that fundamental legal concepts like rights and duties are plausibly residual of prehistoric, superstitious times is too simplistic. The underlying mechanisms those concepts refer to are rather of *systematic interactions* of individuals with "transcendental" entities. Obviously, the reason behind such *commitments* may be different: culture, religion, habit, even superstition, but also rational decision-making.

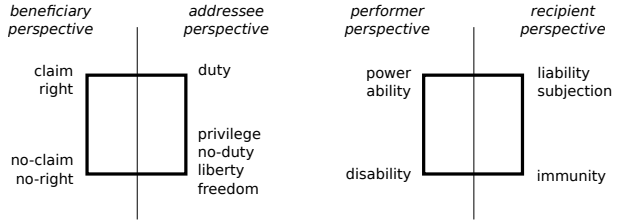

Figure 3. The Hohfeldian obligative and potestative squares of legal concepts, including alternative namings.

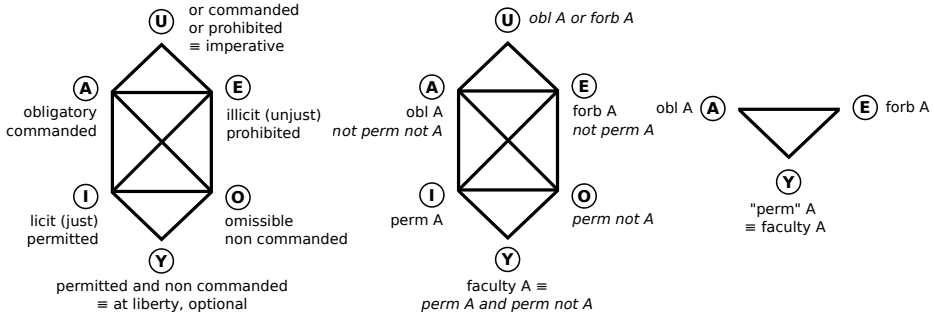

Figure 4. Deontic hexagons (with traditional and formal terms) and triangle of contrariety.

square, *power* corresponds to the capability to produce changes in the institutional system, i.e. creating, modifying, removing certain institutional facts; *liability* means being subjected to that power; *immunity* means to be kept institutionally untouched from the other performing the action. Despite the visual regularity, Lindahl showed in his formal analysis [14] that the opposition and correlation relationships are not the same in the different points of the squares. The following suggests an unifying interpretation.

Squares, hexagons and triangles In order to represent qualitative relations within a family of related concepts, Robert Blanché proposed in the '50s in [2] an extension to the Aristotelian square of opposition. In the quantificational form, the square of opposition is defined by four corners: *A* "all", *E* "none", *I* "some" (in the sense of *at least one*), *O* "some not" (*at least one not*). Blanché, amongst others, observed that in natural language "some" means rather *some but not all*. He proposed therefore a triangle of contrariety, whose corners are *A*, *E*, and *Y*, associated to this new meaning. As *Y* can be obtained by the conjuction of *I* and *O*, he eventually constructed an hexagonal shape, including an additional position *U*.

Following this idea, we report the deontic terminology used respectively by Leibniz and Bentham [14] in the hexagon on the left of Fig. 4, and rewrite it in the central hexagon using the formal notation proposed by Sartor [23].[14] Thus, the deontic triangle of contrariety shows that the common usage of the term *permission* is different from the formal one (`perm`), as it means rather *liberty* (`faculty`).[15]

[14] More complex analysis on possible geometries integrating deontic and alethic logics can be found amongst others in the recent work of Joerden [11], which applies them in interpreting ancient Islamic legal texts.

[15] Crawford and Ostrom's framework [5] is based in practice on such a triangle, as it uses only three operators (*must*, *must not* and *may*). This is also in accordance with the recent proposal of Frantz et al. [7] to extend the ADICO framework from discrete to continuous scale, constructed on positive (e.g. +1), negative (-1) and

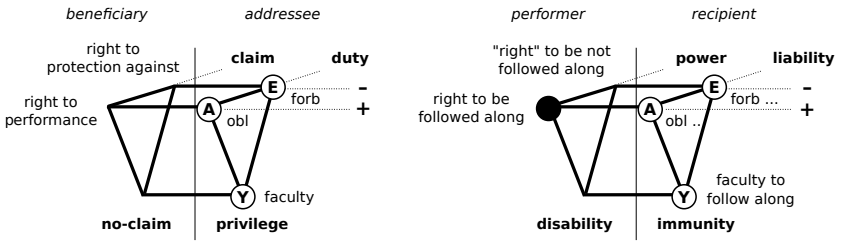

Figure 5. The Hohfeldian prisms obtained from the Hohfeldian squares.

First Hohfeldian prism By expanding the right side of the first Hohfeldian square using the deontic triangle, we produce the first Hohfeldian prism (Fig. 5, left). Obligation (`obl`) and prohibition (`forb`) correspond to duties (in the positive and negative characterizations), while permission (in the common sense) to privilege. It is easy then to derive the correlative triangle, describing the possible positions of the agent who benefits from this obligation. Considering an action A, it contains, beside *no-right* concerning A, the *right to the performance of A*, the *right to protection against A*.

Second Hohfeldian prism In § 2, we argued that liability corresponds to the obligation of recognizing in a certain action the actualization of a power, i.e. of considering its institutional consequences. In more general terms, liability corresponds to the obligation to *follow along* the action. Completing the triangle of contrariety related to this obligation, we can align immunity with epistemic faculty, and *negative liability* with the prohibition on such recognition (Fig. 5, right). The position of negative liability is of critical importance in social terms, but it is strangely neglected in the analytical literature: it prevents the institutional interaction and eventually the consolidation of any "transcendental" entity; in other words, it describes the explicit denial of the agent in that position to recognize the normative system in which the power is posited.[16] In contrast, immune participants (e.g. ambassadors) may still accept to engage in transactions.

Considering the correlative positions, we have respectively *power* (the black circle), *disability to control* and *negative power* or *disability to instill* the institutional consequences associated to the action. Using a physical metaphor, the three relationships stand for attraction, independence, and repulsion.[17]

Jural and motivational positions To summarize the framework in one picture we consider a simpler transaction. Fig. 6 models the practical reasoning of an agent after the reception of a positive command from another agent.[18] The processing of epistemic and practical obligations is enabled and actualized by related motivational positions (left side of Fig. 6), which can be described following the PACK terminology [18]: the positions about *cohesion* activate the social coordination; the positions about *integrity* allow nor-

neutral (0) points.

[16]Cf. the Dutch Declaration of Independence – Act of Abjuration (1581): "*Know all men by these presents [..] we have unanimously and deliberately declared [..] that the King of Spain has forfeited, ipso jure, all hereditary right to the sovereignty of those countries, and are determined from henceforward not to acknowledge his sovereignty or jurisdiction [..],* ***nor suffer others to do it****.*"

[17]Interestingly, the second Hohfeldiam prism can be used as well to express the positions concerning practical power in respect to an object/environment.

[18]The proposed practical reasoning is based on the *motive* → *intent* → *action* → *outcome* causal scheme (cf. [20]), integrated with *motivation*, *affordance* and *disposition* enabling conditions [27].

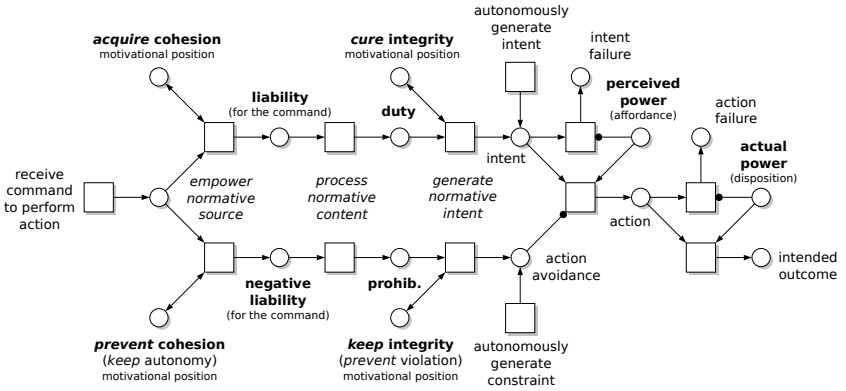

Figure 6. Practical reasoning after a command, accounting motivations, legal positions and affordances.

mative intervention.[19] On the right side of Fig. 6, power is declined as perceived affordance (necessary to initiate the action), and as correct dispositional alignment (necessary to produce the outcome) [28].

Permission and immunity, i.e. the normatively "neutral" positions, are missing in Fig. 6; they can however be inferred by the absence of tokens in the related obligative positions. This observation is confirmed in legal practice: explicitly granting immunity can be interpreted as putting the recipient out of the influence of power (usually in order to protect a weak party, e.g. minors in a sale transaction); and permission (privilege) as the removal of a previous constraint (*licere*).

4. Conclusion

The paper provides an example of how an operational description (e.g. a sale transaction) can be represented as a social interaction in an adequate visual representation (e.g. Petri nets), and can be easily enriched with normative concepts.[20] Our research hypothesis is that this *legal reverse engineering* process is of critical importance to test the alignment between abstract and contextualized normative sources (law vs implementations of law vs scenarios). Taking an IT perspective, we consider jural positions as data structures, whose instances are created and destroyed in a product cycle determined by the normative and social systems. This motivates an investigation for primitive fundamental patterns, leading us to the introduction of the two *Hohfeldian prisms*. Besides a new visualization, the diagrams harmonize the correlation of privilege/immunity positions, integrate the overlooked relationship of negative liability/power, and provide a simple explanation of the conflation of the word "right" for power (removing "to be followed along"). More importantly, the positions they report are easily aligned with interactional/motivational interpretations. For space reasons, we are not able to present further examples of their use with Petri net models, but the interested reader can find some other primitive patterns on our website.[21]

[19] The figure neglects the parallel processes constructing and maintaining these motivations; moreover, for simplicity, it does not model the revision process starting when one position is removed for external reasons.

[20] The question whether deontic concepts or jural relations are at all necessary, which is related to the position of Ross and other legal realists, can be found in the Information Systems literature as well [15]. However, assuming that a complete operationalization responding to all (known and hypothetical) situations is possible, this would still require an infinite number of norms (cf. the *qualification problem* in AI).

[21] `http://justinian.leibnizcenter.org/lnpetri`

References

[1] L. E. Allen and C. S. Saxon. Better language, better thought, better communication: the A-Hohfeld language for legal analysis. *International conference on Artificial Intelligence and Law*, pages 219–228, 1995.

[2] R. Blanché. Sur l'opposition des concepts. *Theoria*, 19(3):89–130, 1953.

[3] G. Boella and L. van Der Torre. The ontological properties of social roles in multi-agent systems: Definitional dependence, powers and roles playing roles. *Artificial Intelligence and Law*, 15(3):201–221, 2007.

[4] A. Chemero. An Outline of a Theory of Affordances. *Ecological Psychology*, 15(2):181–195, 2003.

[5] S. Crawford and E. Ostrom. A grammar of institutions. *American Political Science Review*, 1995.

[6] A. D. H. Farrell, M. J. Sergot, M. Sallé, and C. Bartolini. Using the Event Calculus for Tracking the Normative State of Contracts. *International Journal of Cooperative Information Systems*, 14(02n03):99–129, 2005.

[7] C. Frantz and M. Purvis. Modelling institutions using dynamic deontics. *Coordination, Organizations, Institutions, and Norms in Agent Systems IX (COIN2013)*, pages 211–233, 2013.

[8] J. Gibson. *The ecological approach to visual perception*. Houghton Mifflin, Boston, 1979.

[9] D. Harel and R. Marelly. Specifying and executing behavioral requirements: The play-in/play-out approach. *Software and Systems Modeling*, pages 82–107, 2003.

[10] W. N. Hohfeld. Fundamental legal conceptions as applied in judicial reasoning. *The Yale Law Journal*, 26(8):710–770, 1917.

[11] J. C. Joerden. Deontological Square, Hexagon, and Decagon: A Deontic Framework for Supererogation. *Logica Universalis*, 6(1-2):201–216, 2012.

[12] A. Jones and M. Sergot. A formal characterisation of institutionalised power. *Logic Journal of IGPL*, 1996.

[13] S. Kanger and H. Kanger. Rights and parliamentarism. *Theoria*, 32(2):85–115, 1966.

[14] L. Lindahl. *Position and Change: A Study in Law and Logic*. Synthese Library. Springer, 1977.

[15] L. Logrippo. Normative systems: The meeting point between jurisprudence and information technology. *New Trends in Software Methodologies, Tools and Techniques*, pages 343–354, 2007.

[16] D. Makinson. On the formal representation of rights relations. *Journal of philosophical Logic*, 15, 1986.

[17] T. Murata. Petri nets: Properties, analysis and applications. *Proceedings of the IEEE*, 77(4), 1989.

[18] D. M. Ogilvie and K. M. Rose. Self-with-other representations and a taxonomy of motives: two approaches to studying persons. *Journal of personality*, 63(3):643–79, 1995.

[19] G. Pace and F. Schapachnik. Types of rights in interacting two-party systems: A formal analysis. In *Proc. of the 25th Conf. on Legal Knowledge and Information Systems (JURIX 2012)*, 2012.

[20] N. Pennington and R. Hastie. Reasoning in explanation-based decision making. *Cognition*, 49:123–163, 1993.

[21] J.-F. Raskin, Y.-H. Tan, and L. van der Torre. How to model normative behavior in Petri nets. *Proceedings of the 2nd ModelAge: Workshop on Formal Models of Agents*, pages 223—-241, 1996.

[22] A. Ross. Tû-tû. *Harvard Law Review*, 70:812–825, 1957.

[23] G. Sartor. Fundamental legal concepts: A formal and teleological characterisation. *Artificial Intelligence and Law*, 14(1):101–142, 2006.

[24] G. Sartor. Legal concepts as inferential nodes and ontological categories. *Artificial Intelligence and Law*, 17(3):217–251, 2009.

[25] K. W. Saunders. A Formal Analysis of Hohfeldian Relations. *Akron L. Rev.*, 23(3):465–506, 1989.

[26] M. Sergot and F. Richards. On the representation of action and agency in the theory of normative positions. *Fundamenta Informaticae*, 45:1–21, 2001.

[27] G. Sileno, A. Boer, and T. van Engers. From Inter-Agent to Intra-Agent Representations: Mapping Social Scenarios to Agent-Role Descriptions. In *Proc. 6th Int. Conf. Agents and Artificial Intelligence (ICAART 2014)*, 2014.

[28] G. Sileno, A. Boer, and T. van Engers. Towards a Representational Model of Social Affordances from an Institutional Perspective. In *Proc. Workshop on Computational Social Science and Social Computer Science: Two Sides of the Same Coin (SOCIAL.PATH 2014)*, 2014.