

Legal Power-Subjection Relations: Ontological Analysis and Modeling Pattern

Cristine Griffo¹, Tiago P. Sales¹, Giancarlo Guizzardi^{1,2}, and João Paulo A. Almeida²

¹ Free University of Bozen-Bolzano, Italy

² Federal University of Espírito Santo, Brazil

cristine.griffo@unibz.it, tiago.princesales@unibz.it,
gguizzardi@unibz.it, jpalmeida@ieee.org

Abstract. The development of dependable information systems in legal contexts requires a precise understanding of the subtleties of the underlying legal phenomena. According to a modern understanding in philosophy of law, much of these phenomena are relational in nature. In this paper, we employ a theoretically well-grounded legal core ontology (UFO-L) to conduct an ontological analysis focused on a fundamental legal relation, namely, the power-subjection relation. We show that in certain cases, power-subjection relations are primitive, i.e., by means of institutional acts, other legal relations can be generated from them. Examples include relations of rights and duties, permissions and non-rights, liberties, secondary power-subjection, etc. As a contribution to the practice of conceptual modeling, and leveraging on the result of our analysis, we propose a conceptual modeling pattern, which is then applied to model a real-world case in tax law.

Keywords: ontology design pattern · legal power · legal relations · UFO · UFO-L

1 Introduction

The development of dependable information systems in critical contexts and applications requires a precise understanding of the subtleties of the domain at hand. In these contexts, *Ontology-Driven Conceptual Modeling*, i.e., the practice of conceptual modeling driven by formal ontological analysis [25], has been increasingly adopted. In some situations, the phenomena being analyzed crosscut several specific classes of applications. For example, an analysis of the general notion of *Service Contract* [9] can be captured in general reference models called *Core Ontologies* [10, 11]. From these ontology, a number of *Ontology Design Patterns* can be systematically extracted [10]. Finally, these patterns are reusable higher-granularity modeling primitives that can then be employed to create conceptual models in specific domains (e.g., healthcare service contracts, telecommunication service contracts, etc.) [11].

The legal domain is an example of such a critical domain. Over the years, a multitude of authors have contributed to the ontological analysis of different legal notions (e.g., [5, 8, 30, 47, 51]). In particular, some of us have proposed a *Legal Core Ontology* termed UFO-L [20], which was developed by extending the foundational ontology UFO (Unified Foundational Ontology) [27], and by incorporating the theory of constitutional rights proposed by the German philosopher of law Robert Alexy [1]. The latter offers an

original perspective on the law by conceiving it in terms of legal relations. Besides its appropriateness for understanding legal cases (e.g., analyzing judicial decision-making [22]), this perspective turned to be particularly fruitful for conceptual modeling of information systems [20] (given the central role of relations in their design).

In the past, from UFO-L, some of us have managed to extract a catalog of ontology design patterns addressing different legal relations. These include the *Unprotected Liberty Pattern*, the *Right-Duty to an Action Relator pattern*, and the *Right-Duty to an Omission Pattern* [19,20]. Other authors, have proposed ontology patterns to address notions such as *complaint behavior* [39], *personal data* [37,38], *norm* and *case* [14,15], as well as and some legal relations, such as “rights and obligations relationships” [37]. What has been missing from the literature is an ontological analysis (and, hence, a corresponding modeling pattern) addressing *Power-Subjection Relations*.

Generally speaking, power-subjection relations abound [13,50], and different notions of *power* can be connected to different outcomes of their exercise. For example, power-subjection relations based on *utilitarian power* will result in some performance-reward contingency; if based on *coercive power* will result on imposing conduct on others by means of fear; if based on *charismatic power*, will result on negligence of personal interests due to personal admiration of the charismatic-power holder; if based on *normative power* will result in the subjection-holder’s belief that the social institution has the “right” to govern/submit his/her behavior [13]. It is in this latter type, i.e., *Legal Power-Subjection relations* that we are interested here.

In contrast to the other aforementioned types of legal relations, power-subjection relations are in a sense “reflexive”, since they bestow legal agents with the capacity of creating other legal relations. For example, the law makes certain individuals (playing a certain legal role) capable of joining people in matrimony. This capacity is not a natural ability, but an artificial one constructed by legal norms. When they are exercised, they generate new legal relations with new legal positions of conduct or derivative powers. In contrast, legal relations such as right-duty, permission-no-right, and liberties [21] are related to the performance or abstention of actions of conduct, which, in general, demand only natural (or otherwise preexisting) abilities. This means that the legal positions of conduct only regulate the action or omission that was already possible, e.g., by virtue of natural capacity, such as expressing an opinion, entering a building, etc. As Alexy points out, power is more than permission to act and more than natural ability to act [1]. Suitably understanding this specific nature of this relations is fundamental, e.g., for correctly representing (and monitoring) certain computational contracts [21,45] as bearers of legal powers have the capacity of changing the contract itself (often unilaterally).

The contributions of this paper are two-fold: firstly, we present of an ontological analysis of Legal Power-Subjection Relations based on UFO-L; secondly, we leverage on this analysis to propose an ontology design pattern for modeling this type of relation. The pattern is then employed to analyze and model a case study in Brazilian tax law.

The remainder of the paper is structured as follows: Section 2 briefly reviews the notion of power in the relevant literature with a particular focus on legal powers; Section 3 presents the contributions of the paper, namely, our ontological analysis the resulting ontology design pattern; Section 4 presents our case study; Section 5 positions our contributions w.r.t. related work; finally, Section 6 presents some final considerations.

2 On (Legal) Powers

The question of *what is power* has had significant attention in law [1, 31, 33] and social psychology [13, 50]. Several works in the field of computer science have also addressed this notion, among which we highlight the works on *normative positions* [44], *powers and permissions* in security systems [12] and norm-governed computational societies [3]. There are also works focused on logical formalization of *power* or *institutional power*, for instance, [6, 7, 16, 17, 32, 42].

The concept of legal power³ [1], or legal competence [33, 34, 48, 49], or institutional power [32], has been intensively discussed by legal [28, 29, 31, 35] as well as computer science scholars, e.g., Sartor [41] as well as Governatori and Rotolo [18] distinguish different types of power: enabling-power, potestative right, and declarative power; Boella *et al.* [5], by proposing an action-based ontology of legal relations, introduce the idea of *recursion* from *power*. Differently from what was proposed in [5], we understand that exercising power not only creates duties and obligations, but it may also create other power-subjection legal relations in a recursive manner.

We focus here on the notion of legal power as proposed by Alexy [1], who extends Hohfeld's concept of power [31]. For Hohfeld, a power relation involves a power holder and the subjection holder (a *dyadic relation*) as correlative notions. Alexy goes one step further and makes it a triadic relation by also reifying the object of the relation (referent)⁴. Moreover, they both understand power as a legal position able to alter a legal situation [1]. The exercise of a power is a performance of an *institutional act* [1, 43]. In general, legal relations are founded on the occurrence of legal events, but certain legal events (e.g., signing of contracts, breaking laws, paying taxes, etc.) can create, extinguish and change legal relations.

UFO-L is a core ontology grounded on the *Unified Foundational Ontology (UFO)* [26], which employs UFO's *theory of relations* [23] to model legal positions (e.g., rights, duties, liabilities, etc.) from this relational perspective advocated by Hohfeld and Alexy. In the next section, we present an ontological analysis of the legal power-subjection relation in the context of UFO-L, and use it to propose our modeling pattern.

3 The UFO-L Power-Subjection Relator Pattern

3.1 Power and Subjection in UFO-L

UFO's theory of relation is founded on the central notion of a *relator* [23, 26]. A relator is a bundle of objectified relational properties (called *relational aspects*) that, by being existentially dependent on a number of relata, connects them. For example, Marriages, Enrollments, Employments and Presidential Mandates are relators. On one hand, they are object-like entities having properties and a life-cycle of their own; on the other hand, they are the so-called *truthmakers* of relations and inducers of role-playing, in the sense,

³ In both legal and computer science literature, *power* appears as a synonym to legal capacity, legal competence, competence norm, constitutive norm, etc. Here, we use the terms 'legal power', 'legal ability', 'legal capacity', and 'power' interchangeably.

⁴ The object of the relation can be an *action* or an *omission* performed by the power holder.

for example, in which the marriage between John and Mary makes true the proposition “John and Mary are married” but also that John is a Husband and Mary is a Wife in the situations where that relator exists.

UFO-L [20, 21] extends this notion by proposing the notion of *legal relator* as similarly reifying *legal relations*. On one perspective, legal relators are classified according to legal nature as: *Right-Duty relators*, *NoRight-Permission relators*, *Unprotected Liberty relators*, etc.; on an orthogonal (mereological) perspective, legal relators are classified as *Simple Legal Relator* or *Complex Legal Relator*. Simple legal relators are composed of *Legal Aspects* (or legal positions) (e.g., *Right*, *Duty*, *NoRight to an Omission*, *Permission to Act*), and complex legal relators are composed of simple legal relators [21].

Legal aspects are linked to *legal roles* played by *legal agents* by means of a type of a relation of *inherence* (a type of *existential dependence* represented here by relation of *characterization*) and connected to the other legal agent, participant of the same relation, by means of a relation of *external dependence* (*externally depends on*). For instance, suppose a legal relation between employee and employer. The employee’s right of salary payment (as against employer) correlates with the employer’s duty to pay the employee’s salary. An UFO-L pattern addressing this case is the *Right-Duty to an Action pattern* [19]. The employee’s right is externally dependent on the Employer as *Duty Holder* and, conversely, the employer’s duty is externally dependent on the Employee as *Right Holder*.

Legal Powers are special types of *Legal Aspects*. Their exercise occur by means of *institutional acts* [1], whose types (and consequent situations) are explicitly prescribed in *Legal Normative Descriptions* or *Legal Norms* [21]. Moreover, their correlative legal aspects are *Legal Subjections*. Thus, legal Power-Subjection relations, if simple, are composed of correlative power-subjection pairs (inhering in opposing agents); if complex, they are composed of simplex power-subjection relations.

Legal Relations created, altered or extinguished by a legal power-subjection relation are called *Derived Legal Relations*. Thus, *Legal Power-Subjection Relations* are divided in two groups: *Original Legal Power-Subjection Relations* and *Derived Legal Power-Subjection Relations*. *Legal Events* ground both these relations. *Original Legal Power-Subjection Relations* are those that were introduced by original constituent powers. For example, in the Brazilian constitution, an original constituent power gives Brazilian municipalities the power to impose taxes on their subjects (citizens, organizations); on the other hand, derived power-subjection relations are those that are created by some other legal power-subjection relation (with the exception of an original constituent power). For example, the municipal law approved by the Vitória City Council and sanctioned by the mayor of Vitória gives the municipality of Vitória the power to levy the urban property tax (IPTU). This local law defines a legal power-subjection relation derived from the original power to institute taxes prescribed by Brazilian constitution. *Derived Legal Relations* require additional *founding events* [24, 26], which are *historically dependent*⁵

⁵ ‘An event b depends historically on a whenever: (i) a (or one of its parts) brings about the situation that triggers b (or one of its parts); (ii) a (or one of its parts) brings about a situation that is necessary—but not sufficient—to trigger b (or one of its parts); (iii) a (or one of its parts) brings about a situation that is necessary—and more than sufficient—to trigger b (or one of its parts); or, (iv) b depends historically on an event z that depends historically on a.’ [2]

on the legal events founding the relations are derived from. For example, when the consumer clicks the “I Agree” button to contract some Internet service, they agree with the terms of that service, including the clause in which the service provider can unilaterally change the contract terms with or without the consumer’s consent. In cases that the service provider changes any clause without the need for consumer consent, the event that will provide the basis for the new legal positions will be the publishing of the modified agreement (historically dependent on the original event). In cases that consumer consent is required for those changes to be applicable, the new founding event will be the clicking of the “I consent” button, which is also historically dependent on the event grounding the relation of agreement.

3.2 The Legal Power-Subjection Relator Pattern

In this section, we leverage on UFO-L’s ontological analysis of the power-subjection relations to proposed a reusable modeling pattern. The proposed pattern is: (1) constituted by pattern name, pattern code, rationale, guidelines for the use, a list of competence questions (Table 1); (2) represented in UFO-based conceptual modeling language OntoUML (Figure 1); (3) enriched by axioms (Table 2) regulating the pattern, and by a list of verification criteria to check whether the modeling situation at hand can be appropriately addressed by the pattern (Table 3). Figure 1 shows the *Legal Power-Subjection Relator* pattern (henceforth identified as *P7-PS-LR* in UFO-L’s pattern catalog).

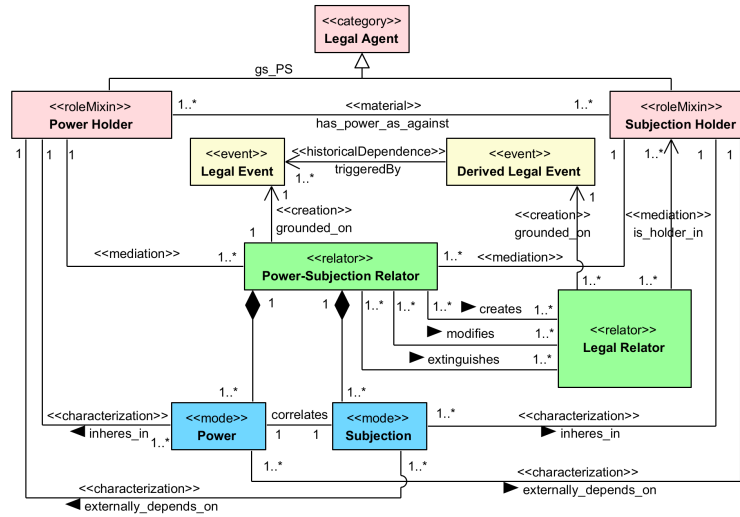


Fig. 1. Legal Power-Subjection Relator Pattern

Rationale. A Legal Power-Subjection Relator is established between Power Holder and Subjection Holder. The Legal Relator is composed of a pair of legal positions: Legal Power, which is inherent in the Power Holder and externally dependent on the Subjection Holder; and Legal Subjection, which is inherent in the Subjection Holder and externally dependent on the Power Holder. By means of an institutional act in a power-subjection

relation, the Power Holder creates, modifies, or extinguishes legal positions held by the Subjection Holder.

Guidelines for the use. This pattern must be used in potestative relations (competence, legal capacity, legal power) with some changing of legal position of Subjection Holder. The action must be conducted by a Power Holder and it needs to be an institutional act, i.e., it must be prescribed by law. The competence questions shown in Table 1 guide the modeler in applying the proposed pattern. The modeler must be able to answer these questions to know if the power-subjection pattern is the adequate pattern for the representation of the relations to be modeled, or rather, the built ontology must be able to answer the questions according to the proposed pattern. For example, for CQ2, the legal roles found and represented must be Power Holder and Subjection Holder, otherwise, the pattern was applied incorrectly and it is necessary to check in the UFO-L patterns catalog a more adequate pattern for the relation to be represented. In this sense, the restrictions presented in Table 2 will also help the modeler in this task and the applicability issues (Table 3) will help in checking existing aspects of this pattern.

Table 1. Competence Questions

CQ1: What are the types of agents involved in the legal relation?
CQ2: What categories of legal roles are involved?
CQ3: What are the legal positions composing the legal relations?
CQ4: Who are the bearers of each existing legal position in the legal relations?
CQ5: Which legal position Subjection Holder holds in the derived legal relation?
CQ6: Which events are the basis of each legal relation?
CQ7: Which institutional act is performed by the Power Holder?
CQ8: What kind of association exists between the legal power-subjection relator and the derived legal relator (creates, alters or extinguishes)?
CQ9: Which Legal Object (e.g. Legal Normative Description or Legal Norm) prescribes the institutional act performed?
CQ10: Who are the role players in the derived legal relation?
CQ11: What event is the basis of the derived legal relation?
CQ12: What is the action/omission of the derived legal relation?
CQ13: What is the Legal Object (e.g. Legal Normative Description or Legal Norm) that legally defines the derived legal relation?

A *Power-Subjection Relator* is composed of two types of *Legal Aspects*: *Power* and *Subjection*. The legal *Power-Subjection* relator mediates disjoint legal agents, who play legal roles (represented here *Legal RoleMixins*, given that they may be played by agents of different kinds).⁶ The legal relation between Power Holder and Subjection Holder is a *material relation* called *has power as against*, which connects Power Holders to Subjection Holders. Power inheres in Power Holder and is externally dependent on Subjection Holder. On the other hand, Subjection inheres in Subjection Holder and is externally dependent on Power Holder. This implies that it is only meaningful to talk about power in a relational context. Thus, at the other end of the relation is the

⁶ UFO-L patterns employs UFO's notions of rolemixin, agent, category, mode, event, material relation, and relator. For details, one should refer to [4, 26, 40].

correlative position called *subjection*. The converse relation (omitted from the diagram) can be understood as *being subject to*: an agent is subject to another agent who, in turn, has power over that one.

Power Holder has the power to create, alter or extinguish legal relations in which Subjection Holder participates. It means that Power Holder has the legal ability to change the Subjection-Holder's legal reality. This change is possible because the legal power is performed as an action prescribed by law (i.e., an institutional act). In addition, Power-Subjection relators are grounded on *Legal Events*, for instance, the publishing of a law conferring powers to an entity to institute taxes. This kind of event brings about situations, which can activate other dispositions (including other legal aspects) of individuals [4].

Table 2. PSLR: Axioms

A1. A Legal Power-Subjection Relator is a relator composed of legal positions called Legal Power and Legal Subjection, which are <i>essential</i> and <i>inseparable</i> parts of the legal relator [26].
A2. Every exercise of legal power changes the legal reality but not every act that alters the legal reality is an exercise of legal power.
A3. Every action performed by Power Holder in the context of legal power-subjection relation is an institutional act prescribed by an institutional agent in a Legal Object (Legal Normative Description or Legal Norm).
A4. Every act of legal power exercised by a Power Holder towards a Subjection Holder is a permissible action (There is no prohibition on the action) but not every permissible action is an action of legal power.
A5. A material relation “has a legal power as against” holds between agents A and B iff there is a conversing relation “is legally subject towards” holding between them.
A6. Every Power Holder has the power of creating, modifying or extinguishing at least one legal relation in which Legal Agent as Subjection-Holder is holder of another legal position.

Table 3. Questions to determine applicability of the pattern

V1. Does the act performed by the Power Holder change the legal situation of Subjection Holder (i.e. creates, modifies or extinguishes legal positions hold by the Legal Agent who is the Subjection-Holder in the legal power-subjection relation)?
V2. Is the Power-Holder's act prescribed by any Legal Normative Description or Legal Norm?
V3. Is the type of the derived legal relation identifiable?
V4. Are the founding legal events (original legal event and derived legal event) of the modeled relations also modeled?

4 Case Study: Legal Power in Brazilian Tax Law

Motivation. The purpose of this case study is applying the pattern to model a case in covering Brazilian constitutional norms as well as a local tax law. Tax law was selected for containing legal power-subjection relations that are generally known to law experts and laypeople alike.

Description. Brazilian tax law is regulated by the Federal Constitution, the National Tax Code, and state or municipal laws. The case analyzed here is the urban property tax (*aka* IPTU) collected by municipalities and the Federal District. There must be a law promulgated by these entities, which is in accordance with the norm of power prescribed by the Federal Constitution. The selected municipality is the municipality of Vitória in the state of Espírito Santo, Brazil and the Act no. 4,476/1997 governs the tax on urban property (IPTU) in Vitória.

Techniques and methods. We first identified the articles that regulate taxes and are contained in the Brazilian Federal Constitution (CRFB/1988), the National Tax Code (CTN), and applicable municipal law (Act no. 4,476/1997); we then used the competence questions summarized in Table 1 to scope the legal relations therein. As result, the following aspects of legal scope were identified: material (real states), temporal (January 1st of each year), jurisdictional/territorial (municipality of Vitória, Espírito Santo State, Brazil), quantitative (progressive rate on property market value), and subjective (tax-payers/owners own real states in Vitória; collector/municipality) aspects. Furthermore, the P7-PS-LR pattern was instantiated to model the legal relations of power-subjection at hand. Finally, the set of verification criteria summarized in Table 3 were checked confirming that the pattern applied was the correct one.

Materials. (1) **CRFB1988.** Article 145. *The Union, the states, the Federal District, and the municipalities may institute the following tributes: I – taxes; (...) (...) Article 156. The municipalities shall have the competence to institute taxes on: (...) I – urban buildings and urban land property; (...);* (2) **CTN.** Art. 32. *The tax, which is the competence of the Municipalities, on urban land and property has as a triggering event the ownership, useful domain or possession of immovable property by nature or by physical accession, as defined in civil law, located in the urban area of the Municipality.(...);* (3) **Law n. 4.476/1997.** Art.1 *The Tax on Urban Property and Territorial Property has as a triggering event the property, useful domain or possession of urban immovable property. (...) Art.2 The triggering event is considered to have occurred on the first day of January of each year (...) Art.6 Taxpayer is the owner, holder of the useful domain or possessor of the property in any capacity. (...) Art. 7 The basis for calculating the tax is the market value of the property, as set out in this law. (...) Art. 9 The tax rates, differentiated according to the use and progressive according to the market value of the properties, observing the respective value range, (...)*

Ontological Analysis. The promulgation of the Brazilian Constitution gives municipalities the power to institute tax norms (Arts. 145 and 156). The exercise of this power by means of an institutional act disposes municipalities in a new relation of Power-Subjection (Figure 2). In this case, the municipal Act no. 4,476/1997 creates the power for the Municipality of Vitória (*as Power Holder*) to levy IPTU tax against taxpayers (*as Subjection Holder*). The ontological choice made for municipalities and taxpayers refers to the ontological nature of each. In fact, the Municipality of Vitória is an instance of Municipality, which provides a principle of identity to its instances; on the other hand, taxpayers may be of different types, i.e., natural persons or juristic persons (e.g. companies, universities), which one providing different principles of identity to their instances.

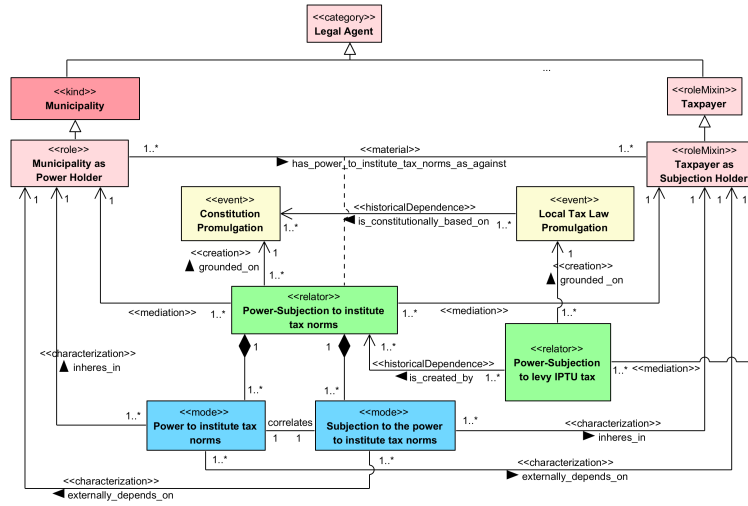


Fig. 2. Derived Legal Power-Subjection for municipality to levy IPTU tax

This power to levy IPTU tax is manifested only in the applicable legal circumstances. The law is explicit with respect to those circumstances by defining hypotheses of tax incidence, i.e., defining *Situation types*, whose instances can trigger [4] certain *Events*, such as the assessment of the tax credit by the municipality. For example, *Being owner of land or buildings in the territory of Vitória in January 1st of each year* (a situation type) has instances that trigger events that will lead to obligations to pay. In other words, an urban property owner eventually becomes taxpayer when the situation “being an immovable property owner in January 1st, in Vitória, Espírito Santo State, Brazil” obtains. When this situation effectively occurs in the world, in a certain time and space with the taxpayer and tax collector roles clearly and uniquely identified, the *legal situation/fact* subsumes to the legal norm, i.e., the hypothesis of tax incidence is true in a specific instance. For example, Maria owns an apartment in Vitória. In January 1st, 2021, the municipality of Vitória verified the group of ownerships in which the IPTU tax is levied on, generating the IPTU tax credits in its favor (*municipality of Vitória as Creditor / Right holder*) (Figure 3). Now, Maria as an apartment’s owner will be notified about her IPTU tax duty. After the *Assessment of IPTU Credit-Debit* (Figure 4), the municipality officially notifies taxpayers. The taxpayer notification is the event that creates the valid duty of the taxpayer to pay IPTU tax in a right-duty relation. According to the legislation, the obligation to pay exists only when taxpayers have been notified. In our example, Maria ought to pay the IPTU tax to the municipality of Vitória after receiving the notification of the obligation to pay the IPTU tax (Figure 5).

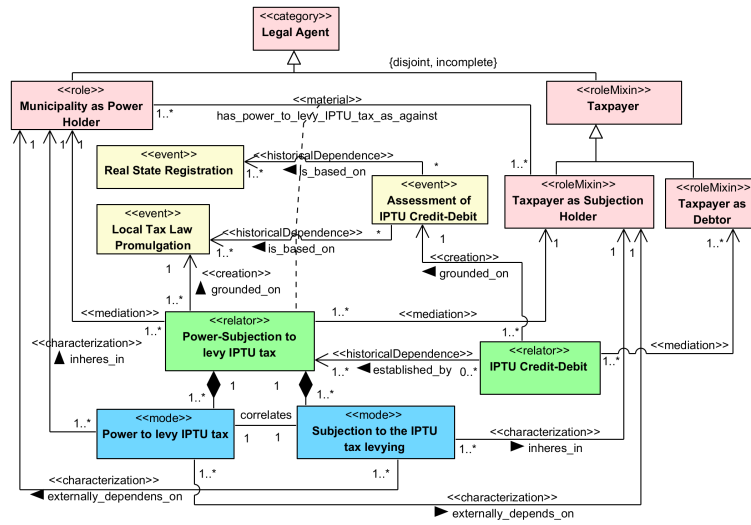


Fig. 3. Legal Power-Subjection pattern applied to tax law

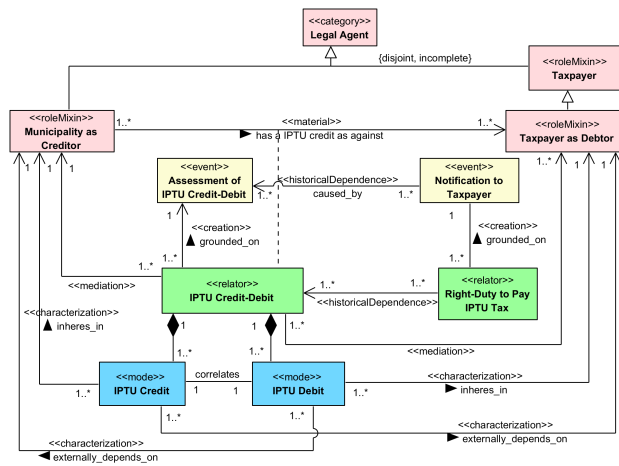


Fig. 4. IPTU Credit-Debit

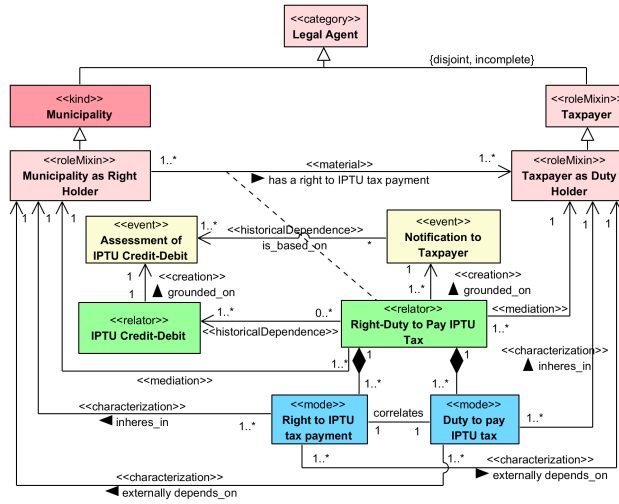


Fig. 5. Right-Duty to an Action pattern applied to tax law

There is a chain of *historical dependence* relations connecting the events that create these legal relations: *Local Tax Law Promulgation* (event E_2) is founded on the Federal Constitution, and, therefore, *Constitution Promulgation* (event E_1) must be prior to event E_2 . Also, the *Assessment of IPTU Tax Credit-Debit* (event E_3) must be done by means of a valid law (event E_2) and, therefore, E_3 historically depends on event E_2 and, by transitivity, on event E_1 . Following this line of reasoning, the event of “Notification (of IPTU tax) to Taxpayer” (event E_4) can only occur if the event of “Assessment of IPTU Tax Credit-Debit” (event E_3) has previously occurred, which historically depends on the event “Real Estate Registration” (event E_5) (Figure 6).

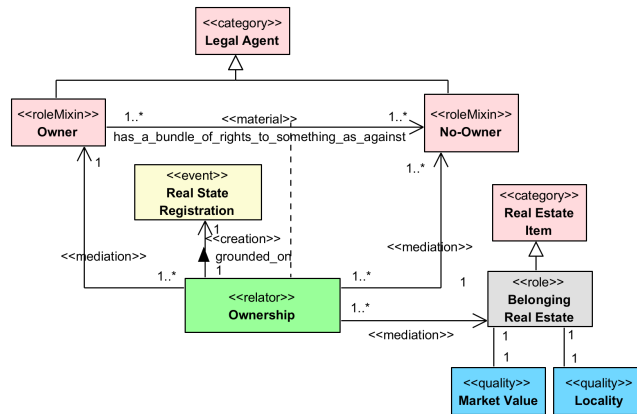


Fig. 6. Ownership of real estate

5 Related Work

There are approaches in the literature that explicitly consider powers. For example:

- In the same line of our work, the RuleML initiative planned to differentiate the concept of legal power from the concept of permission, by introducing “empowering rules”.⁷ Nevertheless, powers and correlative subjections have not been incorporated in LegalRuleML to the present date (a related notion of constitutive rule is included in that specification instead) [36];
- Symboleo [45] is a formal specification language for contracts, in which contracts consist of collections of obligations and powers. Since the contract domain ontology behind the Symboleo language was based on UFO-L, the concept of power is similarly defined as “*the right of a party to create, change, suspend or extinguish legal positions (...)*”. Differently from the pattern proposed here, the correlated position of power (subjection) is not explicit in Symboleo. Representation of the correlative legal positions is relevant for analyzing violations of powers and duties. For example, in the analysis of a concrete case, if Mary does not submit herself to the power of municipality of Vitória to levy the IPTU tax, the municipality can by coercion subject Mary to that power, imposing administrative sanctions or initiating legal actions against her. In UFO-L, with the use of legal relator pattern, it is possible to indicate, at the instance level, who violates a legal power-subjection relation;
- Similarly to Symboleo, Nòmos2 [46] defines power as legal capability to produce changes “in the legal system towards another subject”. The latter acquires the corresponding *liability* but not explicit the correlated legal position;
- In contrast, in FIBO⁸, *legal power* is reduced to *legal capacity* defined as “*the capability to carry out certain actions or to have certain rights together with the resources to do so*”. This definition overlaps to the definition of legal permission proposed in UFO-L, since permission is a legal position hold by a subject who performs an action or an omission towards someone [21].

6 Final Considerations

In this paper, we present the *Legal Power-Subjection Relator* pattern, a new pattern to be included in the UFO-L pattern catalog [19, 20]. This pattern is mainly composed of Power Holder and Subjection Holder, a set of roles played by Legal Agents in the context of legal relations. Differently to the other types of legal relations presented in previous works, this type of legal relation shows that the action holder alters, creates, or extinguishes legal positions of the subjection holder by means of institutional actions.

In order to demonstrate the applicability of the proposed pattern, the legal power to levy taxes was modeled as well the derived legal relations. By using the pattern, we were able to reveal a number of aspects of the case at hand. For instance, it is possible to represent the levying of the property tax over Mary’s properties while she is under 65 years old (in the case that the property tax law grants *immunity* from tax to owners over 65

⁷ <http://ruleml.org/policy/>

⁸ <https://spec.edmcouncil.org/fibo/ontology/FND/Law/LegalCapacity/>

years of age), or the application of bundle of legal permissions in emergency situations for a group of owner's properties without bringing inconsistency to the legal system. The proper modeling of these situations is only possible with the triadic representation of legal relations (i.e. the explicit representation of the parties and the object at hand). In other words, these cannot be properly modeled if the representations of these correlative roles (e.g., *subjection holder*, in this case the taxpayer) are not explicit. For instance, if restricted by monadic deontic operators, one would typically represent the first case as follows: $\neg S(x)$ (where $\neg S$ is the “not subject to the payment of” and x is the IPTU tax). In the same legal system, there would be $\neg S(x)$ for taxpayers aged 65 or over and $S(x)$ for taxpayers aged under 65. This representation does not make explicit the instances of tax-exempt taxpayers and the instances of taxpayers, which may result in inconsistencies. The same occurs in the case of legal permissions in emergency situations.

Regarding future work, we plan to extend our ontological analysis and modeling by: addressing violations of power-subjection relations by applying types of powers and non-powers; conducting a systematic comparison with other types of legal relations, in particular, rights-duties and permissions-no-rights relations. Another relevant study is to investigate some approaches to model meta-powers (powers that establish powers). Finally, in line with [20], we intend to conduct empirical studies to assess the usability of the proposed patterns by legal experts.

There are some questions raised and still open. The first one is whether the pattern proposed here for legal powers can somehow be applied to other types of power (e.g. in autonomous systems). At first, we are inclined to say that yes, it is possible to apply in systems other than legal systems. However, it is necessary to develop some works to conclude that it is applicable in other systems.

The second question is if there is the possibility to distinguish the Original and Derived legal power-subjection relations by means of intrinsic aspects. We have observed that several aspects of legal nature are only activated when their bears are related to others. In the case of original legal power-subjection relations, they are usually perceived in socio-political contexts depending on events to occur. This is an intriguing debate that can be addressed in future research.

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