Applying UFO-L Legal Core Ontology to Bridge Legal and Accounting Domains

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Abstract
While accounting frameworks and standards are primarily oriented toward economic concerns, their legal foundation is indispensable. This paper explores the integration of the Hohfeldian Analytical System and UFO-L Legal Core Ontology into core ontology for financial reporting IS (COFRIS). It expands UFO-L applications by recognizing Legal Positions and Relators for Economic Resources and thus Assets as well as intermediate Legal Positions and Relators to maintain commensurability in economic exchanges. Tables and OntoUML diagrams of enriched ontology fragments, as well as two examples, are provided.

Keywords
UFO, UFO-L, COFRIS, IFRS, Conceptual Framework.

1. Introduction

A significant percentage of the workforce, spanning various roles and industries, needs a basic understanding of accounting principles and standards. One notable illustration of challenges in this domain is that, for a single accounting revenue standard, around 2,000 pages of additional handbooks were needed, and approximately 1,000 "Interpretive Responses" were issued [29]. This reflects areas where authoritative literature proved to be either overly complex, incomplete, or otherwise ambiguous. Accounting frameworks and standards should be general and computational to enable reuse and clear communication. Engineering their ontologies is a promising approach to meet these goals. The concepts underlying these ontologies are rooted in foundational ontologies, such as the Unified Foundational Ontology (UFO) [1], and extend to domain-specific ontologies, including core legal ontology (UFO-L) [2], economic, and finance ontologies (OntoFINE) [3], as well as those modeling economic exchanges (COFRIS) [4].

Recent research introduced ontological engineering methods to address the formal conceptualization of the International Accounting and Financial Reporting Standards (IFRS) framework [5], conceptualized as the CF Ontology [6, 7]. This approach fosters interoperability across various landscapes/domains, addressing ambiguities and enhancing the conceptual consistency of the framework. As depicted in [7], such framework ontologies should be grounded in unified foundational ontologies, in this case in UFO [1] and in an already large set of UFO-grounded core ontologies [2, 3, 8-12, 14]. The next step involves specialization of the CF Ontology for creating IFRS standard ontologies, such as for IFRS 15 Revenue from contracts with customers [15] highlighted in [16]. Furthermore, there is a need for the convergence of different frameworks and standards and the development of converged standards and ontologies.

The problem of engineering ontology common for economics and accounting has been regarded before, e.g. [17], however [18] is the sole documented effort exclusively focused on the (previous iteration of the) IFRS CF itself. Other efforts were devoted to the ontology of Economic Exchange and its use in accounting. Several ontologies for economic exchange were proposed grounded in UFO, and in a recent work, they have been consolidated for standard setting [4].

While accounting frameworks and standards are primarily oriented toward economic concerns—and increasingly toward climate-related issues, their legal foundation is indispensable. This stems from the inherent assumption in accounting frameworks that economic resources correspond to rights, while claims are naturally linked to duties, aligning such frameworks with the principles of the Hohfeldian Analytical System [2]. A Hohfeldian analysis dissects legal relationships into fundamental components—rights, duties, permissions, powers, subjections, immunities, and

disabilities. While IFRS (and most accounting frameworks) speaks about “rights” and “obligations” in a broader, more pragmatic sense, there are still situations in standard-setting where a more granular, Hohfeldian system can illuminate how and why certain rights and obligations should be recognized, measured, or disclosed.

Notable examples include principal-agent analyses in revenue recognition [15], distinguishing powers from claim-rights for investors and lessees, services from leases and licensing, possession from ownership, and clarifying the definitions of intangible assets, convertibles, and derivatives. Although there is a broad literature on the Hohfeldian system and its jurisdictional applications [13], there remains no well-established, mainstream body of scholarship that explicitly and systematically applies Hohfeld’s framework to IFRS or accounting standard-setting in a comprehensive manner. Particularly noteworthy is work on POA theory [28] that discusses legal foundations of accounting elements as technical constructions of bookkeeping and economic exchange; however, this work neither employs Hohfeld's legal positions nor is it grounded in the UFO.

In addition, the development and application of economic and accounting ontologies and frameworks involve critical issues where Hohfeldian analysis could provide valuable insights. One prominent example lies in the varying interpretations of key concepts such as economic resources and, specifically, the resource transfer event. For instance, [12] considers an executory contract to be a resource, even when it lacks any economic value. In contrast, [3] defines transfers in economic exchange solely as the delivery of services.

The primary objective of this study is to analyze and create a core ontology artifact: the Core Ontology for Financial Reporting Information Systems 3.0 (COFRIS 3.0). This enhanced ontology builds upon COFRIS 2.0 and incorporates concepts grounded in UFO-L, to bridge the semantic gap between legal and accounting domains. COFRIS 3.0 initially is aimed at validation and knowledge representation of existing frameworks and standards, creating and providing standard Exposure Draft comments, and the further facilitation of standard-setting.

The research is framed within Design Science Research methodology, with COFRIS serving as the central artifact through multiple development cycles. The paper represents a new design cycle with three key objectives:

- Validate COFRIS's practical utility by applying it to Conceptual Framework legal grounding.
- Propose necessary extensions to COFRIS.
- Improve depiction of accounting and legal concepts in OntoUML diagrams.

The paper is organized in a logical progression: Section 2: Provides a concise overview of UFO-L and the IFRS Conceptual Framework, establishing the theoretical foundation; Section 3: Examines COFRIS 2.0 Ontology with emphasis on legal relators, positions, and triggering events that serve as foundational elements; Section 4: Introduces preliminary additional fragments of COFRIS 3.0 Ontology, presented through OntoUML, tables, and practical example; Finally, Section 5 concludes the paper and outlines future work focused on validation.

2. Background

2.1. The IFRS Conceptual Framework (IFRS CF)

The International Accounting and Financial Reporting Standards Conceptual Framework (IFRS CF) [5] sets out the fundamental concepts that guide the standard-setters in developing international accounting and financial reporting standards. The following objectives and concepts are set by IFRS CF and previously converged with the US counterpart:

- The objective of General Purpose Financial Reporting is to provide financial information about the reporting entity that is useful to existing and potential investors, lenders, and other creditors in making decisions relating to providing resources to the entity.
- Stewardship Responsibility: An entity, through its management, has a stewardship obligation to realize the entity's economic resources efficiently and effectively.

- Qualitative Characteristics of Useful Financial Information: Fundamental Characteristics are Relevance for decision-making and Faithful Representation. Enhancing Characteristics are Comparability, Verifiability, Timeliness, and Understandability.
- Financial reports provide information about the reporting entity's economic resources, claims against the entity, and the effects of transactions and other events and conditions that change those resources and claims. In many circumstances, *the substance of an economic phenomenon and its legal form are the same.*
- Recognition Criteria: Resources and claims are recognized when it is probable that future economic benefits will flow to or from the entity and the item can be measured reliably.
- Measurement Bases: Historical Cost, Fair Value, Current Cost, and Value in Use.
- Going Concern Assumption: It is assumed that the entity will continue operating in the foreseeable future unless management intends to liquidate or cease operations.
- Accrual Basis of Accounting: Financial statements are prepared by recording transactions and other events when they occur, regardless of when cash is received or paid.

2.2. Unified Foundational Ontology (UFO) and Legal Core Ontology (UFO-L)

Unified Foundational Ontology (UFO) is an axiomatic domain-independent formal Theory. UFO is divided into three layered compliance sets: UFO-A, an ontology of concrete *endurants* – of *substantials* and *aspects* [1], UFO-B, an ontology of *events* [8], and UFO-C, an ontology of *intentional* and *social entities* [9]. OntoUML is a language whose meta-model has been designed to comply with the ontological distinctions and axiomatization put forth by UFO [10].

UFO-C encompasses *social relators* of *social commitments* (obligations) and *claims* (rights) between *social agents*. Rights and Obligations are correlative, one logically entails the other and have unique propositional content, often allowing description of a correlative social relator by only one party's *mode*, and a reciprocal relator, such as a contract, by a minimum of one *mode* of each party. However, each party's standpoint in a social relationship involves a specific form of "ought": one bears a commitment or obligation (ought-to-do), and the other holds a claim or right (ought-to-be). This dynamic underscore the complementary but asymmetrical nature of legal relationships [19].

UFO-L is a core legal ontology grounded on the Unified Foundational Ontology (UFO) [2,14]. It employs UFO's theory of relations to modeling legal positions (e.g., rights, duties, powers, subjections, etc.) from the relational perspective advocated by Hohfeld and Alexy.

UFO-L defines four simple *legal relators* of *correlative* pairs of *legal positions* (*modes*) between two *legal agents* w.r.t their *actions of conduct* or *institutional actions*:

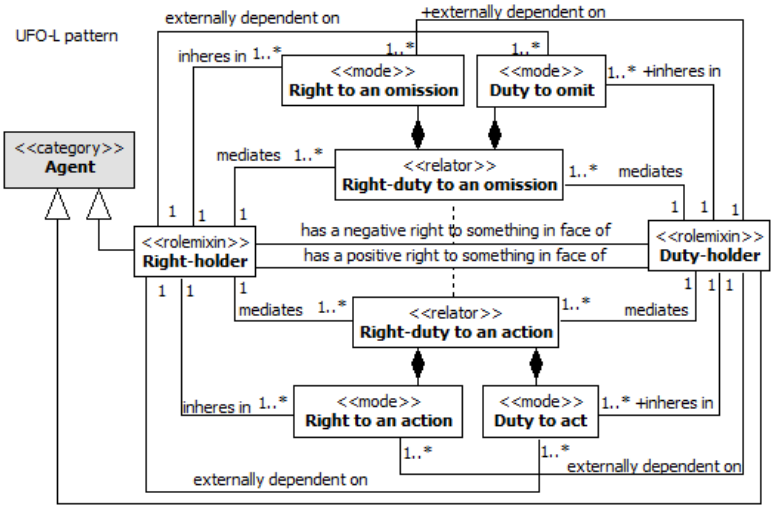

Figure 1: OntoUML diagram of a Right-Duty Pattern, adapted from [2].

- [Claim-]Right and Duty. If subject S1 has the right to an action A or omission O against subject S2, then subject S2 has a duty to perform action A (or omitting O), see Figure 1.

- Permission and No-Right. If subject S1 holds permission towards subject S2 to an action A (or omission O), then subject S2 has no-right to demand that the permission holder S1 omits action A (or refrains from omitting O).
- Power and Subjection. If subject S1 has legal power in face of subject S2 to create, change, or extinguish a legal position (a right, power, etc.) X for subject S2 *by means of institutional actions*, then subject S2 has subjection towards subject S1 w.r.t this legal power.
- Disability and Immunity. If a subject S1 has, in face of subject S2, no power to create, change, or extinguish a legal position X for subject S2, then subject S2 is immune to changes in the legal position that affect S2.

3. Core Ontology for Financial Reporting Information Systems and their Conceptual Framework (COFRIS 2.0)

Core Ontology for Financial Reporting Information Systems (COFRIS) builds upon the foundational works of Institutional economics [20] and Theory of accounting measurement [21], which view economic exchange as the backbone of economics, accounting, and, by extension financial reporting. COFRIS [22, 23], grounded in the UFO and presented in OntoUML, is consolidated in [4] with other UFO ontologies of economic exchange, namely COEX [3], OntoREA [24], and REA2 [25], and includes specific considerations relevant to financial reporting information systems. Recently, COFRIS has been updated to encompass IFRS and US GAAP concepts, particularly their terminology [7]. This update will be referred to as COFRIS 2.0 where appropriate. Below, we outline the COFRIS 2.0 Ontology, depicted by the OntoUML diagram in Figure 2 and detailed in subsections 3.1-3.4. In the discussion, concepts specific to this ontology appear in italics (e.g., *Economic Resource*).

3.1. Enterprise and Market Participants. Economic Exchange

An *Enterprise* is defined as an organization operating as a going concern and functioning as a market participant. The term Market Participant encompasses persons, organizations, or collectives engaging in economic exchanges. Examples include individual entrepreneurs (e.g., John Doe), corporations (e.g., Acme Corporation), investor consortia, or family-owned businesses. Enterprises assert claims on economic resources (assets) while simultaneously facing claims from external parties (liabilities and equity claims). They also demonstrate a commitment to their owners and leverage both resources and claims in exchanges designed to realize economic benefits.

When used as an adjective, *Economic* refers to the monetary valuation or financial aspects of a given concept. In many contexts, this qualifier is implicit and may be omitted when the financial dimension is understood.

An Economic Exchange is a reciprocal transaction between market participants that involves the transfer of economic resources. In return, each participant becomes entitled to commensurate economic benefits, with the exchange conducted under the going concern assumption. Economic transactions and exchanges occur because of rights and obligations embedded in exchange contracts or other mechanisms, where the exchanged resources and services—and the affected assets, liabilities, and equity claims—are characterized by their second-order types (see Figure 2, Part 1).

3.2. Economic Resources and Claims

An *Economic Resource* is an entitling right that empowers an enterprise to engage in the production and exchange of economic resources, thereby generating entitlement to economic benefits. For instance, homeownership functions as an economic resource by mediating the relationship between the enterprise and the broader market. Such resources (see Figure 2, Part 2) embody an *Enabling Right* (e.g., the right to transfer the rights of a house)—paired with a corresponding *Benefit Potential* (e.g., the expectation of payment or receivable). These enabling rights may arise from the ownership of a *Property* or from the right to transfer a claim, such as in a mortgage arrangement.

A *Claim of Entity* (e.g., a receivable), a subkind of Economic Resource, represents an *Entitlement Right* corresponding to an obligation of *Other Parties*. This indicates that the *Constructive Right* was established, or the *Enabling Right* was *Realized* for the benefit of *Other Parties*, thereby creating a direct claim to specific economic resources. For example, once a service is rendered, the enterprise acquires the right to receive payment.

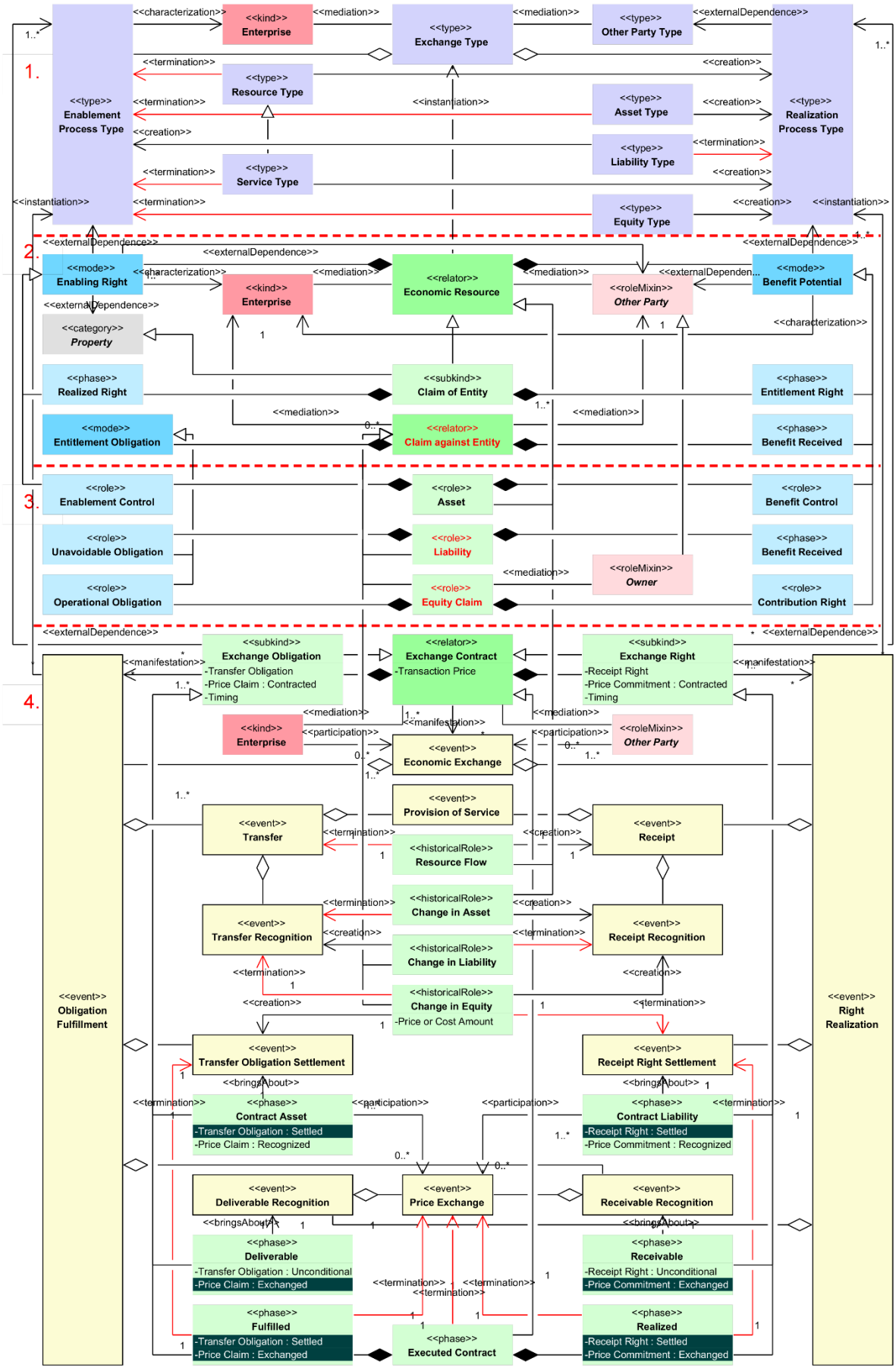

Figure 2: COFRIS. OntoUML diagram of Economic Exchange. Enterprise view. In all diagrams, types are represented in purple, objects in pink, modes in blue, events in yellow, and relators in green. Parts: 1. Exchange Type, 2. Resource and Claims, 3. Asset, Liability, and Equity, 4. Exchange Contract

Conversely, a *Claim against Entity* (e.g., payable, deliverable) constitutes an Enterprise's constructive or exchange obligation with the potential to transfer economic resources, including the assumption of a new claim, such as an obligation to settle payment with a supplier. It means that the Economic Benefit has been *Received*.

3.3. Assets, Liabilities, and Equity

An *Asset* (see Figure 2, Part 3) is understood as the present role of an Economic Resource that is controlled by an enterprise. For example, crude oil held in inventory may serve as a raw material asset. This role arises when the enterprise enhances the inherent properties of the resource. The role of *Enablement Control* specializes the concept of *Enabling Right* by reflecting the enterprise's authority to direct and deploy the resource in a transaction. Similarly, the role of *Benefit Control* indicates the enterprise's capacity to derive economic benefits from that resource.

Liability (Legal or Constructive) is a present and unavoidable claim against the enterprise. It is characterized as an *Unavoidable Obligation*, exemplified by a business's mandatory duty to pay employee salaries.

An *Equity Claim* represents a residual claim on the enterprise's Assets after deducting its Liabilities. This claim, often referred to as a *Residual* or *Operational Obligation*, is primarily held by the *Owners* or shareholders of the enterprise.

3.4. Exchange Contracts, Transactions, and Other Events

An Exchange Contract (see Figure 2, Part 4) is modeled by a UFO-C social relator that mediates between an Enterprise and Other Parties, representing a mutually agreed upon exchange. It is composed of two sets of relators:

- One or more distinct *Exchange Obligation* relators mediate between:
  - a *Transfer Obligation* specifying the deliverable transformative bundles of Resource and Service Types, Asset, Liability, and Equity Types to be affected, and *Timing* of Settlement.
  - a *Contracted Price Claim* of the amount to be recognized upon settlement.
- One or more distinct *Exchange Right* relators—the exchange obligations of the other parties—mediate between:
  - a *Receipt Right* specifying the receivable transformative bundles of *Resource and Service Types*, *Asset, Liability, and Equity Types* to be affected, and *Timing* of Settlement.
  - a *Contracted Price Commitment* of the amount to be recognized upon settlement.

The contract has:

- n transfer obligations, each with a Price Claim R[i], for i = 1,..., n, and not coterminous
- m receipt rights, each with a Price Commitment P[j], for j = 1,..., m.

On inception and in maintaining commensurability it holds that:

$$\sum_{i=1}^{n} R[i] = \sum_{j=1}^{m} P[j].$$

Note: Prices are not immediately paid or received but exchanged after either party fulfills its transfer obligations.

For instance, consider:

A barter agreement in which:

- a car and software embedded in the operating system of a car valued at $140,000 to be transferred on February 1, and
- a trailer valued at $160,000 to be delivered on March 1 are exchanged for:
- three monthly installment payments in Bitcoin, starting in January, each valued at $100,000.

Notice that each non-divisible economic resource and benefit not proportional to other leads to the barter. The barter operations may be substantially hidden for reporting because of net effects and absence from cash flow statements. All sustainability restoration transactions are barters.

A mobile phone transaction where:

- a phone valued at $1,000 is sold for:
- a combination of $750 trade-in value and $250 in credit.

A service arrangement where a marketing agency simultaneously:

- receives specialized market research services (a receipt), and
- provides social media consulting services (a transfer) of equivalent value.

These examples, while unconventional, illustrate the flexible yet precise nature of Exchange Contracts. The model for Contract Execution can be built using either modes or relators, since relators (accounts) are preferred in accounting, we depict modes as attributes. Notice also that we model contract as mediating two sets of relators instead of four sets of modes as in UFO-L because it provides more semantics of mode relationships.

The contract execution occurs through concurrent Obligation Fulfillment and Right Realization, processes interrupted or finalized by the Price Exchange process when either party fulfills its transfer obligations.

3.4.1. Obligation Fulfillment

An *Exchange Obligation* manifested by the *Obligation Fulfillment* process comprises one or more value *Transfer* events. Each Transfer event may include:

- *Service Provision* Event to Other Parties.
- *Resource Flow Termination* Event (can be triggered by contract or external factors).
- *Resource Flow Transfer* Event to Other Parties.
- Transfer of Rights to Other Parties concurrent with assuming Liabilities from them.

Each Transfer implies a *Transfer Recognition* event that results in a decrease in Equity equal to the Cost amount (e.g., Expenses) and possible decreases in Assets or increases in Liabilities.

The *Transfer Obligation Settlement* event makes *Transfer Obligation: Settled* and any unexchanged *Price Claim: Recognized*. This event brings about *Contract Asset* or terminates *Deliverable*, resulting in an increase in Equity (e.g. Revenue), equal to the Price Claim amount.

3.4.2. Right Realization

An *Exchange Right* manifested by the *Right Realization* process involves one or more value *Receipt* events. Each Receipt event may include:

- Provision of Services to the Entity.
- *Resource Flow Creation* Event. Similarly to termination events, they may arise from external environmental or market conditions independent of any contractual exchange.
- *Resource Flow Receipt* Event from Other Parties.
- Receipt of Rights from Other Parties that simultaneously enforce Liability transfer to them.

Each Receipt implies a *Receipt Recognition* event that results in an increase in Equity, typically either by increasing Assets or by decreasing Liabilities.

The *Receipt Right Settlement* event makes *Receipt Right: Settled* and any unexchanged *Price Commitment: Recognized*. This event brings about *Contract Liability* or terminates *Receivable*, resulting in a decrease in Equity, equal to the Price Commitment amount.

3.4.3. Price Exchange

Once either all Transfer Obligations or all Receipt Rights have been *Settled*, all Price Claims and Commitments are terminated into the *Exchanged* phase. This effectively results in terminating all Contract Assets into the *Fulfilled* phase and Liabilities into the *Realized* phase and brings about *Recognition* of either *Receivables* (unconditional Receipt Rights) for all unrealized Exchange Rights or *Deliverables* (unconditional Transfer Obligations) for all unfulfilled Exchange Obligations.

Ultimately, when all Exchange Obligations are Fulfilled and all Exchange Rights are Realized, the Contract is terminated into its final *Executed* phase. It is also noteworthy that resource and service inflows can be immediately offset by corresponding outflows. Thus, in the above example a marketing agency, might simultaneously receive specialized market research services (a receipt) and provide social media consulting services (a transfer) of equivalent value. In such instances, only the net equity changes are recognized, and no asset or liability is recorded. Similarly, claims may be raised by outflows and extinguished by matching inflows.

4. Towards UFO-L Grounded Core Ontology for Financial Reporting Information Systems (COFRIS 3.0)

4.1. Happy-Path Scenarios

Further, we want to explore which UFO-L legal positions would be important to introduce on the CF level into the element definitions and concepts. This Section presents the COFRIS ontology interpreted and enriched by the UFO-L legal concepts forming an updated ontology to be named COFRIS 3.0. The competency questions to be answered in a Hohfeldian way are:

- Which economic events qualify as institutional phenomena (have juridical effects), and which do not have juridical effects? What legal relations and positions are dispositions for economic events, and what legal relations and positions are established or modified because of them?
- What are the legal relations and positions behind the contracts, economic resources, and claims of the enterprise?

We will continue to take an enterprise perspective and analyze only those legal positions and relators with monetary valuation. Our objective will be to put behind the social relator and modes of each element at least four legal relators and hence a minimum of eight positions further describing the element's legal substance specialized by their roles in exchanges and other events.

Let us first regard the main Legal Positions of Enabling Rights of an Economic Resource and thus of an Asset, following [27, 30], complemented by Legal Positions for Benefit Potential, see Table 1 for an example of a van, and Figure 3 for an OntoUML diagram. The fundamental building blocks of all property analysis consist of four elemental entitlements: enablement-permission, enablement right (possibly complemented with exclusion-right), expropriation immunity, and enablement-power. Table 1 lists the legal positions of an enterprise and correlative ones of other parties for ownership of a van. Notice the (causal) order of the positions that is different from UFO-L.

Table 1. Legal Positions Economic Resource and Asset of a Van. Enterprise view.

Position	Entity Enabling Rights	Other Parties Acceptation Obligations	Entity Benefit Potential	Other Parties Sacrifice Potential
Enablement-Permission	Enterprise owns a van for deliveries and operates or leases it freely.	No-Right to Block Enabling – Competitors cannot exclude the Enterprise from using or leasing the van.	Enterprise receives lease or rental income from the van.	No-Right to Block Receipt – Unrelated third parties cannot demand a share of the income.
Enablement-Right	Enterprise controls access and prevents unauthorized use.	Duty not to Interfere (No-Permission to Use) – Others cannot use the van without authorization.	Enterprise exclusively receives lease payments from the lessee.	Duty to Produce Benefit – No third party can claim the lease income unless contractually assigned.
Expropriation Immunity	Enterprise is protected from unlawful government seizure.	No-Power to Expropriate (Disability) – The government/private entities cannot expropriate the van.	Enterprise is protected from the lessee reclaiming paid rent.	No-Power to Interfere – The lessee cannot demand a refund unless contractually allowed.
Enablement-Power	Enterprise can sell or lease the van, transferring ownership.	Acceptation Subjection – Buyers/ Lessees must comply with contract terms when acquiring the van.	Enterprise can assign or sell the right to receive future lease payments.	Subjection to Enforcement – The lessee remains liable to pay rent even if the claim is transferred.

All transactions and events—including inflows and outflows influenced by environmental or market conditions, as well as services received and immediately consumed—are transformed into institutional actions through the accounting processes of recognition and derecognition.

Fulfillment processes related to the *Exchange Contract* and *Obligation* (see Subsection 3.4) qualify as institutional actions in their own right. These processes manifest four core legal positions:

- Transfer Obligation: This requires an Enabling Right to transfer an economic resource.
- Transfer Obligation Settlement Right: This is raised by settlement of a Transfer Obligation.
- Receivable Recognition Right: This is raised by the settlement of all Transfer Obligations.

Conversely, the reciprocal *Exchange Right* includes:

- *Receipt Right*: This incorporates a *Receipt Obligation* of an economic benefit.
- *Receipt Right Settlement Obligation:* This is raised by settlement of a Receipt Right.
- *Deliverable Recognition Obligation*: This is raised by the settlement of all Receipt Rights.

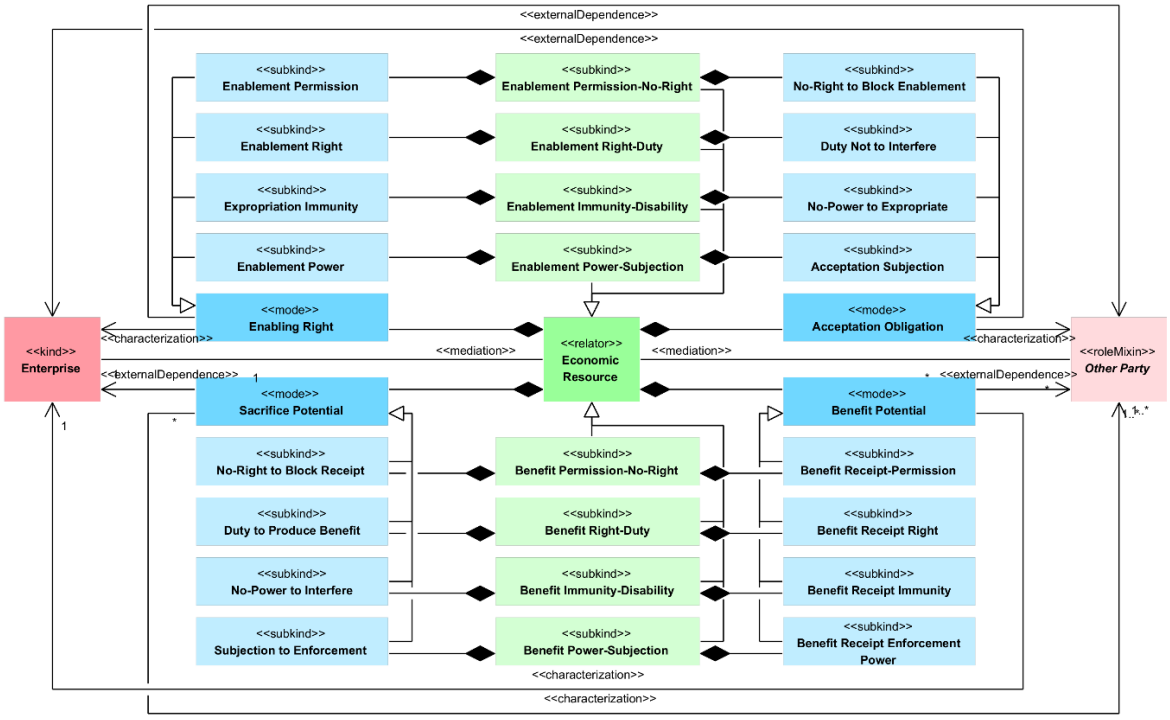

Figure 3: COFRIS. OntoUML diagram of Legal Positions of Economic Resource. Enterprise view.

These two reciprocal groups of rights and obligations are held by the entity. The other party holds the correlative obligations and rights. The correlative analysis for the application of measurement and recognition criteria is used by several IFRS Standards and thus it is reasonable to generalize it in the ontology. Each of these rights and obligations is further disaggregated in a minimum of eight Hohfeldian legal positions (four legal relators). We now present the minimal set for IFRS CF and COFRIS 3.0. The fragment of the OntoUML diagram of legal relators and positions for economic resources and thus assets is shown in Figure 3. Instead of presenting all proposed legal positions in a large OntoUML diagram, we have depicted them in Table 2.

In a typical contract for the delivery of goods or services, the entity holds the necessary permissions and powers to transfer the associated economic resources, as well as certain immunities from improper interference in fulfilling transfer obligations. Correspondingly, the other party has a subjection to receipt of the goods or services. The other party also lacks the right to unilaterally revoke performance without lawful cause or contractual basis.

Table 2. Legal Positions of Obligations and Exchange Rights. Enterprise view.

<table>
<tr><th rowspan="2">Exchange Obligation</th><th colspan="4">Entity</th><th colspan="4">Other Party</th></tr>
<tr><th>No-Right</th><th>Duty</th><th>Disability</th><th>Subjection</th><th>Permission</th><th>Right</th><th>Immunity</th><th>Power</th></tr>
<tr><td>Transfer Obligation</td><td>to prevent benefit inspection</td><td>to transfer resource</td><td>to unilaterally revoke the transfer</td><td>to be compelled to transfer</td><td>to inspect the benefit</td><td>to benefit receipt</td><td>from unilateral assignment</td><td>to enforce receipt</td></tr>
<tr><td rowspan="3">Economic Resource Transfer Right</td><td colspan="4">Entity</td><td colspan="4">Other Party</td></tr>
<tr><td>Permission</td><td>Right</td><td>Immunity</td><td>Power</td><td>No-Right</td><td>Duty</td><td>Disability</td><td>Subjection</td></tr>
<tr><td>to transfer</td><td>to exclude interfering in the transfer</td><td>from unilateral transfer revocation</td><td>to transfer resource</td><td>to block receipt</td><td>to no interference in receipt</td><td>to unilaterally revoke the receipt</td><td>to benefit receipt</td></tr>
<tr><td>Transfer Obligation Settlement Right</td><td rowspan="2">to assess</td><td rowspan="2">to exclude interfering in the assessment</td><td rowspan="2">from unilateral recognition</td><td rowspan="2">to recognize</td><td rowspan="2">to assess</td><td rowspan="2">to non-interference in the assessment</td><td rowspan="2">to unilaterally change recognition</td><td rowspan="2">to accept the recognition</td></tr>
<tr><td>Receivable Recognition Right</td></tr>
</table>

Exchange Right	Other Party				Entity			
	No-Right	**Duty**	**Disability**	**Subjection**	**Permission**	**Right**	**Immunity**	**Power**
Receipt Right	to prevent receipt inspection	to benefit receipt	to unilaterally revoke the receipt	to be compelled to receipt	to inspect the receipt	to resource transfer	from unilateral assignment	to enforce transfer
Economic Benefit Receipt Obligation	Other Party				Entity			
	Permission	**Right**	**Immunity**	**Power**	**No-Right**	**Duty**	**Disability**	**Subjection**
	to transfer	to exclude interfering in the transfer	from unilateral transfer revocation	to transfer resource	to block receipt	to no interference in receipt	to unilaterally revoke the transfer	to benefit receipt
Receipt Right Settlement Obligation	to assess	to exclude interfering in the assessment	from unilateral recognition	to recognize	to assess	to non-interference in the assessment	to unilaterally change recognition	to accept the recognition
Deliverable Recognition Obligation								

4.2. Another Illustrative Example: Hohfeldian Analysis for Distinguishing Software Licenses vs. SaaS Contracts

The Hohfeldian framework helps analyze legal positions in contracts by breaking down rights, duties, permissions, and powers into precise legal relations. Using this approach, we can distinguish whether a contract involves a software license (granting ownership-like rights over software) or a SaaS agreement (providing access but retaining control). Let us compare the rights in Table 3.

Table 3. Comparison of the Rights provided by Software License and SaaS agreement.

Factor	Software License	SaaS Contract
Rights Granted	Right to use software	Permission to access software
Ownership Control	Licensee gets some legal control over software use	Provider retains all control
Modification Rights	No-right to modify unless explicitly allowed	No modification rights at all
Revocability	May be perpetual or limited	Access can be suspended at any time per contract
Payment Structure	Usually one-time or term-based	Recurring subscription model
Infrastructure	Runs on the customer's system	Runs on the provider's system

By using Hohfeld's framework, we can see that: A software license grants claim-rights (limited property-like control). A SaaS contract only grants permissions (revocable access to a service). However, Contracts often blend licensing and SaaS (hybrid models) and Companies use misleading or vague terms in agreements.

5. Conclusion and future work

This paper employs the Hohfeldian Analytical System and UFO-L Legal Core Ontology as a foundational framework for analyzing the elements and transactions of financial reporting. This approach enables a formalized and deeper understanding of these entities.

Firstly, the correlativity inherent in legal positions facilitates the inter-company reconciliation of elements and transactions, particularly in auditing, triple-entry accounting, and transaction-level valuation. However, this method has limitations at the element level.

Secondly, Hohfeldian correlatives are asymmetrical. The obligation side is predominantly characterized by required performance, while the rights side is defined by the achievement of specific outcomes. This asymmetry influences definitions and affects their convergence across different accounting frameworks.

Thirdly, we extend the conceptualization of rights and obligations that define economic resources and assets, an aspect previously underexplored in UFO-L applications. Intermediate Legal Positions and Relators emerging in economic exchanges to preserve commensurability are explicitly recognized.

We provide two examples of legal relator modeling for practical application. One of these pertains to a recurring issue where only "Interpretive Responses" by consultants exist. Future validation of this approach will involve knowledge representation of current frameworks and standards, drafting standard Exposure Draft comments, and further engagement in standard-setting processes.

For future work, recognition and measurement introduce new dimensions to the Hohfeldian system. Recognition and derecognition transform all events into institutional actions. By linking legal positions to specific actions, we can allocate costs—such as exclusion, conformance, and rights transfer—to legal positions, relators, and financial elements.

Defining the unit of account as a set of legal position correlates can extend beyond conceptual frameworks to practical standard-setting initiatives. While this method is not entirely new, its novelty lies in the systematic and formal application through UFO-L and OntoUML-based specifications. Regarding economic-legal relations, a prominent issue for future research is the recursive application of power-subjection.

The COFRIS 3.0 Ontology diagrams were syntactically verified using OntoUML tools. The successful development of Ontology demonstrates the conceptual richness of the UFO-L and COFRIS ontologies and their suitability as ontological analysis means. The COFRIS 3.0 Ontology will be submitted for publishing in OntoUML/UFO Catalog.

Appendix. OntoUML diagram depiction notes.

OntoUML diagrams encompass both first-order and higher-order types. For our modeling approach, we distinguish entities based on their instantiation status within the model. If an entity exists as an actual instance after the model's instantiation, such as a specific Tesla Model Y with chassis #123 involved in a delivery event #345 any entity that exists in the past or present—it is represented as a first-order type. Conversely, if the entity is expected to manifest in the future (e.g., a Tesla Model Y specified within a purchase order), it is represented as a higher-order type. Unfortunately, the OntoUML editor currently does not support modeling of different sorts of higher-order types as discussed in [26]. Higher order types are used also for the categorization of a type, e.g., a car can be characterized by its model, each model having its own *characterization*. The model can be instantiated as a car being a first-order type and further instantiated with chassis #123.

Like OntoClean, which introduces refined levels of specialization, the semantics of the diagrams are greater, if deeper than *characterization* or *material* top-level primitive relations are used. To facilitate this, we suggest utilizing primitive relations, such as *creation* and *termination*, to associate not only events with objects but also to associate higher-order types of future events that represent the intention (commitment) behind the creation or termination of objects specified by higher-order types. The OntoUML editor does not prohibit such usage.

In modeling the lifecycle of an object, the first of its phases has the same name as the object itself.

Dependence and temporal precedence relations are important for depicting semantics, but they clutter the diagrams for two reasons. Firstly, their stereotype names are too long – that could be solved easily by omitting the *Dependence* part. Secondly, *historicalDependence* is often implied by the writing sequence and that causes semantic gaps, but often it also can be inferred especially in situations when e.g. an object in phase a is terminated by an event into phase b, it is clear that b there is *historicalDependence* on a. Numbering of objects or events could also make historical dependence more evident. We also use aggregation relations between events instead of *historicalDependence* relations. An event a is historically dependent on an event b iff a could not have happened without b having happened before.

Navigation arrows involving events point to the event that is a source of creation, termination, or brings about a new situation, phase, or role.

The concepts and terminology have been refined to align closely with those used in established frameworks, with particular attention given to cross-lingual validation using GPT-4 for term testing, including the nuanced selection of terminologies, such as differentiating between *Transferred*

Resource and *Resource Transferred*. During the preparation of this work, the author(s) used ChatGPT o1, and Grammarly in order to: Grammar and spelling check, Paraphrase, and reword. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the publication's content.

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