Towards a Core Ontology for Financial Reporting Information Systems (COFRIS)

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Abstract. Among models and information about economic phenomena that help to understand how enterprises produce value, Accounting and Financial Reporting still play a leading and regulative role. The regulative role is established by enforceable International Financial Reporting (FR) Standards. Ontology engineering methods, which have proven to cope with difficult standardization issues, are seldom used in developing these standards. Furthermore, no widely accepted computational ontology, covering the concepts and relations of FR, and the Information Systems supporting FR, exists. This paper proposes an initial version of the Core Ontology of Financial Reporting Information Systems (COFRIS) grounded on the Unified Foundational Ontology (UFO).

Keywords: UFO · COFRIS · IASB · IFRS · Shared ledger

1 Introduction

Ontology engineering methods, which have proven to cope with difficult standardization issues [5], are seldom used in developing standards of international financial reporting (IFRS). Consistency, completeness and clarity of recent editions of Conceptual Framework for FR [1] and reworked standards [2] by the International Accounting Standards Board (IASB) still need to be improved [12]. Additionally, we see the following deficiencies of this framework and standards:

- absence of ontology engineering tools used for standard setting;
- limited, inconsistent and not generalized conceptualization of economic contracts and their progression events [11];
- repetitions and inconsistency among IFRS standards;
- inconsistency with other enterprise standards and enterprise ontologies;
- limited account for the impact of modern information technologies, such as data analytics and shared ledger [10].

The main contribution of this paper is the initial version of the Core Ontology of Financial Reporting Information Systems (COFRIS) grounded on the Unified Foundational Ontology (UFO) [5] network. Section 2 depicts an essential fragment of COFRIS presented in OntoUML [5] diagram in Fig. 1 and definitions of the main concepts and relations with references to the UFO patterns [3–9] and IASB conceptual framework [1] and IFRS standards [2] in Fig. 2.

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2 COFRIS OntoUML Diagram, and Concept Definitions

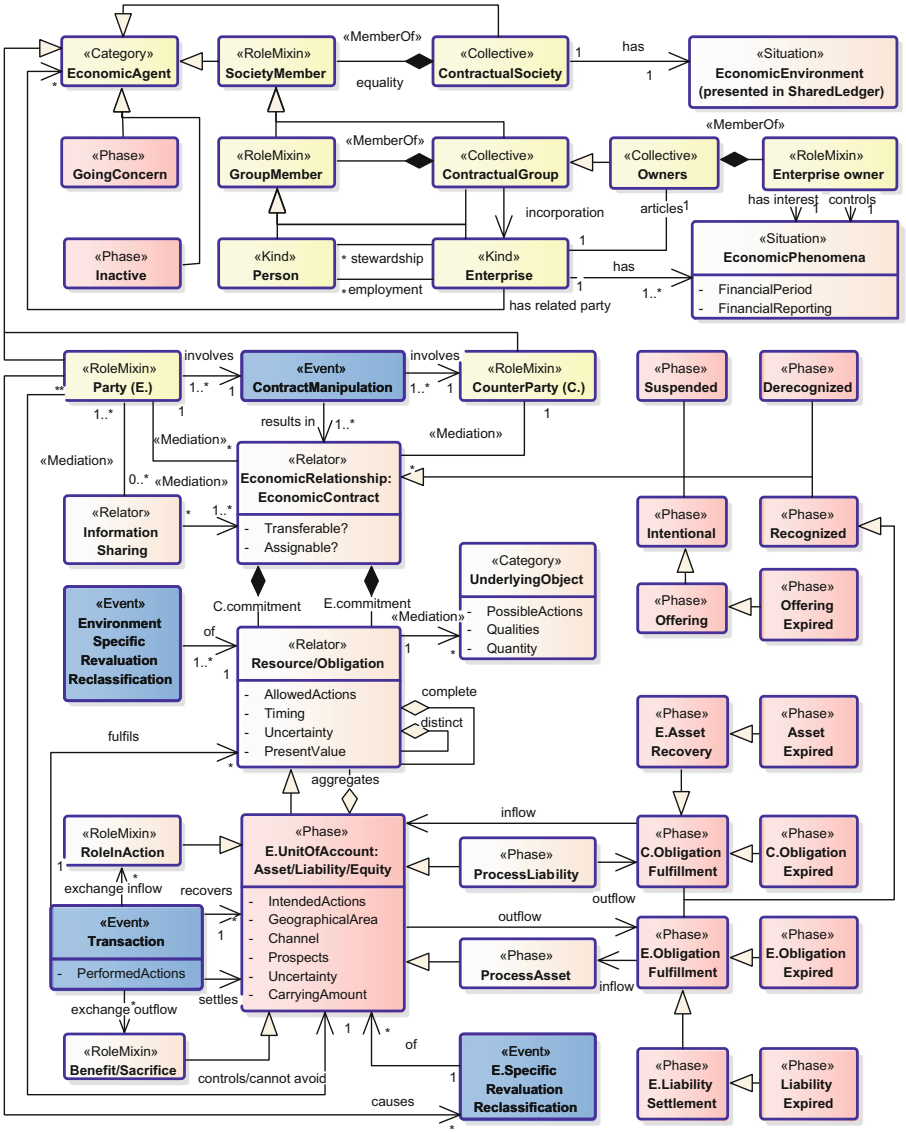

Fig. 1. An OntoUML diagram of COFRIS economic agents (in yellow), relations (in beige), phases (in pink), and events (in blue). (Color figure online)

COFRIS term	COFRIS concept and relation definitions	UFO pattern	IASB[2]
Financial reporting (FR)	provides information relevant to investors about the reporting enterprise's economic phenomena - relationships with economic agents and the changes of those relationships.	Normative description [3]	CF[1]
Reporting period	is used to decompose the changes of the whole as separate one-period flows.	Time period [9]	CF[1]
Economic agent:	is a category of persons and enterprises, contractual groups of people and enterprises, or the society at large. Economic agents are capable of committing and fulfilling economic actions.	Social, Human agent [3]	CF[1]
Enterprise	(subject of FR), is an incorporated contractual group with some inherent goals, An enterprise has control to actions upon economic resources to attain its goals and fulfill its obligations.	Institutional agent [3]	CF[1] IFRS 3
Enterprise owner	controls or has a non-controlling interest in an enterprise as per the articles contract.	Social role [3]	IAS 1
Economic relationship:	is a relational entity existentially dependent on economic agents playing the roles of the party and the counterparty and having commitments/claims quantified in monetary terms, regarding some underlying object. These commitments/claims are: individual/mutual intentions; or enforceable by society: obligations [duties]/rights of a party against a counterparty; or rights of a party against all economic agents [permissions].	Social, Legal relator, Entitlement and Burden/Lack [3, 4]	CF[1]
Timing	is a condition indicating when the resources are to be used/obligations fulfilled.	Events [7]	IAS 39
Present value	is a price that exists independent from the enterprise, and is used as a measurement unit for FR	Value [6]	IFRS13
Resource	is a right that has the disposition to produce economic benefits. The allowed (by law, contract or nature) rights prescribe permissions of economic agents to use economic resources.	Resource, Disposition [5]	CF[1]
Obligation:	is an action to which an economic agent is legally or constructively bound.	Duty [4]	CF[1]
Distinct obligation	fulfillment creates a distinct liability of the counterpary and revenue recognition for the party.		IFRS
Complete obligation	fulfillment creates an unconditional right of the party, a complete liability of the counterparty.		
Underlying object	is a physical or intellectual object; or amount of matter, including human and natural environment energy; or an obligation/right/both (eg, to exchange) for another underlying object.	Endurant [5]	CF[1]
Unit of account:	is a group of recognized by an enterprise enforceable/constructive [net] rights/obligations/ both, classified by their intended use and valuation, with assessed uncertainty and impairment.	Resource [5]	CF[1]
Carrying amount	depicts account value after deducting any accumulated depreciation and impairment losses	Value [6]	CF[1]
Uncertainty	of receiving economic benefits. Assessed through provisions and mitigated by hedging.	Disposition [5]	IFRS 9
Intended actions (Function)	refers to the primary actions and assets and liabilities used in those actions in which an enterprise is engaged and capable, eg, selling goods/services, manufacturing, or administration.	Resource, Capability [5]	CF[1]
Role in an action (Nature)	refers to the economic characteristics or attributes that distinguish assets and liabilities used in actions that do not respond similarly to similar economic events, e.g., raw materials, labour.		CF[1]
Benefit/Sacrifice	refers to the outcome form of intended or performed action, which increases/decreases equity.		
Asset	is a present economic resource controlled by the enterprise as a result of past events.		
Liability/Equity	is a present obligation of the enterprise to transfer a resource as a result of past events.	Duty [4]	
Correlative association	If one party has an obligation to transfer an economic resource (a liability), it follows that another party (or parties) has a right to receive that economic resource (an asset).	Correlative association [4]	
Economic event:	is an economic exchange (manifestation of disposition that inhere in economic relationship) or other event in environment and society, that affects economic relationships.	Events [7]	CF[1]
Contract manipulation	includes offer, inception, modification, [un]suspension and cancellation events.	Communicative act [7]	IFRS 15
Revaluation	of economic relationship due to changes in the environment.or enterprise		IFRS 9
Reclassification	of economic relationship due to changes in the environment or enterprise intended actions.		
Economic exchange	deploys one economic relationship to obtain another for a gain in value for an enterprise. Contains two opposite processes of partial, distinct and complete transfer.	Interaction [7] Exchange [11]	IFRS 9, 15-17
Impairment [loss]	is a condition that exists when the carrying amount exceeds the present value.		IAS 36
Economic contract	establishes a right and an obligation to exchange economic resources. In a contract, a party has a commitment to transfer some resource/obligation to the counterparty in exchange for a claim to receive another resource/obligation. The contract progresses in phases manifested by economic events and the effects of these events become parts of the contract.	Service contract relator [4], [11]	IFRS 9, 15-17
Relator Phase Contract phases:	models the evolution of an instance's membership in a type along its lifecycle and generally includes four phases: *intended* (scheduled), *recognized* (active), *suspended*, *derecognized*	Social Phase [3] Relation Stat.[8]	CF[1]
Offering phase	is formed by a contract offer event as a meta-commitment by a provider to a customer, to exchange. The offering may further enter into the *negotiation* phase or become *expired*.	Offering [7], [11]	IFRS 15
Obligation fulfillment phase	starts with the inception of the contract, includes enterprise/counterparty transfers creating process assets/liabilities and ends with the fulfillment of their respective obligations.	Delivery [7], [11]	
Liability settlement phase	starts when the enterprise/counterparty/obligations are fulfilled and reciprocal liability is accrued and ends when liability is settled or expired.		
Asset recovery phase	starts when the enterprise/counterparty obligations/liabilities are fulfilled/settled and assets are received and ends when asset is recovered or expired.		

Fig. 2. COFRIS terms and definitions with related UFO patterns and IFRS standards.

3 Conclusions

Financial reporting standard setting, implementation and the corresponding information system development at present is a partially informal and long process and, as exemplified by other domains, may be improved using ontological conceptual modeling approaches. Existing foundational and core ontologies, as showed by UFO ontology network usage, provide upper level patterns for representing FR concepts and relationships.

Contract economic relationships as dispositions of economic exchange events, creating new or progressing existing contract lifecycle, is a fundamental and reuse facilitating pattern of capturing economic phenomena for FR. Based on this exchange pattern it is possible to extract patterns from particular standards to facilitate reuse. Ontological analysis allows for explication of the core contract phases and exchange types to capture full partition of the economic phenomena usable for FR. Introducing event reification per [9] should release income/expenses elements of FR from semantic overloading and unify FR concepts for performance statements and notes.

Aligning FR concepts with UFO allows for understanding the FR concepts meaning and classification in the enterprise domain, as for instance, the economic resource and asset definitions. Elaboration of correlative associations between enterprise and counterparty may lay a foundation for consensus based accounting in shared ledger environment.

Further, a full validation of COFRIS by modeling all IFRS standards is needed, including solving the ontology version transition problem.

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