Ontological approach to the normative dimension of organizations: an application of Documents Acts Ontology

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ABSTRACT

Modeling and knowledge representation are indispensable activities for developing information systems in the scope of modern corporations. In order to accomplish these activities, one should analyze a corporation both in terms of its physical structure and in terms its rules structure. The former we call here the descriptive dimension and the later prescriptive dimension. In this paper, we briefly discuss the descriptive dimension, and focus on the prescriptive dimension to explain the rights and obligations that corporations have to manage. After presenting background theories, we analyze the corporation through ontological principles taking advantage of theories of the so-called social ontology, namely, social acts, speech acts and document acts theory. The relevance of developing such analysis rests on the possibility of outlining a strong understanding of corporations by characterizing the nature of rights and duties obligations connected to corporative processes using Basic Formal Ontology (BFO) and Documents Acts (D-acts) Ontology. In doing this, we introduce a formal framework suitable to be applied in information systems working in the context of modern technologies like the Semantic Web.

Keywords: Corporations. Knowledge representation. Ontology. Social ontology. Document Acts.

Abordagem ontológica à dimensão normativa das corporações: uma aplicação da Ontologia Atos dos Documentos

RESUMO

Modelagem e representação do conhecimento são atividades indispensáveis para o desenvolvimento de sistemas de informação nas corporações modernas. Para executar essas atividades, é preciso analisar a corporação tanto em termos de sua estrutura física quanto em termos de sua estrutura de regras. O primeiro caso é aqui denominado dimensão descritiva, e o segundo caso dimensão prescritiva. Neste artigo, aborda-se brevemente a dimensão descritiva, enfatizando a dimensão prescritiva para explicar os direitos e as obrigações que as corporações devem gerenciar. Após apresentar um background de teorias necessárias para o entendimento, analisa-se a corporação através de princípios ontológicos, a partir das teorias da assim chamada ontologia do social, em particular, atos sociais, atos da fala e atos dos documentos. A relevância em desenvolver tal análise diz respeito à possibilidade de melhor entendimento das corporações ao se caracterizar a natureza dos direitos e das obrigações ligadas aos processos corporativos usando a Basic Formal Ontology (BFO) e a Document Acts (D-acts) Ontology. Assim, introduz-se um esquema formal adequado para aplicação em sistemas de informação no escopo de modernas tecnologias como a Web Semântica.

Palavras-chave: Corporações. Representação do conhecimento. Ontologia. Ontologia do social. Atos dos Documentos.

Enfoque ontológico a la dimensión normativa de las corporaciones: una aplicación de la Ontología Actos de Documentos

RESUMEN

Modelaje y representación del conocimiento son actividades indispensables para el desarrollo de sistemas de información en las corporaciones modernas. Para ejecutar esas actividades, es preciso analizar la corporación tanto en términos de su estructura física como también en términos de su estructura de reglas. El primer caso es aquí denominado dimensión descriptiva y el segundo caso dimensión prescriptiva. En ese artículo, se aborda brevemente la dimensión descriptiva, enfatizando la dimensión prescriptiva para explicar los derechos y las obligaciones que las corporaciones deben gestionar. Después de presentar un background de teorías necesarias para el entendimiento, se analiza la corporación a través de principios ontológicos, a partir de las teorías de la así llamada ontología de lo social, en particular, actos sociales, actos del habla y actos de los documentos. La relevancia en desarrollar tal análisis se refiere a la posibilidad de un mejor entendimiento de las corporaciones al caracterizarse la naturaleza de los derechos y de las obligaciones ligadas a los procesos corporativos usando a Basic Formal Ontology (BFO) y la Document Acts (D-acts) Ontology. De esa forma, se introduce un esquema formal adecuado para aplicación en sistemas de información en el ámbito de modernas tecnologías como la Web Semántica.

Palabras clave: Corporaciones. Representación del conocimiento. Ontología. Ontología social. Actos de Documentos.

INTRODUCTION

In order to overcome issues of modeling and knowledge representation, ontologies have received more and more attention for the purpose of developing well-founded models for information systems (SMITH, 2003; GUIZZARDI, 2005; FONSECA, 2011).

Ontology is a term originated in Philosophy and it is now also used to denote a structure in form of an inverted tree, composed by entities and respective relations, used for purposes of knowledge representation. In the ontology development community, in particular in the healthcare arena, there still exists a debate about the nature of organizations, such as corporations. The team developing the Ontology for Biomedical Investigations (BANDROWSKI et al., 2016) defines corporation as:

> An entity that can bear roles, has members, and has a set of organization rules. Members of organizations are either organizations themselves or individual people. Members can bear specific organization member roles that are determined in the organization rules. The organization rules also determine how decisions are made on behalf of the organization by the organization members.[1]

The creators of OBI comment:

> It [the definition] leaves open if an organization is a material entity or a dependent continuant, as no consensus was reached on that. [...] It is debatable what the organization itself is (some kind of dependent continuant or an aggregate of people). [...] favorite is still to define organization as a kind of 'legal entity '[…].'' [2]

This paper presents results of an on-going investigation of how corporations should be representing following the ontological principles of the Basic Formal Ontology (BFO) (SMITH, 2015).

In order to reach our purposes, we present a background section that consists of two parts: first, we present a historical overview describing several theories concerning the nature of corporation; second, we present background information about

BFO and its extensions such as the Document-acts Ontology (d-acts) (BROCHHAUSEN; ALMEIDA; SLAUGHTER, 2013), which are the starting points of our ontological analysis. After the background section, we briefly describe the descriptive dimension of corporations, addressing their structure and their units.

The focus of this paper is the representation of normative lattice that holds the corporation together. We are analyzing the corporation from the point of view of their claims, duties and obligations that exist within itself and which are support its existence. To address the normative perspective, we use pre-existing social ontology approaches, including theories of social acts (REINACH, 2012), speech acts (SEARLE, 1969) and document acts (SMITH, 2012).

The relevance of this analysis rests on the possibility of improving the understanding of corporations by a better understanding the activities that take place within them that are based on the normative backbone of the organization. The resulting framework can be applied in the context of Semantic Web Technologies to implement computer-parsable representations that can contribute to a higher level of automation in managing information about corporations.

BACKGROUND: THE NATURE OF CORPORATIONS

In this section, we present a brief summary of the theory of corporations from the history of Law and Economics. These two fields are generally considered the authoritative sources for defining corporations. Considering these theories is useful to understand the ontological commitment of each one of them.

THE NATURE OF THE CORPORATION IN LAW THEORIES

Corporations are a product of Roman law. Ancient Rome had already elaborated the notion of corporation including most of the legal attributes one can find in modern corporations. Thus, a substantial understanding of the nature

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[1] Retrieved August 23, 2017 from: http://www.ontobee.org/ontology/OBI?iri=http://purl.obolibrary.org/obo/OBI_0000245
[2] Retrieved August 23, 2017 from: http://www.ontobee.org/ontology/OBI?iri=http://purl.obolibrary.org/obo/OBI_0000245

of corporations had already existed when the first English business corporations were chartered in the 15th century (WILLISTON, 1888).

Within the English legal system, a corporation had the following core attributes: i) it is a legal unit with its own legal rights and responsibilities; ii) it is distinct from the individuals who are members constituting it over time; iii) it is a creation of law and may achieve legal status by an act of the state. These core attributes, plus some additions, were applied in the United States assigning the corporation with the following legal attributes: i) it can contract, sue and be sued; ii) it can acquire and dispose of property; iii) it has its own seal by which it could act as a body distinct from its members; iv) its shares are transferable; v) its membership may change without affecting its perpetual existence; vi) it cannot commit treason; and, vii) it cannot serve as a trustee (BLACKSTONE, 2016).

The classical formulation of this set of attributes has been referred to as the "artificial person" view of corporations, which is merely one amidst several theories that explain the notion of corporate personality (DEWEY, 1926; KOESSLER, 1949; BLUMBERG,1993; BLUMBERG, GEORGAKOPOULOS, STRASSER, GOUVIN, 2004; MALCOLM, 1994; PETRIN, 2014). In this view, which was considered to be the orthodox view at least until the beginning of the 20th Century, corporations are intangible legal entities that have personality, but a personality different from the personality of their members (MACHEN, 1911).

To a great extent, the Anglo-American world has maintained that corporations must be treated as persons. The extension of rights and obligations from a natural person to a corporation actually arose from the interpretation of the word "person", for example, in the American Constitution (DEWEY, 1926). However, in countries like France, Germany and Italy there was great debate that yielded a set of heterogeneous theories, for example (MACHEN,1911): *Fiction Theory, Concession Theory, Group Personality Theory* or *Realist Sociological Theory, The Bracket Theory* or *Symbolist*

Theory, Purpose Theory or *Theory of Zweckvermögen, Hohfeld's Theory,* and *Kelsen's Theory*. We present a brief description of the tenets of each theory according to MACHEN (1911), DEWEY (1926) and KOESSLER (1949).

The *Fiction Theory* – introduced by *Savigny* – discusses who would be the real owner of a property considering that property, according to the law, may belong to a corporation. As a corporation is not a natural person, the solution is to create a sort of *fictitious person*, which is the owner of the corporate property. The corporation was considered a creation of law having no existence apart from its individual members, and whose acts are attributed to the corporate entity (MACHEN, 1911; KOESSLER, 1949).

Contrary to that the *Concession Theory* – advanced by *Savigny, Dicey* and *Salmond* – asserts that corporations do have not have legal personality. While Fiction Theory ultimately is based on the philosophical position suggesting that a corporation is a thing of the intellect, the Concession Theory focuses alone on the source of its legal power. In fact concession theory is indifferent to questions of reality, and states that a juridical person is merely a concession by a state or a legal system (DEWEY, 1926).

Real Entity Theory, also called *Group Theory* or *Realist Sociological Theory* – introduced by *Althusius* and *Gierke* – was focused on sociological facts. According to their supporters, collective groups (as corporations) have a real mind, a real will and a real ability to action. Thus, the existence of a corporation is not based on any fiction or in any merely mental entity. A corporation actually is a social organism, which is different from biological organisms in regards to the fact that it does not have the power to reproduce (MACHEN, 1911; DEWEY, 1926).

Associational Theory, also *Bracket Theory* or *Symbolist Theory* – propounded by *von Jhering* and others – suggests that the juristic corporate personality is only a symbol employed to facilitate the work of what Machen (1911) called "corporate bodies". On the one hand, this theory follows the Fiction

Theory in maintaining that the existence of a corporation is a fiction, a metaphor; on the other hand, it states that the corporate personality is not created by the state because it actually does not exist. In other words, the corporation is solely an abbreviated form to represent people that are member of that kind of collective (MACHEN, 1911).

Purpose Theory, also *Theory of Zweckvermögen* – created by *Bekker* and *von Brinz* – is a variant of the Fiction Theory that explaines ownership in charitable corporations (MACHEN, 1911). It considers a corporation as a fictitious entity, but focusing on the purpose of those who manage the property instead of focusing on the ownership of property by an object (KOESSLER, 1949).

THE NATURE OF THE CORPORATION IN ECONOMIC THEORIES

The field of Economics has a special interest in defining corporations, since these entities involve many aspects of the society and play a central role in economic analysis. In this section, we present a brief description of the tenets of individual economic theories about corporations.

Iwai (2001) states that within the economic context, in the simplest perspective, individuals (natural persons) are subjects of property rights and things are objects of property rights, that is, individuals own things and things are owned by individuals. However, there are cases in which a group of individuals act as partners and owns the assets jointly. These partnerships then enter in several contractual relations with other parties, like employees, suppliers, customers, etc., in order to perform activities and reach their goals. In this scenario, whenever there is either a new partner admitted or a partner withdrawing from the partnership, the original contractual relations no longer portray the actual situation. Thus, the number of contractual relation grows at same time that corporation grows, and transactions costs can be high (Fig.1). (IWAI, 2001)

Figure 1 – Contractual relations between the corporation and outside parts
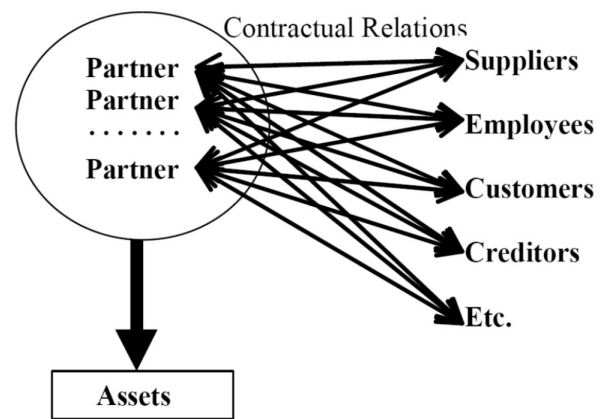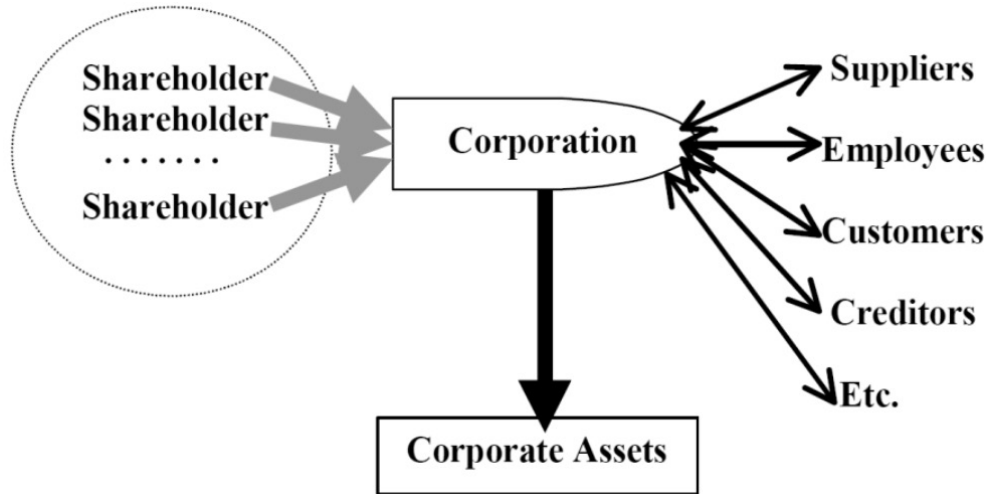

Source: Iwai (2001)

The corporation is a solution for the existence of these multiple contractual relations. When a group of individuals creates a corporation, it also creates an "additional individual" that has the same legal capacity to own real assets as the partners themselves have (Figure 2). Outside parties enter into a contract with this additional individual, independently of the actual partners or their number (IWAI, 2001).

According to Iwai (2001), in seeking to understand the nature of corporation in this context, one needs to understand the ownership relation. Here an additional potential quandary arises. Corporations seem play a dual role with respect to the ownership relation: they can act as individuals, that is, as legal subjects; they can act as thing, that is, as legal objects. The corporation (as an individual) owns its assets and it is owned (as thing) by shareholders. In the former case, it acts legally as a person; in the latter, it acts legally as a thing (IWAI, 2001).

BACKGROUND: ONTOLOGY OF SOCIAL ENTITIES

In his section be provide background information on pre-existing ontology resources. In the first sub-section 3.1 we introduce basics of ontologies in computer and information science, BFO as our top-level ontology and some complementary principles; and in the second sub-section 3.2 we discuss essentials of the social ontology.

Figure 2 – Corporation as a device to simplify outside relations

Source: Iwai (2001)

INTRODUCING OF ONTOLOGIES AND BASIC FORMAL ONTOLOGY (BFO)

Ontology is a term with several different meanings in different scientific fields, such as Philosophy, Computer Science, and Library & Information Science. In *Philosophy*, ontology is a branch of Metaphysics, which includes the study of existence, identity, change over time, dependency, qualities, and so forth (SMITH,2003). The term "social ontology" refers to the ontology of human social devices, for example, money, property, governments, nations, marriages and so forth (SEARLE, 2010).

In *computer* and *information science,* two uses for the term ontology are most important: i) the use of ontological principles to understand and represent reality as support to modeling activities (WAND; WEBER, 1990); ii) the representation of a knowledge domain through a formal language to be processed by automatic reasoners (STAAB; STUDER, 2004).

Top-level ontologies are artefacts of the second kind. They are category systems for knowledge representation that have been developed to meet specific goals concerning to information modeling, automatic reasoning and information retrieval (HOEHNDORF, 2010). Examples of top-level ontologies are the *Descriptive Ontology for Linguistic*

and Cognitive Engineering (DOLCE) ((GANGEMI et al, 2002); and Basic Formal Ontology (BFO) (GRENON; SMITH; GOLDBERG, 2002).

In this paper we focus on using BFO to model social entities relevant to corporations. BFO is following the principles of *ontological realism* (SMITH; CEUSTERS; 2010) and has shown a lot of promise and uptake lately. As a top-level ontology, BFO intends both to represent the most generic categories and to provide means of categorizing entities in a knowledge representation (SPEAR, 2006). BFO has a large acceptance in domains like medicine, biology, bioinformatics and related fields, law, geography, to mention a few.

BFO consists of a taxonomy that provides a categorization of the entities existing in the world and it thus, provides an account of reality (Fig.3). Consequently, the root node of BFO´s taxonomy is "entity".

The second level introduces the major distinction underlying BFO: the distinction of entities into *continuants* and *occurrents*. Continuants are those entities which exist self-identical through time and which undergo changes. Occurents only exist in their successive temporal parts (GRENON & SMITH, 2004). The full framework of BFO is describe in detail in Arp, Smith; Spear (2015).

Figure 3 – BFO top−level ontology, its levels and categories
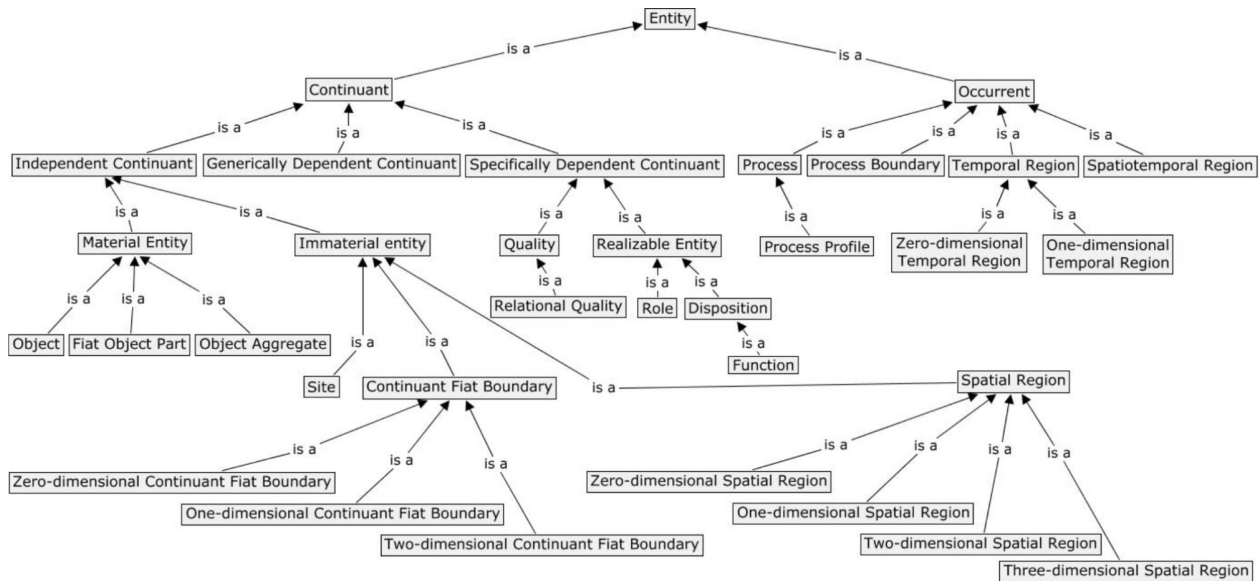
Source: Smith et al. (2015)

In addition to top-level ontologies, a variety of formal frameworks is available for creating and testing ontological representations (SMITH, 2003).

Mereology use two sets of principles to explain the relations between parts and wholes: i) *principles of decomposition*, which take one from a whole to its parts; and ii) *principles of composition*, which take one from the parts to the whole (SIMONS, 1987). A relevant property of mereology is *extensionality*, which ensures that: i) entities are completely defined by their parts; and ii) no composite objects with the same proper parts can be distinguished (VARZI,1996). The principle of extensionality is important when explaining the descriptive dimension of a corporation.

The Theory of Granular partitions deals with granular partitions, which are cognitive devices that people employ to label or sort activities. Examples are lists, hierarchies, classifications and so forth (BITTNER; SMITH, 2008). Within the context of granular partitions, an object is anything that exists and that can be recognized by some unit of partition. Objects can be either *bona fide objects* or *fiat objects*: while the former exists independently of human demarcating activities, the latter exists only because

of the very same activities. Indeed, partition units can recognize fiat objects from limits based on human cognition, and fiat objects are created through the projection of partitions in a portion of reality (SMITH, 2001).

ESSENTIALS OF SOCIAL ONTOLOGY: SOCIAL ACTS, DOCUMENT ACTS AND THEIR IMPLEMENTATION IN ONTOLOGIES

In order to explain the normative dimension of analysis, we need to introduce key components of social ontology, namely: *social acts*; *speech acts, document-acts* and Document Act Ontology (SEARLE, 1969; 1976; SEARLE, 1983; SEARLE, 1984; SEARLE, 2002; SMITH 2012; BROCHHAUSEN, ALMEIDA, SLAUGHTER, 2013). Historically, the ontological analysis of legal acts and legal entities has paved the way to social ontologies.

An ontological theory explaining social acts, spoken or written, was first advanced by *Reinach* (SMITH, 2012) in his work focused on the phenomenological analysis of civil law. In his analysis, Reinach starts out from *spontaneous acts*: the set of experiences a person may have, in which, in addition, the very

same person has an active participation. Indeed, some experiences require the existence of a subject of reference and Reinach called them *non-self-directable*. One specific subtype of those acts are acts that in addition to refering to another subject, have to be perceived by the very same subject. Acts that need to be perceived are then called *social acts*, actually, acts with intentional roots (MULLIGAN, 1987). Both *speech acts* and *document acts* are subtypes of social acts.

The *Theory of Speech Acts* was originally proposed by *Austin.* Speech Acts Theory proposes that the elementary units to understand human communication are speech acts (MULLIGAN, 1987). A speech act is the basic unit of meaning, constituted by three connected dimensions: *locutionary acts, illocutionary acts* and *perlocutionary acts*. We do not need to plan going into more detail here Further examples can be found in Morris (2007).

Searle consolidated Austin's approach to a general Theory of Speech Acts by providing a theoretical framework that gathered together the three dimensions involved in speech acts. Searle distinguishes "brute force facts", basically, the facts of the natural science; from the so-called "institutional facts", which are created through language. Thus, there is a difference between observer-independent features, for example mass and gravitational attraction; and observer-dependent features, for example money and property, which are examples of institutions in Searle's sense. Searle describes and analysis some of those entities – powers, functions, acts, events, states, properties, and relations – that do not belong to the realm of brute physical reality, but rather to the realm of institutions. Through these entities, people are able to bring into existence entities of the social reality (SMITH, 2003).

One issue regarding the speech acts is its evanescence, a result of its inherent orality. This makes the possible range of effect of a speech act temporally and regionally constrained. To overcome this limitation Smith extended speech act theory to the *Theory of Document Acts* (SMITH, 2012). Indeed, a speech act exists only in the moment of

its performance; documents, on the other hand, are continuant entities able to persist in time while absorbing modifications through its history.

A theory of document acts explains how people and organizations make use of documents to bring about social entities, such as social roles. Documents here do not serve only to document information, through their involvement in a document act they also have social and institutional (ethical, legal) powers, contributing to bring about a variety effects, which have made possible new types of social institutions. Examples of this kind of documents are contracts, statutes of incorporation, deeds, patents, statements of accounts, marriage licenses, stock certificates, diplomas, registrations of baptism, insurance certificates, and so forth. In addition, the theory document of acts involves what humans do with documents, for example: signing, stamping, depositing in registries, filling in, registering, conveying, validating, attaching, to mention a few. Documents, in this context, play an essential role in social interactions, and in human daily activities (SMITH, 2012; SMITH, 2014).

Document Acts Theory is operationalized through the aforementioned Document Act Ontology (d-acts). This ontology reuses pre-existing ontologies developed on the basis of the *Open Biological and Biomedical Ontologies* (OBO) *Foundry principles* (SMITH et al., 2007). The basic representations of information artifacts is reused from the *Information Artifact Ontology* (IAO)[3]. Besides IAO, we imported selected classes and object properties from *Ontology of Biomedical Investigations*[4] (BANDROWSKI (2016), *National Center for Biotechnology Information (NCBI) Taxonomy*[5] (NCBI, 2016) and the *Ontology of Medically Related Social Entities* (OMRSE)[6] (HICKS; HANNA; WELSH; HOGAN, 2016).

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[3] Retrieved July 4, 2012 https://bioportal.bioontology.org/ontologies/IAO

[4] Retrieved July 4, 2012, from http://www.berkeleybop.org/ontologies/oboall/obi/obi.owl

[5] Retrieved July 4, 2012, from http://www.berkeleybop.org/ontologies/oboall/ncbi_taxonomy/ncbi_taxonomy.owl

[6] Retrieved July 4, 2012, from http://www.berkeleybop.org/ontologies/oboall/omrse/omrse.owl

ONTOLOGICAL ANALYSIS OF CORPORATIONS

After we presented the legal and historical context (section called "Background: the nature of corporation") and some background regarding ontologies and social ontologies (section called "Background: ontology of social entities"), we are now ready to introduce the ontological analysis of corporations. The next sub-section briefly explains the descriptive dimension, and the last subsection of this section describes the prescriptive dimension.

THE DESCRIPTIVE DIMENSION

In this section, we briefly discuss the descriptive dimension of the corporation, since our focus rests on the prescriptive dimension. We describe how the corporation can be divided in units and subunits in the scope of BFO. In the remaining of this section, we present a brief description of the tenets of each theory according to Smith (2016) and Vizenor (2006).

Corporations have some relevant features: i) they do not depend on other entities except constitutive entities; ii) they remain numerically one and the same over time; iii) they are composed by their members. Thus, corporations have some features in common with BFO's independent continuants, which are characterized by the presence of all their parts at any time, and by the fact that their existence does not depend on any other discrete entity. In order to understand a corporation and its divisions, we need to use the partitive principles (presented before in the background section). So, what kind of whole a corporation would be? *Summative wholes* are exhaustively defined by their constituent parts. According to the principle of mereological extensionality, objects with the same parts are equal. However, this notion does not conform to the intuitive notion that corporations preserve identity even undergoing changes in membership. *Integral wholes*, on the other hand, have strong structural connections among their parts, differently of corporations, which are not maximally connected like, for example, organisms. Finally, *aggregates* are not defined in terms of their own elements.

Otherwise, they have detached parts that integral wholes do not have. As corporations have members linked together (persons, units, for example), one can acknowledge that corporations are kinds of aggregates: they are material entities consisting exactly of a plurality of objects, and these objects are member-parts of them all times at which they exist (SMITH, 2016).

In order to divide a corporation in units and sub-units, we make use of partitive theories (presented before in the background section). Mereology deals with material entities and does not seem to be the best framework to explain corporations and its units. It is hard to believe that the relation between a corporation and its members is a part-whole relation, insofar as in mereology, the part-whole relation is transitive. Accordingly, one might say inconsistent statements, for example: if John is part of a corporation, any part of John as for example his eyes or his mouth, are also part of the corporation. In addition, mereology cannot account the fact that a corporation preserves its identity over time even when it loses or gain members.

The Granular Partitions theory, on the contrary, employ cognitive devices to show how people divide the world. It relies on the distinction between bona fide objects and fiat objects, as mentioned before: bona fide objects exist independently of human subdividing activity; and fiat objects exist only because of the very same subdividing activity. Using the Granular Partitions theory – namely, Theory A – one can define units, sub-units (or cells and sub-cells), as well as the relation between unit/subunit (or cell/sub-cell). Likewise, using the Granular Partitions theory – namely, Theory B – one can define the projection relation that holds from a cell to the reality; and the location relation that holds from an object to a cell (SMITH, 2016; VIZENOR, 2006).

Finally, we assume here that, in the scope of BFO, a corporation is an independent continuant, a kind of aggregate. However, a colony of ants or herd of antelopes can be classified as an aggregate. What are the differences between a corporation as an aggregate and the other examples? What distinguishes a corporation from other kinds of aggregates? To answer this question, we need to approach the normative dimension of corporations.

THE PRESCRIPTIVE DIMENSION

If corporate units (descriptive dimension) are *fiat* objects, one can ask: how does a *fiat* object come to existence? A *fiat* object comes to existence through the human cognition, which can create a mental partition, for example, delimiting a corporate unit. Considering that corporations are long-lasting entities, how a fiat object is sustained in existence? (SMITH, 2016). Here, we are approaching the realm of the social ontology: to explain the verbal form, we use the *Theory of Speech Acts* (AUSTIN, 1975; SEARLE, 2010); to explain the written form we use the *Theory of Document Acts* (SMITH, 2012).

The Document Acts theory, which is crucial to represent traceable duties, obligations and responsibilities, for example within a corporation,n can be related to BFO through the *d-acts* (BROCHHAUSEN; ALMEIDA; SLAUGHTER, 2013). d-acts incorporates the kinds of acts present in the document act theory, namely: *social acts, deontic declarations, document acts, and standing declarations*. We start our explanation from the notion of *social act* and continue its subtypes, in d-acts[7].

A *social act* is a process that is carried out by a conscious being or an aggregate of conscious beings. It is spontaneous, directed towards another conscious being or another aggregate of conscious beings, and that needs to be perceived. The term "spontaneous" is used in the following meaning of being self-generated and it does not stand in contrast to being planned.

Examples of social acts are: Colonel Klink giving Sergeant Schultz an order; Jake promising Jill to take her to the junior prom.
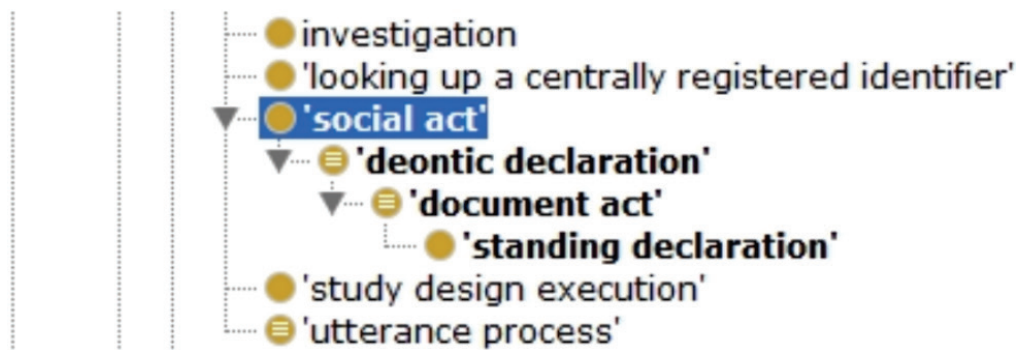
A *social act* is a process that is carried out by a conscious being or an aggregate of conscious beings. It is spontaneous, directed towards another conscious being or another aggregate of conscious beings, and that needs to be perceived. The term "spontaneous" is used in the following meaning of being self-generated and it does not stand in contrast to being planned. Examples of social acts are: Colonel Klink giving Sergeant Schultz an order; Jake promising Jill to take her to the junior prom.

A *deontic declaration* is a social act that brings about, transfers or revokes a socio-legal entity. Declarations do not depend on words spoken or written, but sometimes are they merely actions, for instance the signing of a document. Deontic declarations express what ought to be, for example, a promise is a declaration of how things ought to be. They can either create or remove social entities in reality: a promise creates both an obligation of one person and a claim of another person; but a declaration can also revoke a social entity, such as an order or an obligation. Examples of deontic declarations are: my consenting verbally to buy a used TV set for $ 500; John Robbie's taking of Mrs. Steven's jewels; Jane Doe's revoking of informed consent over the phone; John Doe signing an employment contract.

Figure 4 – Main classes of D-acts ontology

Source: D-acts ontology

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7 http://purl.obolibrary.org/obo/iao/d-acts.owl

A *document act* is a social act creating, revoking or transferring a socio-legal entity by validating (signing, stamping, publishing) a document. Examples of document acts are: my filling in an immigration form; a judge's signing and stamping a court order. Finally, a *standing declaration* is a document act that postulates a socio-legal fact for a specified group of people or organizations. An example is in the case of the promise from the Chief Cashier of the Bank of England 'to pay the bearer on demand the sum of £5' that is printed on each £5 note.

Figure 5 - presents an example of using d-acts Ontology. In such example, we represent a promotion process in a corporation: Maria has received a promotion, but her hospital privileges and her obligation to communicate with the department supervisor remains unchanged.

DISCUSSION

The prescriptive (normative) dimension of analysis presented before still present the necessity of further research and discussion. At this moment, we raise some speculations that admittedly need to be properly verified in future works. One speculation regards the relevance of corporative documents and document acts for charactering corporations and kinds of corporations.

We believe that one can characterize the kind of corporation through both the documents that serve as inputs to document acts and the kinds of the very same document acts. We survey some theoretical evidences, coming from philosophers and researchers, for our premise that corporations are distinguished by documents they produce and use (ALMEIDA, 2016).

Figure 5 – Example of using D-acts

Image credit: J. Neil Otte, University at Buffalo (SUNY)

Practices and resources regarded documents reveal how one does organization of information within a corporation. The way one structures documents imposes certain kinds of administration to employees and eventually create indexes of how the corporation is managed. Indeed, documents are both the means and the results of a continuous process of notation, summarization, and information dissemination that aims to construct a depiction of what happens in the corporate environment (LEDEMA, 2013).

The ubiquity of documents in our society is also described in a theory called *documentality*, according to which "there is nothing social outside the text (FERRARIS, 2012)". According to this theory, since nothing social exists outside the text, society is based on the registrations in documents, and this very act of registering is the condition for creating social objects. Thus, documents constitute the fundamental ingredient of the social world (FERRARIS, 2012).

Indeed, documents are important to explain society, and social relations, for example, those ones produced and manipulated within a corporation. As society became more and more complex, "the mnemonic powers of individuals have been extended prosthetically through documents in ways which have given rise to a variety of novel artifacts of social reality" (SMITH, 2014, p. 5).

So, we also say that one could identify the kind of corporation through the kinds of document acts performed. Our speculation is that, in identifying the kinds of D-acts that a document contains or generates may provide clues to formally distinguish a corporation from other ones.

FINAL REMARKS

In this paper, we presented the preliminary foundations of an ontological representation for corporations. One might say that we briefly approach the ontological status of corporations both in describing historical theories regarding the nature of corporations to identify their ontological commitments, and in dividing our task in two dimensions, namely, descriptive and prescriptive. However, to fully define the ontological status of corporation is a complex task beyond the purposes of the paper.

We choose to focus the prescriptive (normative) dimension of the corporation and carried out our research using well-founded theories – formal ontology, speech acts, document acts – in the hope to offer a solid framework to analyze corporations.

As our final remarks, we would like to emphasize the connection among the different representations existing throughout our ontological analysis for purposes of formalization and application in the modern information systems. One can realize that both the reality and different levels of representations of it – partitions, speech acts, d-acts – can be mapped to BFO, a transcategorial formal top-level ontology. The relevance of such analysis rests on the need of a better understanding of corporations, as well as the advantages of a formal framework to be applied in information systems working in the context Semantic Web.

As future works, we plan to overcome some limitations of the present stage of our on-going research. We need to consider the myriad of kinds of existent corporations: third sector, churches, clubs, commercial associations, public companies and so forth. Here, for the sake of simplicity, we privilege to choose the standard commercial corporations with two or more partners. Also, something that can be approached in future papers is the classification or organization of the deontic powers involved in claims and obligations that d-acts represents. Finally, we need to evaluate how modern theories were influenced by old theories about the nature of the corporation.

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