Social Participation Ontology: community documentation, enhancements and use examples

Renato Fabbri,[1, a)] Henrique Parra Parra Filho,[b)] Rodrigo Bandeira de Luna,[c)] and Ricardo Augusto Poppi Martins[d)]
Instituto de Física de São Carlos, Universidade de São Paulo (IFSC/USP)

(Dated: 10 January 2015)

Participatory democracy advances in virtually all governments. South America presents a prominent context with mixed culture and social predisposition. In 2012, civil, academic and governmental parties started elaborating the "Common Vocabulary of Social Participation" (VCPS from the Brazilian name *Vocabulário Comum de Participação Social*), as a public and online process. By May, 2013, first reference documents were publicized, together with a preliminary OWL code, logos, and a diagram of a general "public consultation". The Corais platform kept online records of the process, like discussions and preparation of texts. This article exposes this material and proposes an elementary unfolding: the "Social Participation Ontology" (OPS from the Brazilian name *Ontologia de Participação Social*). To exhibit this new ontology, these steps were considered: correction of ontological contradictions and OWL protocol use errors; completion of VCPS OWL code into a preliminary version of the OPS; translations and standardizations; enhancements of class names and labels in Portuguese, Spanish and English; a toy expansion of the ontology by further specifying classes; linked data examples regarding dereferencing, a SparQL endpoint and participatory instances; use cases by researchers and public managers. Ongoing work involves further adoption of OPS by the official Brazilian federal portal of social participation, further adoption by civil participative organizations, and linkage to other participative ontologies. OPS is being used as an upper ontology, and all classes linked further to FOAF and BFO as higher upper ontologies.

PACS numbers: 89.65-s,07.05.Bx,07.05.Kf
Keywords: OWL, semantic web, linked data, electronic democracy, participatory democracy, social systems

I. INTRODUCTION

Easy access to social media is reshaping citizen participation in government affairs[1]. Information and communication technologies (ICTs) have exhibited such an impact on the way individuals interact that it is giving birth to new organizational methods in social movements. These changes can be observed, for example, in the 2010 Arab Spring and the 2013 Brazilian protests. These events gathered millions of people and, although recent, have shown direct and strong impact in governments and new laws, and the forecast is an intensification of the process[2–4].

Concomitantly, electronic government initiatives are flourishing, favored mainly by the ubiquity of Internet technologies (e.g. HTML 5, Node.js, open source browsers) and by the need for renewal of representative democracy practices. These initiatives have taken place in various platforms, including usual social networks (e.g. Facebook, Twitter) and dedicated clients created by both government and civil society agents[1,5–7].

A natural challenge arises: how to link information produced into an unified knowledge base. This is being addressed, at the technology level, by semantic web developments. Endorsed by World Wide Web Consortium (W3C), current semantic web technologies include[8]:

- reasoning by means of ontological specifications,
- linking data from different sources (e.g. databases),
- organization of domain knowledge for coherent consideration.

Key among these technologies, ontologies are considered one of the pillars of the semantic web. An ontology is usually defined as a formal specification of a shared conceptualization[9]. They give meaning to data and are useful for datasets available on the web to make them automatically retrievable and linkable with other datasets. The W3C created the Web Ontology Language (OWL) as a standard to represent ontologies in the web. The second version of the language is called OWL 2 and offers greater expressive power[10], but the version is omitted with very few exceptions.

In this context, to describe and give meaning to social participation, the "Common Vocabulary of Social Participation" (VCPS from the Brazilian name *Vocabulário Comum de Participação Social*) was proposed as a joint effort of Latin America academic, civil and governmental groups[11]. Although started in 2012, a recent initiative

a)http://ifsc.usp.br/~fabbri/; Electronic mail: fabbri@usp.br
b)http://www.cidadedemocratica.org.br/; Electronic mail: henrique@cidadedemocratica.org.br; Cidade Democrática
c)http://www.cidadedemocratica.org.br/; Electronic mail: rodrigoyellow@cidadedemocratica.org.br; Cidade Democrática
d)http://ricardopoppi.org/; Electronic mail: ricardo.poppi@presidencia.gov.br; Social Participation Department, Social Articulation National Secretariat, Brazilian Presidency General Secretariat of the Republic (DPS/SNAS/SG-PR)

for ontological developments, it already yielded relevant material, including a public preliminary OWL ontology with a concise taxonomy. Also important are the reference documents reporting results from a first working phase, from July to December, 2012. As stated by the community, VCPS was propelled by three goals: 1) to ease adoption of the vocabulary; 2) to stimulate the creation of public tools to understand, visualize and summarize how participation is happening; 3) to meet the need of participative initiatives to open and link their data.

It is important to notice that VCPS, an ontology, was called a *vocabulary* both to ease understanding of the general public and because it started as a vocabulary. The present article presents the "Ontology of Social Participation" (OPS from the Brazilian name *Ontologia de Participação Social*), based on VCPS, in which the term *vocabulary* was substituted by the term *ontology* for the following reasons:

- The usage of the word "vocabulary" can lead to confusion is some situations as OPS is an OWL ontology (not, for example, a SKOS vocabulary).
- Documentation seems inconsistent when an ontology is repeatedly called a vocabulary.
- OPS is, in fact, an ontology, with a vocabulary, a taxonomic organization and properties further relating the terms.
- This coherent naming is a prerequisite for for academic acceptance and further formal adoption by government instances, such as the Brazilian Federal Portal of Open Data[12] and the Brazilian Federal Portal of Social Participation[13].

Also, the term *common* was dropped when OPS was conceived, as the term is redundant for an ontology. The VCPS presented other difficulties, such as missing classes, incorrect URI specifications (containing spaces), some logical flaws, and unnecessary out-of-standards restrictions. This were all solved within OPS (to the extent authors were able to, of course).

Next section is dedicated to an inspection of the documents delivered by the VCPS: reference textual documents, images, OWL code, blog posts, discussions and Etherpads. Section III presents OPS: modifications made from VCPS to OPS: class and property names and labels, class restrictions and property axioms. Section IV is dedicated to OPS usage: dereferencing, SparQL queries, a toy OPS expansion, discursive example of usage, and use cases from government, civil society and academic parties. Concluding remarks are stated with future work, in Section V.

II. VCPS ORIGINAL DOCUMENTATION

From April to December, 2012, VCPS was first conceived. In the online process, as registered by Corais platform, 66 users interacted, 6 of them were the most active[14]. Various materials were produced both as activity traces and as reference media. This section is dedicated to these materials.

A. Reference textual documents

The main documents are:

- "Commented methodology"[14]: this document describes the public process of VCPS conception. It is composed by brief inspections of forum topics, pointing both pertinent characteristics of the online collective process and ontological observations (about classes and properties). Considerations are made about tightening relations with the Open Government Partnership (OGP), an international initiative to foster transparency and open practices in governments worldwide[15], and the Brazilian formal action plan, as means to achieve ontology usage. There is also a proposal of a systematic study of electronic government initiatives, so that the VCPS might be better contextualized. This document ends by proposing an agenda of meetings with academics, entrepreneurs and government parties.
- "Conceptual modeling, version 0.1 (in natural language)"[16]: this document is a description, in common English, of the VCPS. The introduction is mainly a collage of the document above[14]. Both the itemized description of the ontology, and the considerations for its usage, are of great value as reference. Figure 2 is heavily influenced by a diagram related to this document and further described in Section II B.

B. Images

There are various images associated with the ontology[17], most notably:

- Various proposals for the VCPS logo, some of which are in Figure 1.
- Figure 2 shows an English and completed version of the original diagram of OPS in the document[16]. For completeness of exposition, the original diagram is in Appendix D, Figure 8.
- A diagram for general public consultations. Given the details and the pertinence of public consultations for OPS, the digram is exposed in Appendix B and Figure 7.

FIG. 1. Some of the various logos for of the VCPS. (a) is a colored text logo proposal; (b) is a figurative logo; (c) is mixture of both ideas. It can be seen that these logos were conceived for the ontology when it was called a *vocabulary*. Community documents reflect this nomenclature, which is being changed with this article and subsequent work with OPS advent.

C. OWL code of VCPS

The OWL code of VCPS is online[18] and deprecated by OPS advent. The VCPS OWL code did not contain all relation from Figure 2 (or Figure 8). This is directly addressed in Section III, which exposes the implementation of all relations in the OPS, including VCPS OWL corrections and adjustments to best practices. The complete and correct OPS is further contextualized in Section IV.

D. Blog Posts

The VCPS blog aggregates both important discussions and documents in no more than twenty posts to date. All OWL code, final documents, public consultations, mental map and images are posted in the blog[19]. The first post if from July 24, 2012. Last post about VCPS is from May 7, 2013. Most blog posts are from the first day (almost half of them). They received more than twenty commentaries. Two "out-of-season" blog posts, one from August 9, 2012 and another from October 22, 2012, separate first day posts from last posts. Both have about ten commentaries. Last blog posts occurred as a few days burst and a final message, a month after.

There are three more recent blog posts, from November and December, 2013. But these already address OPS conception from VCPS.

E. Discussions and etherpads

Besides blog registries of collective elaborations, four Etherpads were written[20] (these are interfaces that allows writing online texts with multiple simultaneous contributors[21]):

- A pad for important words.
- A pad dedicated to a second phase of VCPS elaboration, which did not happen yet.
- A pad for process documentation. It became the first document described in Section II A.
- A pad for both vocabulary specification and "questions not addressed to in the webinar".

III. OPS: THE ONTOLOGY OF SOCIAL PARTICIPATION

This section makes considerations about OPS label standardization and implemented classes, properties and restrictions. Features present in Figure 2, but not present in VCPS, are fully described in Section III A. Examples of usage are addressed in Section IV.

A. Standardization and exhibition of implemented features

Without explicit criteria, VCPS URI was `http://lumii.lv/ontologies/Corais.owl`. OPS URI was chosen to be `http://purl.org/socialparticipation/ops` for the following reasons:

- This URI is directly related to the ontology name (OPS).
- This URI, also an URL, is independent from government and other political associations. This is important to coalesce with interested parties: the Brazilian Federal Social Participation Portal[13], Brazilian government repository of vocabularies and ontologies[22], academic groups, NGOs, and non-organized civil society.
- Derived URIs, when reached via HTTP, can be redirected to where current documentation is held, as it is hosted by `http://purl.org`.

Labels in the languages of interest should be written in label fields. Even so, OPS class names should be friendly to users, bearing the attention not to take the class name as the label or as a meaning restriction.

For standardization, all classes are written in CamelCase[23] in plain English to ease internationalization, adoption and maturation. Labels are written in Portuguese, English and Spanish. Therefore, class names changed, receiving respective labels (`rdfs:label`) in each language and a textual short explanation (`rdfs:comment`) in English. Table I exhibits all classes is OPS.

OPS property names fit headlessCamelCase[23] format, are readable in English (to ease internationalization, adoption and maturation), and some of them have defined domains and ranges. Table II is dedicated to OPS properties, with labels in English, Portuguese and Spanish.

In the first versions of OPS, all properties yielded existential restrictions, except `ops:hasParticipationCharacteristic`. Although

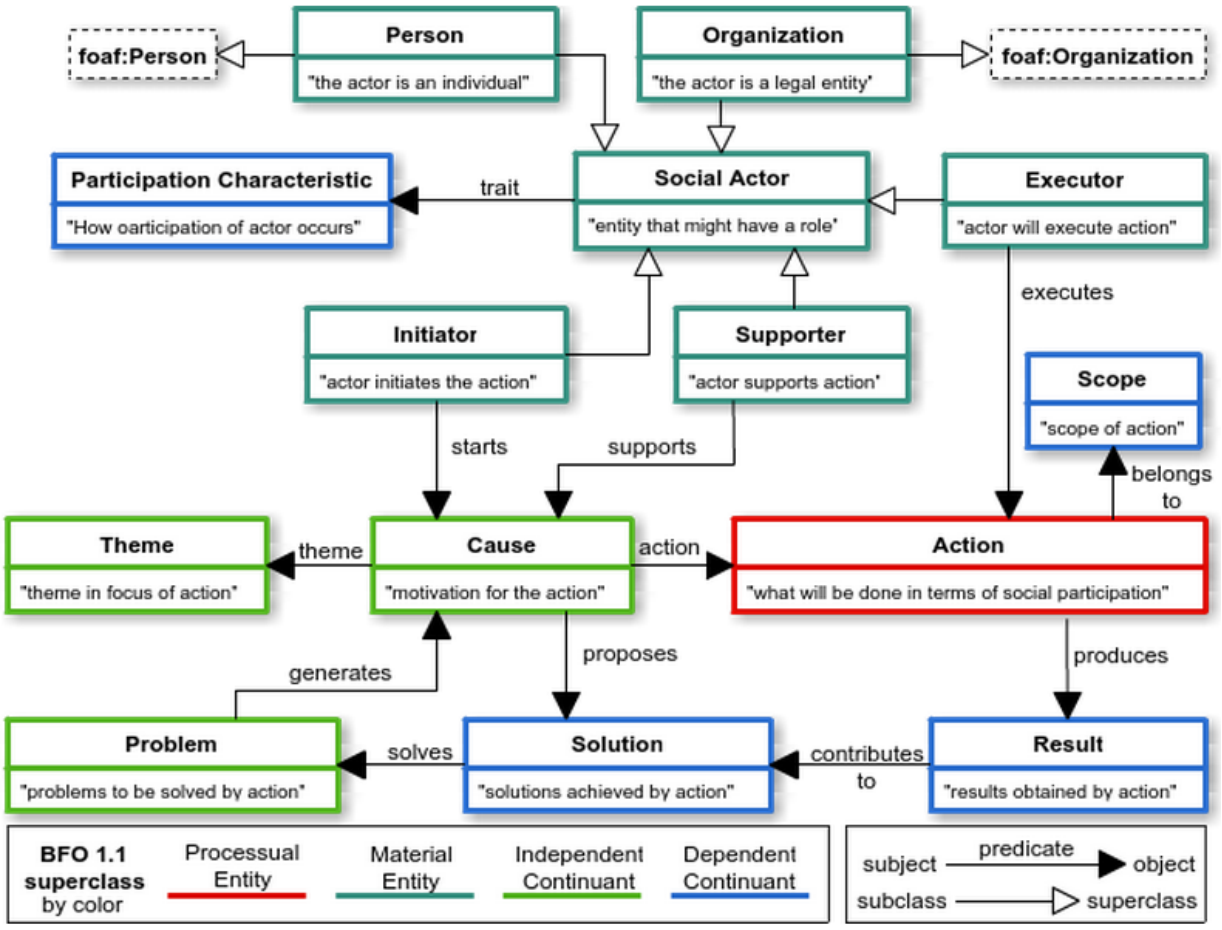

FIG. 2. Diagram representation of the Ontology of Social Participation (OPS). Arrows with white heads indicate "is a" relations (subclass points to superclass). Arrows with black heads indicate property relations from subject to object . All property relation yield existential restrictions, with the exception of the "has characteristic" property, that does not yield restriction. Upper ontologies BFO and FOAF are asserted through color (BFO) and dashed boxes (FOAF).

such efforts were aimed at handling a better defined OPS, further developments and discussions revealed that these restrictions made OPS rigid, a bit more complicated, and was not of much help, at least in this stage of OPS development and adoption. The result is that all restrictions were removed. Appendix A and Table IV exhibit all dropped OPS restrictions.

An inspection of VCPS also yielded a contradiction present in Figure 8: a role cannot execute, initiate or support a cause. These are done by the social actor. Therefore, to maintain VCPS directions and obtain a sound ontology, `ops:Role` was removed from OPS in preliminary versions. The result can be seen directly in Figures 2 and 3.

A comparison of the VCPS OWL code[24] with the diagram in Figure 8, which reflects official VCPS documentation, revealed that a class, two properties and three restrictions were not implemented. These were fully implemented in OPS before all restrictions were removed. These are the missing class and properties (restrictions missing in VCPS and implemented in preliminary OPS versions are exposed in Appendix A):

- Class: `ops:ParticipationCharacteristic`.
- Property: `ops:hasRole`.
- Property: `ops:composesSolution`.

OPS is available online[25]. To ease navigation of the ontology by interested parties, it is also available in the Webprotege interface[26]. The diagram of OPS taxonomic structure is exposed in Figure 3.

Upper ontologies usage with OPS is under development and should receive a dedicated article, as possibilities should be inspected carefully. Pertinent and already used as upper ontologies for OPS are FOAF[27] (for linking and describing people and things they do) and BFO[28] ("designed for use in supporting information retrieval, analysis and integration in scientific and other domains" as stated on their documentation). Properties were not related to upper ontologies as reasonable relations are still being searched for. Table I exposes OPS classes and respective upper ontologies classes.

Figure 2 is a complete diagram of current OPS: classes, properties and relations to FOAF and BFO. Actually, Figure 2 is more informative than OPS OWL code, as restrictions were removed and not all properties have defined domain and range. Therefore, the diagram is the remaining source of relations envisioned by OPS creators.

TABLE I. Classes of the OPS (Ontology of Social Participation). These are core concepts in the ontology. Along with the taxonomic structure exposed in Figure 3, these classes are related by the properties in Table II. Noteworthy is VCPS class name "`vcps:Espaço de Ação`", which caused original VCPS OWL to be pointed as corrupted by Protègè (spaces are not allowed in URIs). Also, class `vcps:Role` was dropped as it yields logical problens in VCPS.

OPS class name	**VCPS class name**	**pt-br label**	**es label**	**en label**	**definition**	**upper ontology classes**
Person	Pessoa	Pessoa	Persona	Person	a person (social actor is a person)	`bfo:'Material Entity'`, `foaf:Person`
Organization	Organizacao	Organização	Organización	Organization	social actor is a group of individuals, organized formally or informally (e.g. movements, collectives)	`bfo:'Material Entity'`, `[foaf:Organization]`
Executor	Executor	Executor	Ejecutor	Executor	performs action directly and is responsible for results	`bfo:'Material Entity'`
Initiator	Iniciador	Iniciador	Iniciador	Initiator	originates cause, individually or collaboratively	`bfo:'Material Entity'`
Supporter	Apoiador	Apoiador	Apoyador	Supporter	supports cause with resources of any kind (e.g. cognitive, financial, equipments)	`bfo:'Material Entity'`
SocialActor	Ator	Ator Social	Actor Social	Social Actor	entity that might have a participatory role	`bfo:'Material Entity'`
Participation-Characteristic	NivelDe-Participacao	Característica de Participação	Característica de Participación	Participation Characteristic	the way the participation of the specific actor is happening	`bfo:'Dependent Continuant'`
Cause	Causa	Causa	Causa	Cause	the motivation for Action	`bfo:'Dependent Continuant'`
Theme	Tema	Tema	Tema	Theme	the theme in focus by Action	`bfo:'Independent Continuant'`
Action	Acao	Ação	Acción	Action	what is done in terms os social participation	`bfo:'Processual Entity'`
Scope	**Espaço de Ação**	Escopo	Ambito	Scope	the scope os Action	`bfo:'Dependent Continuant'`
Result	Resultados	Resultado	Resultado	Result	the result obtained with action	`bfo:'Dependent Continuant'`
Solution	Solucao	Solução	Solución	Solution	solution achieved with Action	`bfo:'Dependent Continuant'`
Problem	Problema	Problema	Problema	Problem	the problem that the Action aims to solve	`bfo:'Independent Continuant'`
dropped class	Papel	-//-	-//-	-//-	the role of the actor	-//-

TABLE II. Properties of the OPS (Ontology of Social Participation) along original VCPS names. Only a few ranges were established, and no domain, as these were not currently useful and, without them, OPS can be used more freely.

OSP property name	**CVSP property name**	**pt-br label**	**es label**	**en label**	**domain**	**range**
theme	possuiTemaAssociado	tema	tema	theme	-//-	Theme
belongsTo	pertenceAoEspaco	pertence ao	pertence al	belongs to	-//-	Scope
supports	apoiaCausa	apoia	apoya	supports	-//-	-//-
contributesTo	compoeSolucao	contribui para	contribuye para	contributes to	-//-	-//-
executes	executaAcao	executa	ejecuta	executes	-//-	-//-
generates	geraCausa	gera	genera	generates	-//-	-//-
starts	iniciaCausa	inicia	inicializa	starts	-//-	-//-
solves	soluciona	soluciona	resuelve	solves	-//-	-//-
action	possuiAcao	ação	acción	action	-//-	Action
produces	produzResultado	produz	produce	produces	-//-	-//-
proposes	propoeSolucao	propõe	propone	proposes	-//-	-//-
dropped	temPapel	-//-	-//-	-//-	-//-	-//-
trait	temNivelDeParticipacao	traço	rasgo	trait	-//-	-//-

FIG. 3. A taxonomic tree of the Ontology of Social Participation (OPS). This image was rendered inside Protègè, with the OWL code in Appendix C. Figure 2 is more informative, but this diagram is more standard and might be simpler for the newcomer. Note that the taxonomic tree does not present any information about properties further linking these classes. The prefixes `snap:` and `span:` are BFO specific.

IV. OPS UTILITY

OPS is meant to be useful. First, as a systematization of what is social participation to Latin America groups, as conceived by VCPS. Second, as a mean to ease linked data, and enable integration of various instances for social participation. An indicative of this pertinence is OPa, OCD, Ontologiaa, and OBS, ontologies that already uses OPS as upper ontology[29].

This section explores different OPS uses: dereferencing, SparQL queries, expansion, discursive fictional cases, and real use cases.

A. Usage of OPS through dereferencing

All OPS classes and properties URIs are accessible via HTTP. A Pubby instance delivers information like name, labels and relations to other classes and properties. As an example, the URI http://purl.org/socialparticipation/ops/SocialActor returns information about this class and all subclasses it is related to, as shown in Figure 4.

FIG. 4. Dereferencing an OPS class: the URI is also an URL, which, reached by HTTP, returns information for the user as shown. Also, if the client is not a browser, but a crawler or a linked data application, Pubby delivers plain RDF, not user-friendly HTML.

B. Usage of OPS through a SparQL endpoint

Linking multiple databases is an OWL technology core purpose. The standard way to access these data via ontologies is by using a SparQL endpoint. This endpoint delivers data from a triplestore (collection of RDF triples) or, with more experimental technology, from relational database systems, such as a MySQL server (e.g. via OnTop/Quest[30]). Either way, the query is the same: the user or machine reaching the endpoint uses the SparQL protocol in order to retrieve information through semantic criteria. Figure 5 is a schematic representation of OBDA (Ontology Based Database Access), which is a common name for this multiple database access through ontologies.

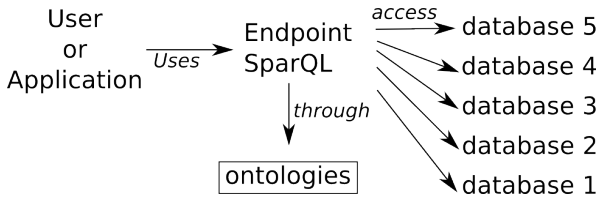

FIG. 5. Scheme of the common use of ontologies for multiple databases integration. A user or application reaches a SparQL endpoint. This endpoint, through ontologies, delivers data from one or more databases. Nowadays, the most usual is to find only one database available at an endpoint, and this database is usually duplicated and not synchronized, but available as a (converted) triplestore. Even so, it is possible to access multiple ontologies and it is desirable that the databases have synchronous access, i.e. without need to convert data to triples beforehand.

Some examples of this usage can be given by SparQL queries and concise explanations:

- `"select ?s ?s2 ?s3 where {?s a ops:SocialActor . ?s2 a ops:Person . ?s3 a ops:Organization}"`: this query retrieves all social actors (returned in variable `?s`), be each a person, an organization, or something else; retrieves all persons (variable `?s2`); and retrieves all organizations (`?s3`). In a similar manner, one can retrieve all roles played, all executers, all initiators and all supporters.

- `"select ?s ?o where {?s ops:starts ?o}"`: this query retrieves all causes (`?o`) and their initiators (`?s`) or whatever use is being done of the `ops:stars` property.

- `"select ?s ?s2 ?o ?o2 where {?s a ops:Action . ?s ops:belongsTo ?o . ?s2 ops:executes ?s . ?s ops:produces ?o2}"`: this query retrieves all actions (`?s`) along their Action Field (`?o`), their Executer (`?s2`) and their Results (`?o2`), or whatever use is being made of there OPS classes and properties.

Noteworthy is that while `opa:Participant` can be used to retrieve all Participa.br participants, `ocd:Participant` can be used to retrieve all Cidade Democrática participants, and `aa:User` can be used to retrieve all AA participants; their upper ontology class `ops:SocialActor` retrieves all of them and relates these entities directly to the class of generic actors of social participation processes[29].

C. OPS expansion

OPS matches VCPS online documentation[11]. As an example of additional classes, an expanded OPS ontology is exposed in this section and is uploaded to Webprotege[31]. Table III is dedicated to these additional classes while Figure 6 presents the resulting taxonomic structure.

The property `ops:receivesFrom` was also added and has an inverse: `ops:SocialActor ops:paysTo ops:Executor`. Also, the `ops:DownloadedMod` class is a defined class by the existential restriction: `ops:Mob ops:convoquedBy ops:Network`, with a newly defined property `ops:convoquedBy`.

This is one of the numerous ways by which OPS might deal with further classes, properties and restrictions. This particular expansion was chosen as an example by direct observance of VCPS documentation and recent social affairs, such as the Brazilian protests.

D. Fictional examples of usage

OPS usage might not be obvious at first. How is data linked? How is field knowledge organized? Why and by whom? Core principles of these OPS utilities, can be understood by the following observations:

- Different participation instances have social actors, actions being developed, organizations involved, problems being tackled, etc. These can yield one consistent database by means of OPS usage.
- One can understand and share the mutually exclusive nature of being a paid or a voluntary contributor by observing the expanded version of OPS (see Section IV C. Also, noticing the fact that a mob can be very big or not, and that it can be convoked or not by a Network, can make the field more neat for a newcomer or ease discussions and problematization for senior researchers or politicians.
- Other fields of human knowledge and practice also have agents, problems and so forth. These can be linked to participatory data and ontologies by means of OPS.

Fictional examples are useful to make these points clear:

- Suppose a public SparQL endpoint unifies several participation instances by means of OPS (we will see in Section IV E that this is not really fictional). Thus, the number of participants is publicly available (`|ops:SocialActor|`). Also, depending on the platforms involved, one can observe how many of these participants are individuals (`ops:Person`), how many are organizations (`ops:Organization`), and understand to which extent the corporative influence is explicit. One can observe how many of the participants are the same in each platform, and what roles they take, and make assumptions about how much the society is really participating or if these processes are manipulated by a few agents (`ops:SocialActor`). One can also gaze uppon the problems being discussed and which solutions are being proposed, therefore easing the sense of what is being considered important and valid as public discussions. This list of possibilities is endless, specially when OPS variations and expansions are considered.
- Suppose a person, say Jessica, has a new proposal for a participative system that uses OPS. She can have a quite concise understanding of the concepts involved, and how they relate. She can now make very objective observations and deliver clear suggestions that relate directly to the systems used or envisioned. She can make an OPS variation or another ontology, as a way to confront paradigms.
- Suppose there is a system for exhibiting indicators about social participation (how effective it has been, how wide is the scope of interests, etc.). Instances that are integrated by OPS can be queried for information and, for example, this system registers any organization involved as a social actor. Also, reflecting the expanded OPS exposed above, the system registers any mob involved, whose incidence was recorded in the database as a `DownloadedMob`, as related to some social network (the network might be unknown).

E. Real use cases

OPS is a recent ontology. Even so, some real use cases can be pointed, from which are most notable:

- The UNDP/UN consultant contract 2013/00056, project BRA/12/018, was profoundly influenced by OPS[29]. Within written products are other participatory ontologies, such as OPa, OCD, Ontologiaa and OBS, which relates directly to OPS. Also, some methods for analysing OPS related data and for resource recommendation were delivered. These developments where done by the computational physics researcher R. Fabbri (first author of the present article), in collaboration with other parties, specially the Brazilian General Secretariat of the Republic, University of Brasília researchers, and free software parties. Data from three participatory instances were triplified: Participa.br, AA and Cidade Democrática; all related to OPS. These linked data resources are available in SparQL endpoints and can be dereferenced, in a similar fashion as done for OPS. As these are all executed in research facilities, they might lack maintenance and should be kept by a dedicated team.

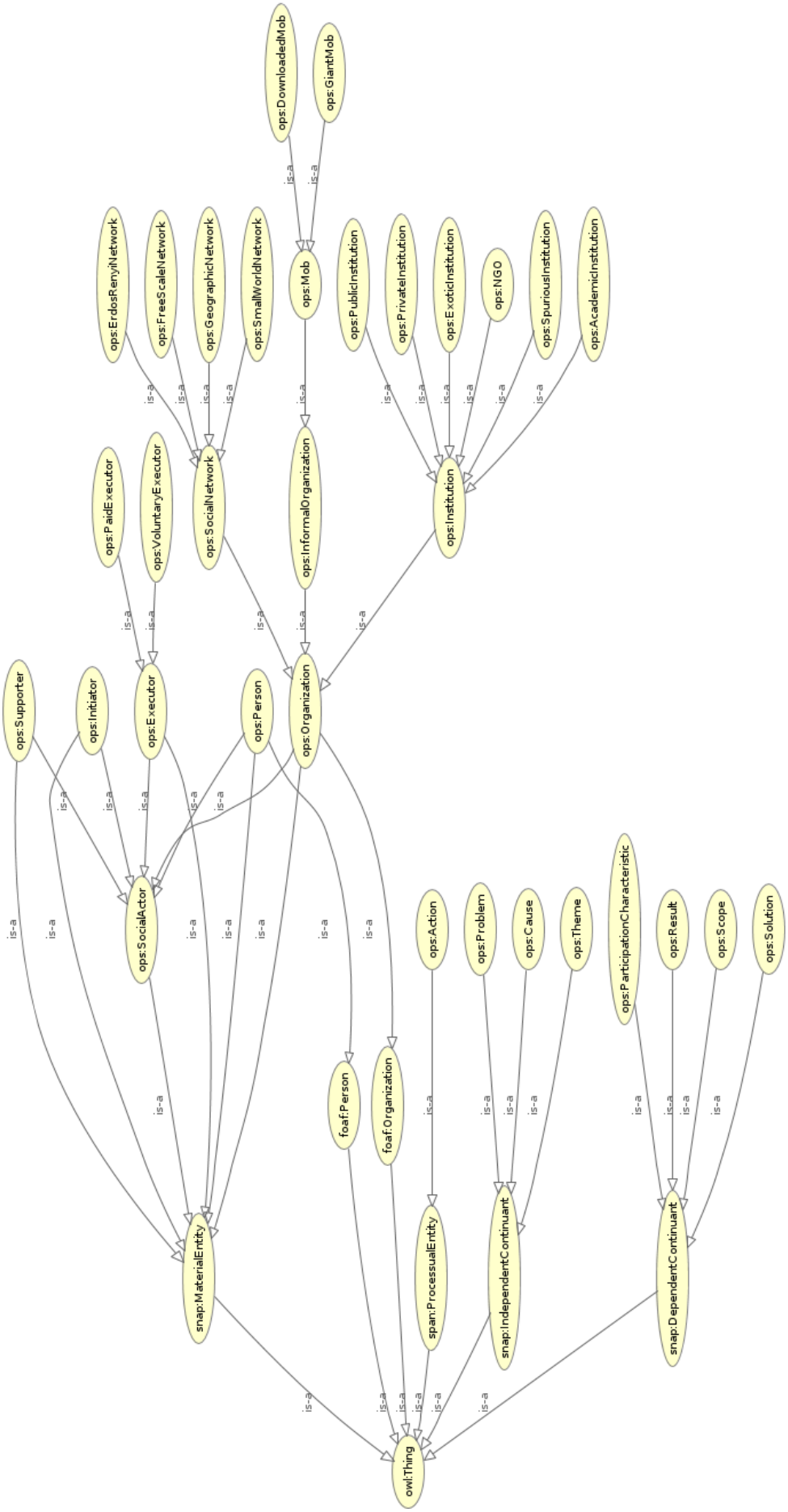

FIG. 6. A taxonomic diagram of an example expanded instance of OPS. `ops:PaidExecutor` is defined as being the subject of a `ops:receivesFrom` relation with a `ops:SocialActor`; `ops:DownloadedMob` is defined by being the subject of a `ops:convoquedBy` relation with a `ops:SocialNetwork`. OWL code is online for live editing[31]. The new classes added to OPS are in Table III

TABLE III. New classes considered for expansion of the OPS. The taxonomic organization of these classes, within OPS can be observed in Figure 6. Further information is in Section IV C.

new class	subclass of	description	further notes
SocialNetwork	Organization	a social structure made up of social actors (such as individuals or organizations) and a set of dyadic ties between these actors	–//–
FreeScaleNetwork	SocialNetwork	a network whose connectivity follows a power law	disjoint with UniformrandomNetwork and GeographicNetwork
ErdosRenyiNetwork	SocialNetwork	also known as Poisson network, this network sets, with equal propability, an edge between each pair of nodes	disjoint with FreeScaleNetwork and GeographicNetwork
GeographicNetwork	SocialNetwork	a network whose connectivity is related to the distance of nodes in a metric space	Disjoint with both FreeScaleNetwork and ErdosRenyiNetwork
SmallWorldNetwork	SocialNetwork	a network where most nodes can be reached from other nodes with few hops or steps	not disjoint with FreeScaleNetwork, ErdosRenyiNetwork and GeographicNetwork
InformalOrganization	Organization	an organization that is not formalized	disjoint with Intitution
Mob	InformalOrganization	a crowd of individuals	–//–
GiantMob	Mob	a crowd with more than 10,000 individuals	–//–
DownloadedMob	Mob	a Mob convoqued by a network	this is a defined class, by being a network and being the subject of the relation convoquedBy with object Network
Institution	Organization	a mechanism of social order that governs a set of individuals	disjoint with InformalOrganization
PublicInstitution	Institution	an institution backed through public funds and controlled by the state	disjoint with Private Institution
PrivateInstitution	Institution	an institution backed through private fundings and controlled by private parties	disjoint with PublicInstitution
AcademicInstitution	Institution	an institution dedicated to education and research, which grants academic degrees	–//–
NGO	Institution	a legally consituted corporation created by natural or legal people that operate independently from any form of government	–//–
SpuriousInstitution	Institution	an institution that holds prominent illegitimate or corrupt characteristcs	–//–
ExoticInstitution	Institution	an institution that does not fit previous classes or is characterized by a very unique traces	–//–
VoluntaryExecutor	Executor	an executor that receives no formal reward for the tasks	disjoint with PaidExecutor
PaidExecutor	Executor	an Executor that receives formal reward for the tasks accomplished	a defined class, being an Executor and the subject of a receivesFrom predicate with SocialActor as object

- Another UNDP/UN contract was responsible for some advances in information technologies. A special case is a dedicated OPS expansion[32].

- The Brazilian Federal Data Processing Service (Serpro) is triplifying Participa.br data (the Brazilian federal social participation portal). Is this process, they as making direct use of OPS[33].

- The linked data Brazilian community had some ma-

turing related to OPS beyond the ontologies developed, UNDP/UN documentation, Serpro triplification, and VCPS. Interested government, civil society and academic parties circulated OPS documentation for conceptual and technological goals[34,35].

V. CONCLUDING REMARKS AND FUTURE WORK

OPS, based in VCPS, yields initial steps in achieving an effective social participation ontology: community has registered activities and delivered reference documents, including this article. Sections III and IV have expansion directions for the ontology, regarding uses, further definition of classes, upper ontologies and related ontological structures.

On the practical side, the use of this ontology or related developments for the Brazilian federal participation portal (Participa.br[13]) is a desirable reality, as it implies usage and good maintenance. Moreover, an ontology was done for Participa.br, based in the OPS: the OPa[29] (Ontology of Participa.br). This is confluent with the presidential Decree that establishes a policy and commitment for social participation[36]. In this context, presidential, ministerial and academic parties started formalizing current legal participatory mechanisms (e.g. conferences, councils, forums, public consultations, round tables) in ontological terms, which resulted in the Social Library Ontology (OBS from the Brazilian name Ontologia da Biblioteca Social) and the Social Library Vocabulary (VBS from the Brazilian name Vocabulário da Biblioteca Social). Hosting ontologies on Webprotege[37] have become central, as a way to share specific ontologies in a friendly environment and to collects observations.

A. Further work

Further work involves observing community manifestations about OPS and this article, accomplishing use by means of formal instances and civil society, and studying upper ontologies usage with OPS. The use of OPS (or a variant) in different instances is being tackled for the creation of social participation indicators and easing participation processes.

Academic texts dedicated to each new participation ontology created (OCD, OBS, Ontologiaa, OPa) should be written and submitted to peer review for enhancements and quality assurance[29].

Data related to these ontologies were found in relational databases and preliminary scripts were written to make them available as RDF. A sound linkage of this data and incorporation to the Linked Open Data (LOD[38]) cloud is planed for a near future. This should make Brazilian participative structures and data part of the Giant Global Graph[39].

ACKNOWLEDGMENTS

This article is deeply influenced by Protege and BFO documentation. Authors thank community and researchers related to these projects[28,40]. Authors thank Corais Platform maintainers for their efforts in delivering a collaborative platform which gave birth to VCPS documentation. Authors thanks Prof. Dr. Dilvan de Abreu Moreira (ICMC/USP) for all help and incentives in the genesis of this article. Authors thank Flor Karina Mamani Amanqui for initial Spanish labels. Renato Fabbri is grateful to CNPq (process 140860/2013-4, project 870336/1997-5), PNUD/ONU (contract 2013/00056, project BRA/12/018), SNAS/SG-PR, and the Postgraduate Committee of the IFSC/USP.

Appendix A: Restrictions in VCPS and initial OPS which were removed for the time being

These restrictions were part of VCPS documentation, but not implemented in VCPS OWL code:

- Restriction: `ops:Role ops:hasParticipationCharacteristic some ops:ParticipationCharacteristic`.
- Restriction: `ops:Results ops:composesSolution some ops:Solution`.
- Restriction: `ops:Problem ops:generatesCause some ops:Cause`.

Present in preliminary OPS implementation, all restrictions were removed from current OPS as explained in Section III A.

TABLE IV. Restrictions of the OPS (Ontology of Social Participation). All OPS restrictions are existential (`owl:someValuesFrom`).

subject	predicate	object
Initiator	starts	Cause
Supporter	supports	Cause
Executer	executes	Action
Solution	solves	Problem
SocialActor	hasRole	Role
Action	produces	Results
Result	contributesTo	Solution
Cause	action	Action
Action	belongsTo	Scope
Cause	theme	Theme
Cause	proposes	Solution
Problem	generates	Cause

Such OWL restrictions are valid, to the best of chances, for the final state of a participatory process (for example, in an arbitrary snapshot, a `SocialActor` may be not tied to a role). This might lead to NULL or “not yet

defined" field supplies. Also, in VCPS, existential restrictions were written as "min 1". These were changed to the standard "some" existential restriction in preliminary OPS and were completely removed afterwards, as a way to avoid making OPS usage rigid and more complicated.

Appendix B: Public consultation

Public consultations have core importance in participatory democracy and the model in Figure 7 was conceived as part of VCPS community documentation. An OWL implementation of such public consultation was meant to be developed and made public, with dedicated attention. Considerations of this public consultation with respect to the OPS and formal existent instances was envisioned as well. This public consultation model is observed here for completeness of exposition and further details goes beyond the scope of this article. A public consultations along the lines of a recent Presidential decree[36] was formalized in OBS OWL and in VBS SKOS[29].

FIG. 7. A diagram representation of a general public consultation, part of initial VCPS documentation. Further context of this image is in Appendix B.

Appendix C: OWL code of the Ontology of Social Participation

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix ops: <http://purl.org/socialparticipation/ops/> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix snap: <http://www.ifomis.org/bfo/1.1/snap#> .
@prefix span: <http://www.ifomis.org/bfo/1.1/span#> .
@prefix xml: <http://www.w3.org/XML/1998/namespace> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

ops:Action a rdfs:Class,
        owl:Class ;
    rdfs:label "Action"@en,
        "Acción"@es,
        "Ação"@pt ;
    rdfs:comment "what is done in terms os social participation"@en ;
    rdfs:subClassOf span:ProcessualEntity .

ops:Cause a rdfs:Class,
        owl:Class ;
    rdfs:label "Cause"@en,
        "Causa"@es,
        "Causa"@pt ;
    rdfs:comment "the motivation for Action"@en ;
    rdfs:subClassOf snap:IndependentContinuant .

ops:Executor a rdfs:Class,
        owl:Class ;
    rdfs:label "Executor"@en,
        "Ejecutor"@es,
        "Executor"@pt ;
    rdfs:comment "performs action directly and is responsible for results"@en ;
    rdfs:subClassOf ops:SocialActor,
        snap:MaterialEntity .

ops:Initiator a rdfs:Class,
        owl:Class ;
    rdfs:label "Initiator"@en,
        "Iniciador"@es,
        "Iniciador"@pt ;
    rdfs:comment "originates cause, individually or collaboratively"@en ;
    rdfs:subClassOf ops:SocialActor,
        snap:MaterialEntity .

ops:Organization a rdfs:Class,
        owl:Class ;
    rdfs:label "Organization"@en,
        "Organización"@es,
        "Organização"@pt ;
    rdfs:comment "social actor is a group of individuals, organized formally or informally (e.g. movements, collectives)"@en ;
    rdfs:subClassOf ops:SocialActor,
        snap:MaterialEntity,
        foaf:Organization ;
    owl:disjointWith ops:Person .

ops:ParticipationCharacteristic a rdfs:Class,
        owl:Class ;
    rdfs:label "Participation Characteristic"@en,
        "Característica de Participación"@es,
        "Característica de Participação"@pt ;
    rdfs:comment "the way the participation of specific actor is happening"@en ;
    rdfs:subClassOf snap:DependentContinuant .

ops:Person a rdfs:Class,
        owl:Class ;
    rdfs:label "Person"@en,
        "Persona"@es,
        "Pessoa"@pt ;
    rdfs:comment "a person (social actor is a person)"@en ;
    rdfs:subClassOf ops:SocialActor,
        snap:MaterialEntity,
        foaf:Person .

ops:Problem a rdfs:Class,
        owl:Class ;
    rdfs:label "Problem"@en,
        "Problema"@es,
        "Problema"@pt ;
    rdfs:comment "the problem that the Action aims to solve"@en ;
    rdfs:subClassOf snap:IndependentContinuant .

ops:Result a rdfs:Class,
        owl:Class ;
    rdfs:label "Result"@en,
        "Resultado"@es,
        "Resultado"@pt ;
    rdfs:comment "the result obtained with Action"@en ;
    rdfs:subClassOf snap:DependentContinuant .

ops:Scope a rdfs:Class,
        owl:Class ;
    rdfs:label "Scope"@en,
        "Ambito"@es,
        "Escopo"@pt ;
    rdfs:comment "the scope of Action"@en ;
    rdfs:subClassOf snap:DependentContinuant .

ops:SocialActor a rdfs:Class,
        owl:Class ;
    rdfs:label "Social Actor"@en,
        "Actor Social"@es,
        "Ator Social"@pt ;
    rdfs:comment "entity that might have a participatory role"@en ;
    rdfs:subClassOf snap:MaterialEntity .

ops:Solution a rdfs:Class,
        owl:Class ;
    rdfs:label "Solution"@en,
        "Solución"@es,
        "Solução"@pt ;
    rdfs:comment "solution achieved with Action"@en ;
    rdfs:subClassOf snap:DependentContinuant .

ops:Supporter a rdfs:Class,
        owl:Class ;
    rdfs:label "Supporter"@en,
        "Apoyador"@es,
        "Apoiador"@pt ;
    rdfs:comment "supports cause with resources of any kind (e.g. cognitive, financial, equipments)"@en ;
    rdfs:subClassOf ops:SocialActor,
        snap:MaterialEntity .

ops:Theme a rdfs:Class,
        owl:Class ;
    rdfs:label "Theme"@en,
        "Tema"@es,
        "Tema"@pt ;
    rdfs:comment "the theme in focus by Action"@en ;
    rdfs:subClassOf snap:IndependentContinuant .

ops:action a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "action"@en,
        "acción"@es,
        "ação"@pt .

ops:belongsTo a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "belongs to"@en,
        "pertence al"@es,
        "pertence ao"@pt ;
    rdfs:range ops:Scope .

ops:contributesTo a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "contributes to"@en,
        "contribuye a la"@es,
        "contribui para"@pt .
```

```
ops:executes a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "executes"@en,
        "ejecuta"@es,
        "executa"@pt .

ops:generates a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "generates"@en,
        "genera"@es,
        "gera"@pt .

ops:ops.owl a owl:Ontology ;
    rdfs:label "OPS"^^xsd:string,
        "Social Participation Ontology"@en,
        "Ontología de la participación social"@es,
        "Ontologia de Participação Social"@pt ;
    rdfs:comment "Social Participation Ontology headed
         by Cidade Democrática, Brazilian Federal
         Government and Corais Platform, in direct
         collaboration with dozens of actors throughout
          latin america"@en,
        "Ontología de Participación Social conducida
            por el Cidade Democrática, el Gobierno
            Federal de Brasil y la Plataforma Corais,
            en colaboración directa con docenas de
            actores en toda América Latina"@es,
        "Ontologia de Participação Social capitaneada
            pelo Cidade Democrática, Governo Federal
            Brazileiro e Plataforma Corais, em
            colaboração direta com dezenas de agentes
            de toda américa latina"@pt ;
    rdfs:seeAlso <http://purl.org/socialparticipation/
        aa>,
        <http://purl.org/socialparticipation/obs>,
        <http://purl.org/socialparticipation/ocd>,
        <http://purl.org/socialparticipation/opa>,
        <http://purl.org/socialparticipation/vbs> ;
    owl:versionInfo "0.02"^^xsd:string .

ops:produces a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "produces"@en,
        "produce"@es,
        "produz"@pt .

ops:proposes a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "proposes"@en,
        "propone"@es,
        "propõe"@pt .

ops:solves a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "solves"@en,
        "resuelve"@es,
        "soluciona"@pt .

ops:starts a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "starts"@en,
        "inicia"@es,
        "inicia"@pt .

ops:supports a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "supports"@en,
        "apoya"@es,
        "apoia"@pt .

ops:theme a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "theme"@en,
        "tema"@es,
        "tema"@pt ;
    rdfs:range ops:Theme .

ops:trait a rdf:Property,
        owl:ObjectProperty ;
    rdfs:label "trait"@en,
        "rasgo"@es,
        "traço"@pt .
```

Appendix D: Original diagram of ops

Although deprecated, Figure 8 is the basis of VCPS and OPS. It is displayed here for completeness of exposition and as support for discussions within this article.

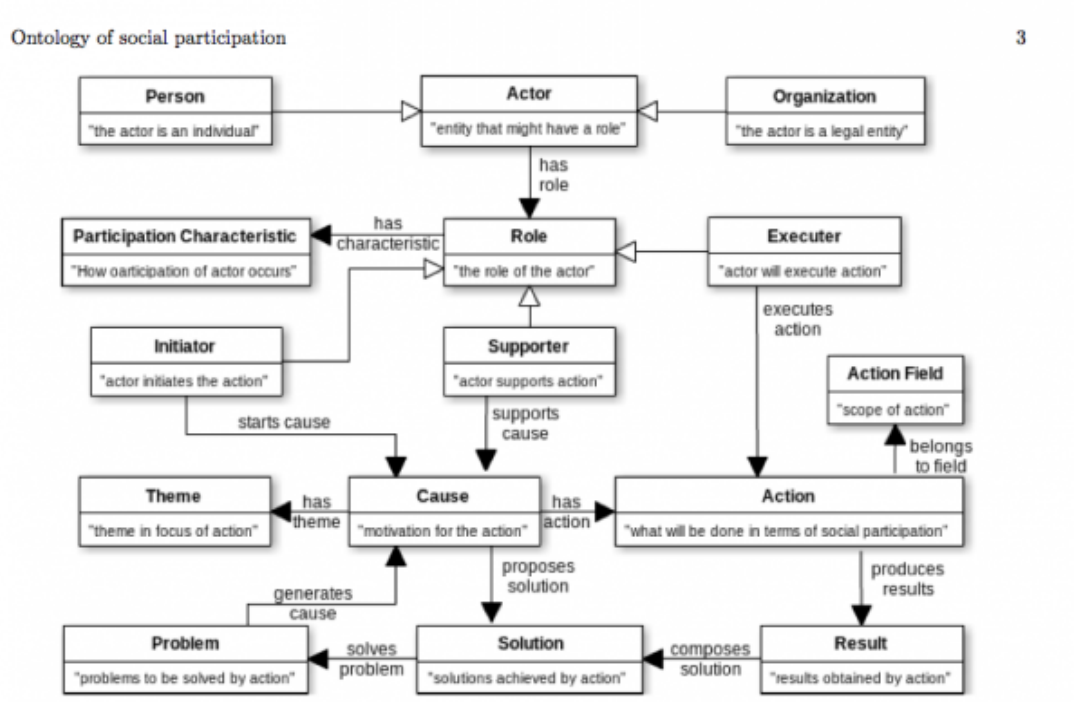

FIG. 8. Original VCPSdiagram. Although there were substantial OWL modifications, the main difference in the diagram is that the class `Role` was removed, as a `Role` is not able to start, execute or support anything. That is done by the Social Actor, as exposed in Figure 2.

Appendix E: Script for constructing current ops

Preliminary OPS was done with Protègè software[40]. Current OPS is the output of a Python script[41]. Actually, this article, latex files, the OWL code, the Pythonscript and auxiliary files are in a public git repository[42], as is the common practice of the first author of this article.

Appendix F: Glossary of terms, acronyms and abbreviations

The subjects involved in this article have numerous jargons, acronyms and abbreviations. Table V should help readers as a concise references.

[1] R. T. Khasawneh and E. Abu, "E-government and social media sites: The role and impact," World Journal of Computer Application and Technology **1**, 10–17 (2013).
[2] E. Turner, "New movements, the digital revolution and social movement theory: Five propositions concerning new forms of internet mobilisation," in *20th International Conference of Europeanists-Crisis & Contingency: States of (In) Stability* (Ces, 2013).
[3] "Digital revolution,".
[4] Y. H. Kim, "Book review: The creative destruction of medicine: how the digital revolution will create better healthcare," Journal of Gynecologic Oncology **24**, 98 (2013).
[5] M. Pita and G. Paixao, "Arquitetura de busca semântica para governo eletrônico," in *II Workshop de Computação Aplicada em Governo Eletrônico & Congresso da Sociedade Brasileira de Computação, Belo Horizonte* (2010).
[6] A. Barros, D. R. CANABARRO, and M. CEPIK, "Para além da e-ping: o desenvolvimento de uma plataforma de interoperabilidade para e-serviços no brasil," Panorama da Interoperabilidade. Brasília: Ministério do Planejamento, Orçamento e Gestão , 137–157 (2010).
[7] D. Sarantis and D. Askounis, "Knowledge exploitation via ontology development in e-government project management," International Journal of Digital Society **1**, 246–255 (2010).
[8] D. Allemang and J. Hendler, *Semantic web for the working ontologist: effective modeling in RDFS and OWL* (Access Online via Elsevier, 2011).
[9] T. Gruber, "Ontology." (2009).
[10] P. Hitzler, M. Krotzsch, B. Parsia, P. F. Patel-Schneider, and S. Rudolph, "Owl 2 web ontology language primer," (online) (2012).
[11] "Platform for open development of common ontology of social participation, with more than a hundred contributors, half brazilians, half from colombia, mexico, chile, ecuador, peru and paraguay," http://corais.org/vocabulariodaparticipacao (),

accessed: 2013-10-21.
[12] "Brazilian federal portal of open data," http://dados.gov.br/, accessed: 2013-12-08.
[13] "Brazilian federal social participation portal," http://participa.br/, accessed: 2013-12-08.
[14] R. B. de Luna, "Metodologia de trabalho comentada e publicada!" http://corais.org/vocabulariodaparticipacao/node/76734 (2013).
[15] "Open government partnership: a multilateral initiative that aims to secure concrete commitments from governments to promote transparency, empower citizens, fight corruption, and harness new technologies to strengthen governance," http://www.opengovpartnership.org/country/brazil, accessed: 2013-12-08.
[16] H. P. P. F. I. L. S. R. A. P. M. e. R. B. d. L. Dalton Martins, Frederico Bortolato, "Modelagem conceitual publicada! verso 0.1 em linguagem natural," http://corais.org/vocabulariodaparticipacao/node/76730 (2013).
[17] Corais platform page with many images: http://corais.org/vocabulariodaparticipacao/node/1517.
[18] "Owl code of the common vocabulary of social participation (vcps)," http://goo.gl/AtrBwF (), accessed: 2015-01-10.
[19] "Online blog of the common vocabulary of social participation," corais.org/vocabulariodaparticipacao/blog (), accessed: 2014-02-06.
[20] "Etherpads used in elaboration of the comon vocabulary of social participation," http://corais.org/vocabulariodaparticipacao/texts, accessed: 2013-11-06.
[21] B. Tomlinson, J. Ross, P. Andre, E. Baumer, D. Patterson, J. Corneli, M. Mahaux, S. Nobarany, M. Lazzari, B. Penzenstadler, *et al.*, "Massively distributed authorship of academic papers," in *CHI'12 Extended Abstracts on Human Factors in Computing Systems* (ACM, 2012) pp. 11–20.
[22] "Electronic government repository of vocabularies and ontologies," http://vocab.e.gov.br/, accessed: 2013-12-08.
[23] D. Binkley, M. Davis, D. Lawrie, and C. Morrell, "To camelcase or under_score," in *Program Comprehension, 2009. ICPC'09. IEEE 17th International Conference on* (IEEE, 2009) pp. 158–167.
[24] "Complete owl implementation of the common vocabulary of social participation with standard class and property names and with missing classes, properties and restrictions. webprotege interface to the ontology." http://goo.gl/Ckd0l7 (), accessed: 2013-11-06.
[25] F. B. H. P. P. F. I. L. S. R. A. P. M. e. R. B. d. L. Renato Fabbri, Dalton Martins, "Ops owl code," https://github.com/ttm/ops/blob/master/rdf/ops.owl and https://github.com/ttm/ops/blob/master/rdf/ops.ttl (2015).
[26] F. B. H. P. P. F. I. L. S. R. A. P. M. e. R. B. d. L. Renato Fabbri, Dalton Martins, "Ops owl code within webprotege," http://goo.gl/Q66JRA (2015).
[27] D. Brickley and L. Miller, "Foaf vocabulary specification 0.98," Namespace document **9** (2010).
[28] R. Arp and B. Smith, "Function, role, and disposition in basic formal ontology," Nature Preceedings , 1–4 (2008).
[29] *Product 5 of UNDP/UN consultancy by Renato Fabbri, showcasting* OP*a, O*ntologiaa, OCD, OBS *and* VBS, https://github.com/ttm/pnud4/blob/master/latex/produto.pdf?raw=true.
[30] M. Rodriguez-Muro and D. Calvanese, "Quest, an owl 2 ql reasoner for ontology-based data access," OWLED 2012 (2012).
[31] "Expanded version of OPS," http://goo.gl/ercNGy (), accessed: 2013-11-06.
[32] *Produto 6 da consultoria PNUD/ONU de Paulo Meirelles e Fernando Cruz*, https://github.com/ttm/tese/blob/master/bib/sgpr/pnud_fwcruz_pmeirelles_produto06_vfinal.docx?raw=true.
[33] "Serpro using OPS," http://tinyurl.com/m93bd39, accessed: 2013-11-06.
[34] R. B. de Luna, "VCPS Facebook post,".
[35] N. B. Silva, "OPS email post,".
[36] M. C. Delduque, S. G. Dallari, and S. M. C. Alves, "Executive order n. 8,243 and the brazilian national policy for social participation: impacts on health," Cadernos de Saúde Pública **30**, 1812–1814 (2014).
[37] T. Tudorache, J. Vendetti, and N. F. Noy, "Web-protege: A lightweight owl ontology editor for the web." in *OWLED*, Vol. 432 (2008).
[38] C. Bizer, T. Heath, and T. Berners-Lee, "Linked data-the story so far," International journal on semantic web and information systems **5**, 1–22 (2009).
[39] T. Berners-Lee, "Giant global graph," Decentralized Information Group Breadcrumbs , 6–11 (2007).
[40] M. Horridge, "Review of protege and protege-owl," Ontogenesis (2010).
[41] R. Fabbri, "Python script to construct OPS OWL code,".
[42] "Git repository for OPS and related resources: article, script, OWL files, images, etc." https://github.com/ttm/ops, accessed: 2015-01-10.

TABLE V. Glossary for current article

term	meaning	further information
OPS	Ontology of Social Participation	Acronym from the Brazilian name: Ontologia de Participação Social
VCPS	Common Vocabulary of Social Participation	Acronym from the Brazilian Vocabulário Comum de Participação Social
OWL	Web Ontology Language	for authoring ontologies
SparQL	SparQL Protocol and RDF Query Language	an RDF query language
BFO hline DBpedia	Basic Formal Ontology DBpedia is a crowd-sourced community effort to extract structured information from Wikipedia	an upper ontology supporting information retrieval, analysis and integration in scientific and other domains consists of an ontological organization and data
FOAF	Friend Of A Friend	an ontology devoted to linking people and information using the Web, FOAF is a core ontology of the web semantic/linked data academic community
ICT	Information and communications technology	often used as an extended synonym for information technology (IT)
HTML	HyperText Markup Language	the standard markup language used to create Web pages
Node.js	an open source, cross-platform runtime environment for server-side and networking applications	applications are written in JavaScript
Facebook	an online social networking service	-//-
W3C	World Wide Web Consortium	the main international standards organization for the World Wide Web
SKOS	Simple Knowledge Organization System	a W3Crecommendation designed for representation of thesauri, classification schemes, taxonomies, subject-heading systems
Etherpad	a web-based collaborative real-time editor, allowing authors to simultaneously edit a text document	-//-
OGP	Open Government Partnership	an international organization promoting multilateral initiative and seeking strong commitments from participating government institutions to promote transparency, increase civic participation, fight corruption, and harness new technologies to make government more open, effective, and accountable
IRI	Internationalized Resource Identifier	a new internet standard to extend upon the existing uniform resource identifier (URI) scheme, where IRIs are always utf-8
URL	Uniform Resource Locator	also known as a web address, particularly when used with HTTP
NGO	Non-Governmental Organization	a term commonly used for an organization that is neither a part of a government nor a conventional for-profit business
HTTP	Hypertext Transfer Protocol	an application protocol for distributed, collaborative, hypermedia information systems. It is the foundation of data communication for the World Wide Web
OPa	Participa.br Ontology	from the Brazilian name Ontologia do Participa.br
OCD	Cidade Democrática Ontology	from the Brazilian name Ontologia do Cidade Democrática
Ontologiaa	AAOntology from the Brazilian name Ontologia do AA	
OBS	Social Library Ontology	from the Brazilian name Ontologia da Biblioteca Social
Pubby	A Linked Data Frontend for dereferencing URIs	-//-
RDF	Resource Description Framework	a standard model for data interchange on the Web
MySQL	a widely used open-source relational database management system	-//-
AA	Algorithmic Autoregulation	a platform for personal transparency, sharing ongoing work and proving dedication
Cidade Democrática	a Brazilian civil society participatory portal	-//-
Participa.br	the Brazilian federal participatory portal	-//-
OnTop	a platform to query databases as virtual RDF graphs using SparQL	-//-
Quest	the SparQL engine/reasoner that comes with OnTop	-//-
OBDA	Ontology-Based Database Access	a general term for accessing databases through ontological criteria
UNDP	United Nations Development Programme	the United Nations' global development network
UN	United Nations	an intergovernmental organization to promote international cooperation
VBS	Social Library Vocabulary	from the Brazilian name Vocabulrio da Biblioteca Social
LOD	Linked Open Data	a human legacy of open and linked data
Serpro	Brazilian Federal Service of Data Processing	the biggest government-owned corporation of IT services of Brazil
Python	a widely used general-purpose, high-level programming language	known as an easy scripting language among researchers, developers and hackers