Openness as an Asset. A Classification System for Online Communities Based on Actor-Network Theory

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ABSTRACT

There exists a lack of consensus among scholars about the definition and categorization of technology-mediated communities. If these divergences hamper the possibility to devise a unique definition of online communities, some *principia divisionis* can nonetheless be found, in order to handle heterogeneity.

Drawing upon case studies selected from Ars Electronica's Digital Communities competition, this paper analyses the limits of the categorization variables traditionally used to classify online communities, and proposes a new classification system made of two variables measuring the "openness" of the community. The first variable enacts Actor-Network Theory's distinction between mediators and intermediaries, while the second considers the degree of openness of the regimes of access and visibility enabled by groupware architectures.

On-field evaluation of this classification system shows three advantages: since it is based on the abstract criterion "openness", it does not arbitrarily reduce the richness of the techno-social world, but rather allows researchers to cluster few types of online community. In addition, it is of some merit in tracking innovation in techno-social assemblages.

Categories and Subject Descriptors

K.4.m [Computers And Society]: Miscellaneous
H.5.3 [Information Interfaces And Presentation]: Group and Organization Interfaces --- Collaborative computing, Evaluation/methodology, Organizational design, Theory and models, Web-based interaction, WEB;
H.1.m [Models And Principles]: Miscellaneous

General Terms

Measurement, Design, Theory.

Keywords

Open online communities, classification variables, ANT, innovation, textual account, groupware architecture, membership.

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1. INTRODUCTION

Early research on online forms of collaboration and knowledge production used to look at the notion of "online community" (OC) as underpinned by a kind of "ethical substance". This early criterion tended to distinguish homogeneous computer-mediated groups from other techno-social aggregations not based on solidarity [36] [38]. With the popularization of the Internet and the advent of social software platforms, though, OC extended in scope [46], as well as in the range of potential shared interests [2], so that today it is not clear anymore whether there exist ties that are specific enough to be called "communitarian".

The efforts to devise categorization variables that could help handle such multi-faceted objects of study have been characterizing the work of scholars at the confluence of HCI, Internet marketing and social sciences, e.g. [22] [26] [31] [34] [44]. These categorizations have relied mainly on data collected from direct observation like, e.g., the profit/non-profit character of the community, the relationship to a physical community, the presence of a specific focus of interest, and the type of technologies supporting them. I argue that OC do indeed need systems of classification that allow researchers to handle them, but, following an Actor-Network Theory approach, a similar classification system should follow more theoretically-grounded criteria.

In this paper I present arguments that call into question the variables that have been traditionally used to classify OC. Drawing upon case studies selected from Ars Electronica's Digital Communities competition, I will show that, while being ambiguous, these categorization variables prevent researchers from reducing heterogeneity and identifying few types of OC. I will thus propose a classification system based on two theoretically-grounded variables: Actor-Network Theory's distinction between mediators and intermediaries, and the degree of openness of the regimes of access and visibility enabled by software.

I will then evaluate the proposed classification schema. Results will highlight three advantages deriving from the use of this schema. In addition, they will reveal that in the last years the OC analyzed have shown an "inertial tendency to closeness" as far as the social rules embedded into groupware architecture are concerned.

2. BACKGROUND AND RELATED WORK

Since their first appearance in Howard Rheingold's book in 1993 [36], "online communities" have been constituting the most successful discourse explaining forms of techno-social

collaboration and knowledge production. Social researchers have shown remarkable interest in OC because of their decentralized non-hierarchical organizational model exportable to the emerging net economy [40]; as examples of grassroots self-organized groups sustained by mechanisms of consensus based on reputation; as sites of innovation production and dissemination. OC have thus become a sort of "living laboratory" for the study of how human beings aggregate, collaborate, develop innovation and a sense of belonging [21] [42] [43].

One thread of such scholarship has elaborated classification schemata to help the design and management of, and the research on, OC. Lazar and Preece [26] provided one of the first overviews on this regard. According to these authors, up to that moment four different schemata for classifying OC had been proposed. Communities had been classified according to:

1. their **attributes**. E.g., a shared interest [47], social and linguistic conventions [35], population size [6], strong emotional ties and support among members, shared activities and resources;
2. the type of **software** supporting the community. E.g., listserver, newsgroup, bulletin board, Internet Relay Chat, Multi-User Dungeon [20];
3. their relationship to **physical communities**. Three types of OC had been identified: those that are based on physical communities, those that are somewhat related to physical communities, and those that are not based on any physical community;
4. the degree of "**boundedness**". i.e., how many social relationships remain within the defined population of a community [45].

Similar criteria return also in more recent attempts to propose classifications [31] [34], with HCI researchers focusing on interface design [44], marketing researchers focusing on the presence (or lack) of a community's purpose to generate revenues [23], social scientists stressing some attributes like the relationship to physical communities, the common shared interest, emotional ties [38], the structure of the interaction, i.e. the distinction between groups and networks [46].

As a matter of fact, researchers had a tendency to classify OC starting from the variables that are most relevant to their disciplines [34]. Variables are often based on pre-existing knowledge and, since they are mainly categorical, they cannot help researchers to reduce heterogeneity by identifying few types of OC. E.g., the classification of communities upon their use of listservers rather than newsgroups, bulletin boards, IRCs, etc. is based on categorical variables, rooted into the information system vocabulary, whose utility is no more self-evident.

On the other hand, the recent developments in social software and UGC platforms suggest the obsolescence of many of the categories underpinning those classification schemata. First, an ever-widening meaning of community is ascribed to the meaning of OC. There is a clear **etymological trend** in the successive variations of this expression: it goes from the most specific meaning of the early underground scene to the most comprehensive one [46]. "Online communities" have been ranging up to include almost every form of aggregation through ICT: collaborative tagging, blogging, bookmarking associate objects as well as digital *personae*. On the one hand, this evidence interrogates **whether there exist ties that are specific enough to be labelled** "**communitarian**"**.** On the other hand, it questions the distinction between human beings and objects, and asks whether it is possible to **extend agency to technological artefacts**. Thus, a distinction among types of agency exerted by technologies would be more revealing of current communities, than a distinction among types of technology.

Second, OC have been growing in popularity as the range of potential **shared interests** has widened. If the Berkshire Encyclopaedia of Human Computer Interaction indicates digital divide's reduction, open access to ICT, community empowerment and revitalized democracy as issues that were addressed by "cybercommunities" during late 1990s, with social networking sites (SNS) it has become hard to identify an explicit interest focus that expands beyond sociability itself. If early OC were glued together by a common mission, today "the interest focus cannot be considered a prolific category for research" [31]. Likewise, Boyd and Ellison [2] argue that SNS mark a shift from interest-centred networks to **me-centred networks**, and that this shift mirrors a new organizational structure of OC.

Third, pervasive computing and smart mobs [37] show much more variegated ways to articulate the **dichotomies /individual Vs. collective/** and **/physical Vs. virtual/** than it was postulated by early research on OC. More generally, the categorization variable based on the relationship to physical communities does not take into consideration the physical interactions taking place at many levels, e.g. among those who run the community as administrative or technical team.

Fourth, as far as the "boundedness" attribute is concerned, by running a Boolean search across written accounts by OC spokespersons, a recent research [33] has found not only that "**group**" and "**network**" are not mutually exclusive terms, but also that they occur very often together in the accounts elaborated by social actors directly involved in communities. These results show that **loose networks** are not the dominant form of sociability when it comes to community ties online. Rather, they are inter-changeable with models of sociability which social actors label as "groups".

Given all these pieces of evidence, new classification schemata to help research on OC are much needed. A similar classification system should 1) avoid outdated or **anecdotal variables**, 2) be applicable to a **wide range** of cases, 3) be enough **abstract** to do not stick to a specific discipline's interests, 4) help researchers to **reduce heterogeneity** by identifying few types of OC. 5) Furthermore, a similar system should provide a framework for researchers to identify techno-social aggregates that produce **innovation.**

The overall goal of this paper is thus *to develop a similar classification system for OC*. To do this, I first need to identify a general principle that can nonetheless be measurable.

3. A CLASSIFICATION SCHEMA BASED ON OPENNESS

Science and Technology Studies (STS), and **Actor-Network Theory** (ANT) in particular have developed epistemological tools that can be used to address the five requirements set above. First, when dealing with transient, opaque objects of studies, ANT

suggests that there are no specific social groups to be preferred over another [25]. By following the above suggestion, this classification system does not make in advance any specific choice regarding any type of social aggregation (e.g., it does not set "network" rather than "group" as the best social assemblage to start with). For the same reason, it does not take into account any classification based on intended targets or contextual domains. Rather, types of groups will be found *a posteriori*, as the result of an analysis using abstract criteria.

Second, according to the STS approach focused on situated action, the presence of the social cannot be postulated once and for all, but needs to be demonstrated each time anew. In particular, ANT argues that social groups are not inertial, but they need to be constantly maintained by group-making efforts. This insight fits the goal of this paper, since on the Internet **instability of group boundaries** is the norm. For the purpose of this article, I thus replace the focus on type of technology with a focus on **how code contributes to keep up group boundaries**. Following STS' definition of the Social as "a movement that can be seized indirectly when there is a slight change in one older association mutating into a slightly newer or different one" [25, p. 36], this classification system does not look for peculiar ties that can be named "communitarian", but investigates how **groupware architecture** allows members and non-members to move into and out of techno-social assemblages.

Third, differently from HCI's focus on immediacy, STS have adopted the notion of "mediation" [1]. Latour distinguishes "**mediation**" – a relationship where objects, too, can make a difference in some other agent's action, from "**intermediation**" – a relationship where tools just transport agency from one pre-existing point to another pre-existing point [24] [25]. While with intermediation the inputs are enough to define the outputs, mediation exceeds its inputs and cannot be reduced to a relationship of cause-and-effect. For instance, saying that "access to information empowers communities" [12] implies a one-step causation model where ICT are intermediaries that limit themselves to transport information from one point (the source) to another (the community). On the contrary, saying that "a mobile device has proved to be helpful in expanding the project" [16] extends agency to the device, seen as a mediator in its own right. This paper adopts the dichotomy /mediator Vs. intermediary/, and distinguishes between accounts wherein **ICT** are treated as mediators and accounts wherein they act as mere intermediaries.

Above all, enabling research to track innovation in OC, this classification proposal provides a framework to evaluate whether a community fits Michel Callon's definition of **actor-network**.[1] This definition identifies an actor-network as an **open** network, an assemblage that has potential for change and innovation, one that keeps the procedures through which it gets assembled porous, one that redefines its "identity and mutual relationships in some new way and brings new elements into the network".

Therefore, this proposal sets **openness** as the abstract principle underpinning the classification schema. Developing a similar classification schema nonetheless requires variables that can be measurable.

3.1 First *Principium Divisionis*: "Length of the Chain of Action"

The first variable is related to ANT's distinction between mediators and intermediaries and can be measured by the **proportion of mediators against intermediaries** in the accounts whereby community spokespersons "bring their community into existence" [25].[2]

Latour suggests a criterion for assessing the accuracy, objectivity and truthfulness of a textual account.[3] A good account is "one that traces a network, a string of actions where each participant is treated as a full-blown mediator" [25, p. 128]. Since good accounts are those that bring networks into existence, and because of ANT's definition of network, good accounts are thus **those that bring open networks into existence**. Therefore, Latour's criterion for assessing the quality of a textual account is adopted here for the purpose of devising a new classification system that can identify open OC. I propose to label this variable "**length of the chain of action**" (**LCA**).

On the "**short chain**" side are those accounts that number more intermediaries than mediators. These accounts draw a short concatenation of actions: there are few "passages" between the cause and the effect, and technologies are depicted as intermediaries which merely transport agency, without making any difference in the course of action. In other terms, these accounts tend to depict the relationship between ICT and society in terms of simple causation. They also describe community as a stabilized entity whose boundaries are taken for granted.

A community-based e-literacy program from the dataset introduced below provides a perfect example of a chain of action which is arbitrarily short-cut before agency is fully unfolded.[4]

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[1] "The actor network is reducible neither to an actor alone nor to a network. Like networks it is composed of a series of heterogeneous elements, animate and inanimate, that have been linked to one another for a certain period of time… But the actor network should not, on the other hand, be confused with a network linking in some predictable fashion elements that are perfectly well defined and stable, for the entities it is composed of, whether natural or social, could at any moment redefine their identity and mutual relationships in some new way and bring new elements into the network" [3, p. 93].

[2] I am referring here of course to the argument according to which transformations and agency are visible only once they reach a narrative form through "accounts". I cannot account here for the semiotic, literary and, generally speaking, post-modernist literature underpinning this argument. I will thus limit myself to quote the work of Bruno Latour on social assemblages [25], which can be seen as a compendium of much of that literature.

[3] "Textual accounts are the social scientist's laboratory and if laboratory practice is any guide, it's because of the artificial nature of the place that objectivity must be achieved on conditions that artefacts be detected by a continuous and obsessive attention. […] If the social is something that circulates in a certain way […], then it may be passed along by many devices adapted to the task – including texts, reports, accounts, and tracers. It may or it may not. Textual accounts can fail like experiments often do" [25, p. 127]

[4] "The process of providing the skill sets shall lead to the creation of a long lasting relation between the IT-centres and the families in the catchment, which on a macro level will generate a state wide data warehouse and repository" [12].

While the theory of action is underpinned by an overtly causal relation (i.e. providing skills creates relationships which in turn generate a repository – a 3-step chain), there are no traces of the **means whereby** the long lasting relationship between the centres and the families is supposed to be maintained, nor of how/whether ICT exert any agency.

On the "**long chain**" side, on the contrary, are those accounts that include more mediators than intermediaries. These accounts dwell on the most minute interchanges through which a community emerges as the result of many concatenations; they describe community as an unstable entity whose boundaries are simply not traceable once and for all because of the ceaseless proliferation of mediators. These are accounts that describe the relationship between technologies and social ties as a long chain of action where each mediator makes a difference.

A good example in this regard is provided by an offspring of a cultural exchange program between Austrian and Zimbabwean artists (see below).[5] Here traditional music acts as a powerful mediator and translates agency from the "short blow on an antelope horn" into a binary, digital sound. It is traditional music and mobile media that keep the Tonga community united in spite of the diaspora.

3.2 Second *Principium Divisionis*: "Degree of Visibility of the Outside"

The second variable focuses on **code** as another form of text that can bring a community into existence, and addresses the question on how software can not only bring a community, but also an actor-network into existence, in a similar way as (good) textual accounts can do.

Like accounts, and even more evidently, groupware architecture embodies the procedures whereby a digital assembly is gathered, and its boundaries crystallized. As Clay Shirky has pointed out, social software is "political science in executable form" [41]. In other words, code brings a community into existence by articulating **regimes of access and visibility**: groupware architectures make some online activities accessible and visible only to members, while some other activities are also accessible and visible to non-members.

So, when does software bring a close community into existence, and when does it shape an open actor-network? Boyd and Ellison [2] have shown that in SNS it is the structural variation around visibility and access of profiles that articulates different regimes of inclusion/exclusion. Furthermore, Masanès [30] argues that UGC platforms design differences among themselves in terms of the potential to access a number of functions as non-members. Finally, Lovink and Rossiter provide an analysis of weblogs that associates the regimes of visibility and access to the issue of openness [29]. According to these scholars, systems where the non-Friend, the non-member, the **Other** is structurally kept outside and remains invisible are to be considered closed.[6]

For the purpose of devising a new classification system for OC based on openness, I propose to set a second variable and to label it "**degree of visibility of the Outside**" (**DVO**). As textual accounts can or cannot trace a network where new elements pop-up at any time, in a similar vein code can or cannot **plan in its design the potential for the Outside to access the community and be visible**. As in "good" textual accounts the dichotomy Addresser/Addressee loses relevance and "the definition of the 'outside' has been dissolved and replaced by the circulation of plug-ins" [25, p. 214], so open groupware architectures can help avoid the dichotomies /membership Vs. otherness/, /inside Vs. outside/. Similar architectures would establish the potential for the Outside (guests, non-members) not only to access the assemblage, but also to interact with it and to leave a **publicly visible trace** of the interaction.

According to this definition, examples of completely open architectures are un-moderated forums and subscription-open mailing lists, which allow a high degree of participation and visibility of non members. On the contrary, "contact us" forms that generate private flows of communication to the website manager do not leave a publicly visible trace of the interaction, even if also a non-member can submit a message. Yet, between closed web forms and un-moderated forums there are many intermediate technologies which articulate different procedures whereby non-members can acquire membership, as SNS show. As a consequence, this criterion should be seen as an **ordinal variable**.

4. METHOD

Having proposed a new classification system for OC based on the abstract principle "openness", I am now going to test it by verifying whether it fits the requirements discussed above. That is – apart from those that have already been explicitly taken into account when discussing the proposal – if it helps researchers to track innovation and to reduce heterogeneity by identifying few types of OC.

4.1 Choice of the Sample

I tested the classification system by drawing upon a set of selected case studies. For what I discussed above, I had first to choose samples of OC that could provide me with data extracted both from **textual accounts** by spokespersons and from their **websites**. If websites are easy to be retrieved, textual accounts are activities of group formation where meaning emerges from comparison or controversies: meetings, trials and plans in science labs, distance in time and/or space, breakdowns, archives and museum collections, fiction [25].

I chose as case studies the entry forms submitted to the world's largest OC competition: **Ars Electronica's Digital Communities**

[5] "It appears that the Tonga people's understanding of digital technology has its roots in their musical tradition. […] A mobile device called Alpha Smart has proved to be very helpful in expanding the project beyond the centres. […]. People will use it to provide and collect messages and digital reflections on the effects of the project extension and send them frequently onto the website. These contributions will create a kind of social intervention sculpture by addressing stakeholders and the general public" [16].

[6] "The fact that I do NOT link to you remains invisible. The unanswered email is the most significant case. So while the blog has some characteristics of the network, it is not open, it cannot change, because it closes itself to the potential for change and intervention" [29, p. 8].

competition.[7] Competitions constitute a primeval form of controversy, an arena where meaning emerges from **comparison** among projects which struggle in order to be recognized as innovative OC. Furthermore, entry forms submitted to competitions are ideal cases of textual accounts: they present some recurring elements like a **spokesperson**, **anti-groups** and **boundaries**. In the case of AE's Digital Communities, competition is the place where online networks hit representation: it constitutes the moment when spokespersons must emerge and – together with them – self-representations and opponents, in an unstable process of techno-social innovation. Finally, the submission forms had been archived by Ars Electronica over the years. Extracting data from an **archive** allowed me to compare submissions from 2004 to 2007.

Of all the entry forms stored in the archive which were admitted to the competition by the International Advisory Board and the jury (920 cases), for the purpose of this paper I selected eleven projects awarded with first or second prize over four editions of the festival.

4.2 Data Collection and Analysis

To test the first variable (**LCA**), I used textual analysis techniques of data collection and analysis. Since they were process-produced data,[8] entry forms had to undergo a process of adaptation. To make them widely accessible for further analyses that could use textual analysis software, I chose to recode data in a format and codification that are readable by the largest number of textual analysis applications (.txt format, ASCII ISO 8859 – 1 codification).

I then proceeded with analytical partition and text classification procedures. I subjected textual accounts to a set of questions gathered in an **analysis sheet** (see Table 1). The analysis sheet is composed of descriptive categories and operative questions meant to isolate elements that could help distinguish mediators from intermediaries. These elements stemmed from Latour's list of five elements always present in controversies about groups [25, p. 30-4], his definition of mediator and intermediary, and Greimas' distinction between Addresser and Addressee [7]. I tested the analysis sheet on 1/3 of the sample. I then moved to the proper analytical phase: I isolated and coded parts of the texts that "responded" to the operative questions. At the end of each session, I indexed all extracts on the third column in the analysis sheet (see Table 1).

Once I had the results for each actant – be it human or technological – I compared the answers and evaluated whether it was depicted as a mediator or an intermediary. I then weighed the number of mediators against the number of intermediaries for each entry form, and attributed the value "brief chain" or "long chain" to the whole form.

Table 1. Analysis sheet for textual analysis of accounts

Descriptive categories	Operative questions	Index
Goals	What is the goal(s) that the project aims at achieving?	A1
Source of boundaries	To what element does the entry form appeal in order to depict the community as a stable, taken for granted assemblage?	A2
Addresser	Is there any entity that designed/developed the project?	B1
Addressee	Is there any identifiable target of the action of the Addresser? Are Addresser and Addressee clearly distinguishable?	B2a B2b
Anti-groups/anti-actants	Are there anti-actants that interfere with the course of action in a negative way?	B3
Actants as mediators Vs. intermediaries	Is there any entity that contributes with some competences to the course of action? Does the actant trigger further actions? Does it activate new participants? Does it introduce a bifurcation in the course of action? Does it 'transport' (shift) or 'translate' (modify) what it is supposed to carry? Is the output predictable starting from the input? Does the actant determines some other event? How many passages is the chain of action composed of?	B4 B4a B4b B4c B4d B4e B4f B4g

In order to test the second variable (**DVO**), I had to analyse the communities' websites.[9] To collect data, I navigated through their websites and wrote down a list of all the communication technologies implemented (second column in Table 2).

Among these technologies, I then selected those allowing users to interact with the community and to **leave publicly visible traces of their interaction** (third column in Table 2). To identify this subset of technologies, I myself acted like a guest and accessed all the facilities provided by the websites, each time exploring the boundaries embedded into the groupware architecture. Among these interactive technologies, in fact, some allow **only members** to interact, others allow **also guests** to participate, still others allow guests to register online and to **become members**, either without asking for specific requirements, or by anchoring the

[7] On Ars Electronica Festival as the world's leading competition not only for OC, but for digital arts at large, see [27]. For a close examination of Ars Electronica's DC competition and judging criteria over the years, see [33].

[8] I.e., information produced during ordinary social processes for other purposes than research [5].

[9] There is a temporal gap between the moment when accounts were written for competition purposes (from 2004 to 2007) and the moment when the websites underwent my observation (in 2007-8). However, as a member of AE's Advisory Board, I had had the opportunity to inspect the websites even at the moment of the submission. Therefore, when I came back to the websites in 2007 I realized that only minor changes had intervened.

registration to data related to the physical domain (passport, ID, health insurance number, etc.).

Each set of interactive technologies implemented in a website can thus be seen as establishing **peculiar regimes of access and visibility**. These regimes can be ordered in terms of the degree of visibility granted to the contributions submitted by the tester-researcher acting as a guest. I set five values for the DVO ordinal variable:

1. "invisible", non-members cannot interact at all
2. "very low", non-members can access very few interactive technologies
3. "rather low", non-members can access few interactive technologies
4. "rather high", non-members can access a considerable number of interactive technologies
5. "very high", non-members can access most interactive technologies.

I thus ranked each website according to these five values (fourth column in Table 2).

Table 2. Analysis of websites according to the DVO variable

	Technologies used	Interactive technologies	Degree of visibil. of Outside
Case 1	HTML pages; News feed; Discussion forum; Contact form; Newsletter; A/V streaming	**Discussion forum**: read-only for guests, submission-open for members. Online registration allowed	Very low
Case 2	…	…	…

5. RESULTS

In this section, drawing upon the case studies selected from Ars Electronica's DC archive, I show the limits of the criteria traditionally used to classify OC. I then present the results of the evaluation of the classification schema proposed in section 3.

5.1 The Limits of Traditional Variables

An observation of the case studies selected provides data that call into question the variables traditionally used to classify OC.

On the one hand, the observation of the entry forms reveals the ambiguity of the variables discussed in section 2. Basically, these variables try to constrain the richness of the social world into *a-priori*-defined, discipline-related categories. Some examples can explain this point. First, it is not clear what degree of specificity is required to identify a **focus of interest**. For instance, the project *Telestreet/NGVision* [9] – the Italian network of independent micro TV stations broadcasting on a neighbourhood scale, and the video archive that distributes their videos via p2p networks – fosters universal access to media-making. Thus, it does not address a specific focus of interest, since media-making is a sort of meta-skill that can be deployed to address different issues. At the same time, one could see "open access to media-making" as a broad focus of interest, as well.

Second, the **profit/non-profit nature** cannot be defined exclusively in terms of monetary revenues. On the one hand, some non-profit projects depend upon multinational corporations for their sustainability, and provide them back with an image of "social accountability". This is the case of projects like *Proyecto Cyberela-Radio Telecentros* [13] – a Brazilian initiative aimed at developing women's leadership through web radio-making – and *Overmundo* [18] – a web 2.0 platform with the goal of promoting Brazilian culture in all its complexity. On the other hand, some for-profit initiatives cannot rely upon any other economical support than their position as intermediaries (or, better, mediators) in the information production chain. *dotSUB* [8] – a web facility for subtitling citizens videos, based on a publicly accessible database of .sub files – manifests such behaviour.

Table 3. Analysis of case studies according to orientation to business, relationship to physical community, focus of interest

	Profit/Non-profit	Relation to physical comm	Specific focus of interest
Tonga.Online – smart X tension	Non-profit	Also offline	No
Akshaya	Profit	Also offline	No
Projecto Cyberela – Radio Telecentros	Non-profit	Also offline	Yes
The World Starts With Me	Non-profit	Also offline	Yes
canal*ACCESSIBLE	Non-profit	Mainly online	No
Electronic Frontier F.	Non-profit	Mainly online	Yes
Free Software Found.	Non-profit	Mainly online	Yes
Telestreet/NGV	Non-profit	Also offline	No
Overmundo	Non-profit	Mainly online	No
Open Clothes	Profit	M. online	Yes
dotSUB	Profit	M. online	Yes

Third, when considering the "**Relationship to physical communities**" variable, one can observe how it registers a state of the world, without considering how that state has got crystallized, or the physical interactions taking place at many levels in an OC. The mediators who participate in community activities are not only users interacting online on the web platform, but also people and technologies initiating the community and assuring its smooth-running in the back-office. For instance, the Overmundo entry form stresses the fundamental role of face-to-face interactions between the community initiators and Petrobras, the main funding partner, in the establishment of the community.

On the other hand, classifying the dataset according to traditional variables does not enable the **clustering of communities** into few

types.[10] Traditional variables like "Focus of interest" and "Type of technology" are un-ordered categorical variables. In turn, even if I reduce them to dichotomies, the analysis does not reveal any relationship among the variables. Lack of correlation in my dataset can be noted in Table 3; a further analysis using the phi coefficient method to test any correlation shows the following outcomes. As Table 4 shows, the phi coefficient is closed to 0 (no relationship, random pairing of values) for all pairs of variables.

Table 4. Correlation between "orientation to business", "relationship with physical community", "focus of interest" variables. Phi Correlation method

	Profit goal (yes/no)	Relation with phys. comm. (yes/no)	Single focus of interest (yes/no)
Profit goal (yes/no)	1	**-,149**	**,149**
Relation with physical community (yes/no)	**-,149**	1	**-,267**
Single focus of interest (yes/no)	**,149**	**-,267**	1

This means that the "Profit/non-profit", "Relationship to physical community" and "Presence of a single focus of interest" dichotomous variables do not show significant correlations. As a consequence, these traditional criteria prevent researchers from clustering few types of OC to reduce heterogeneity.

5.2 Testing the Classification System Proposed

In this subsection I present the results of the on field evaluation of the classification system proposed in section 3. To test the system I analysed the case studies following the method discussed in section 4.

As to the LCA variable, six OC were given the **value "long chain"**. These are Overmundo, Telestreet/NGVision, dotSUB, the *Free Software Foundation* [15] – the world renowned movement fostering free software development, *Tonga.Online-smart x tension* [16] – a community-based Internet centre based in the remotest areas of Zimbabwe, *The World Starts With Me* [10] – a digital learning environment on sexual health education based in East Africa.

These case studies depict community as an actor-network: mediators are more than intermediaries, the chain of action is well-deployed, and each mediator activates other participants (see Table 1). In addition, in these accounts the dichotomy Addresser/Addressee inherited from mass-media theory loses relevance. The broadcast model is replaced by a model where the two actors of a communication process (i.e. "sender" and "receiver") cannot be clearly distinguished, since each mediator plays both roles at the same time (i.e. it activates other participants). As a consequence, in these cases community boundaries have not been black-boxed yet.

The following five projects were given the **value "brief chain"**. They are Proyecto Cyberela-Radio Telecentros, *Akshaya* [12] – a Government-led project to reduce digital divide in the Indian state of Kerala, the *Electronic Frontier Foundation* [14] – the champion of the independence of cyberspace, *Open Clothes* [17] – a Japanese network of producers, users and contractors in the garment industry, *canal*ACCESSIBLE* [19] – a geo-referenced cartographic system embedding the point of view of urban minorities.

These cases depict communities as stabilized assemblages: intermediaries are more than mediators, elements are usually linked through relationships of cause-and-effect and the chain transporting action often consists of a couple of actants only (the cause and the effect), ICT are conceived of as mere intermediaries that transport agency without interfering with the output. Furthermore, an association between shortness of the chain of action and relevance of the dichotomy Addresser/Addressee can be noticed: in these accounts communication follows a broadcast-like model where the stabilized community acts as Addresser to an audience. As a consequence, the inside/outside dichotomy maintains a relevance: group boundaries tend to be stable and taken for granted.

As for the DVO variable, four OC' websites were given either the **value "invisible"** or the **value "very low"**. In these cases, the design of the regimes of access and visibility does not/only to a very low degree provide the possibility for non-members to interact online. Akshaya's and Proyecto Cyberela-Radio Telecentros' websites implement mainly broadcast technologies (html pages, video and radio streaming or download, document publishing): in these cases, both guests and members are invisibles. The case of The World Starts With Me is slightly different: members can interact on the discussion forum, whereas online registration is not allowed. A similar politics of enclosure is adopted by Tonga.Online-smart X tension, with the remarkable difference that here online registration is allowed.

A politics of access that fosters a **"rather low" value** is shown by the Electronic Frontier Foundation's website. In this broadcast-like model, an editorial staff produces information that users are supposed to consume and propagate throughout. Wiki technologies are implemented only when it comes to software co-development. Open Clothes' website was ranked "rather low", as well. The website shows a vast array of participatory tools: from a bulletin board to a selling platform, from members' showcase to a newsmagazine open to contributions by members. However, these possibilities of interaction are restricted to members, and membership cannot be acquired online.

Four websites were given either the **value "rather high"** or the **value "very high"**. In these cases groupware architecture allows non-members to interact online to a very/rather high degree. In the Canal*ACCESSIBLE's website a discussion forum is open for comments and posting does not need registration. In the FSF's website, access to software development and group organization facilities – the core activities of FSF – is open also to non-members. Notably, the Free Software Directory allows members and guests to download and rate software, submit a level, subscribe to mailing lists and IRC channels. A wiki aimed at

[10] If reducing the complexity of a typology to few types is not necessarily a good thing in itself, it is also true that the widening meaning of "online community" requires new conceptual tools to deal with multi-faceted techno-social assemblages, as it was discussed above.

facilitating the organization of regional groups focused on FOSS is open to guests, too. As a decentralized video subtitling platform, dotSUB allows guests to upload their own videos and subtitle other people's videos only upon registration. However, online registration is allowed and requires a digital identity (i.e. no ID number). Lastly, the Telestreet's website is almost completely open to contributions by users. In the news section, guests' comments are granted access without any need to register. Subscription to the mailing list is open. The discussion forum requires online registration, but it doesn't require ID. NGVision's p2p video distribution and ftp uploading functions are accessible not only to members, but also to guests.

The most complex regime of inclusion is probably shown by Overmundo. The website is constituted by a blog where everyone can read articles, whereas commenting, writing, revising and voting functions are restricted to members. This project articulates membership in a very complex way. First, online registration is allowed, but it requires sensitive data, like CPF or passport. Second, membership is not seen as a status, but as a **process of assimilation**: members have different voting weights and can exert different influences on the contents according to the length of their participation in the OC. It may be said that in the Overmundo community the Outside is invisible not only because it is not given access to interactive tools, but especially because it is transformed into an Inside. While non-members remain invisible, they are presented with the potential to be transformed into members. Overmundo's groupware architecture, in fact, admits non-members to undertake a process of accumulation of good reputation by registering, providing sensitive data and proving to be active netizens.

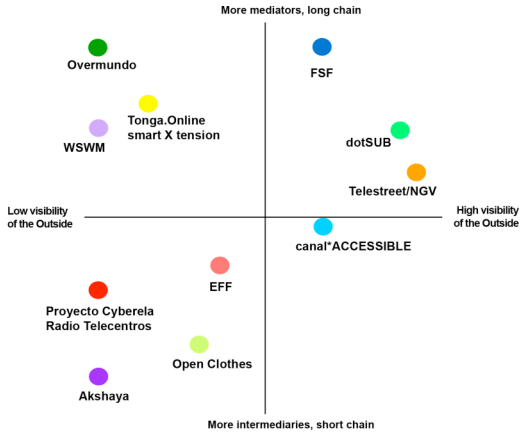

Figure 1. Map of winning Digital Communities according to LCA and DVO variables

If one visualizes the two variables respectively on a Y-axis and X-axis, four quadrants may be obtained (see Figure 1).

The quadrant on the upper-right side includes cases where the number of mediators in the textual account is higher than the number of intermediaries, and where non-members are allowed to access interactive technologies on their website. The quadrant of the upper-left side still represents cases where mediators are more than intermediaries, but here the groupware design leaves few or no room for external contributions.

Conversely, quadrants in the lower part of the map include cases whose textual accounts number more intermediaries than mediators: the chain of action is short, identities are stabilized and the traditional mass media distinction between Addresser and Addressee is relevant. Those projects whose groupware architecture does not design any visibility of non-members are included in the lower-left quadrant. Lastly, the lower-right quadrant includes canal*ACCESSIBLE, the only case whose account includes more intermediaries than mediators and whose website allows a rather high degree of visibility of non-members.

6. DISCUSSION AND CONCLUSIONS

The proposed LCA and the DVO variables have allowed me to distinguish four types of OC according to their **openness**, that is, the porosity of their **boundaries** set up through text and code. A classification system based on these two *principia divisionis* shows three main advantages. First, since it is based on the criterion "openness", it is more **abstract** than those based on focus of interest, relationship to physical communities, presence of business goals, or type of technology used. For this reason, it is applicable to a wider range of cases. Furthermore, it is not restricted to discipline-related variables, but rather enacts **meta-theory**.

Second, since it adopts ordinal, and not categorical, variables, it allows to cluster communities into **four typologies**, thus enabling researchers to bring some order into a widely variegated panorama.

Third, this system of classification has the merit of **tracking innovation,** even when it comes to communities that have been crystallized into standard submission forms for competition purposes. Innovation is hardly traceable through traditional categorizations that require to postulate well-defined classes before starting the research on field. These categorizations are unable to track innovation because innovation is exactly about contaminating existing classes by adding, subtracting or mixing elements. By focusing on openness and adopting **ANT's definition of innovation** as a process wherein elements move from one older assemblage into a new one, this classification schema provides a method to detect where innovation is more likely to happen.

This schema proposes to consider "innovative" those groupware architectures that remain open to the potential for change, those that maintain their boundaries porous, those where "the entities they are composed of, whether natural or social, could at any moment redefine their identity and mutual relationships in some new way and bring new elements into the network" [3, p. 93]. Similarly, this schema considers "open" those textual accounts which account for community as an assemblage "made to act by a large star-shaped web of mediators flowing in and out of it" [25, p. 217]. We may thus conclude that cases included in the upper-right quadrant are those that are more likely to innovate, that is, those that not only remain open to welcome new elements, but that also face the risk of losing some of their own elements.

On this regard, the cases included in the upper-right and lower-left quadrants in Figure 1 fit Paul Ricœur's distinction between **utopia** and **ideology**. According to Ricœur [39], utopia and ideology constitute the two extreme poles of the social *imaginaire*. While ideology tends to preserve the identity of a given social group, utopia aims at exploring new possibilities. Therefore, ideology and utopia are involved in a continuous tension between stability and change. In particular, the aggregates included in the **lower-left quadrant** could be considered as having reached the stage of

ideologies. Their principal aim is to assure the same preservation: few mediators appear in their accounts and software establishes impermeable boundaries. On the contrary, the aggregates included in the **upper-right quadrant** might be seen as lingering at the stage of utopias. They keep including external elements as mediators and have not yet closed their digital boundaries to the Outside.

Between these two poles, there are cases whose boundaries are partially permeable. Notably, in the upper-left quadrant there are those cases that account for community as an open actor-network, but their groupware architecture does not design forms of visibility for non-members. **UGC platforms** and **SNS**, like Overmundo, are classified here. On the one hand, access to non-members is strictly limited, on the other hand, membership – while being virtually easy to be obtained – is actually the final result of a process of assimilation: it is the capitalization of reputation strategies, participation, engagement.

As the literature on the correlation between system architectures and politics of information highlights [28] [29] [41], similar sites **embed into code the rules** that non-members have to follow in order to become members. As a consequence, access rules are not publicly negotiated among peer participants, as it used to happen with discourses on netiquette in early mailing lists and forums. Rather, the "openness" of the techno-social assemblage is articulated in a much more complex way than the dichotomy /open Vs. close / implies: it is subordinated to a process of status acquisition.

If applied further to wiki communities, this classification system brings one insight to their study. If we consider wiki software architecture in itself, wiki communities might find place in each one of the four quadrants in Figure 1. It is only when it comes to **situated techno-social assemblages,** brought to life by means of textual accounts and regimes of access and visibility, that it is possible to place them in one of the four quadrants. In other words, since this classification system purposely avoids deterministic correlations between software architecture and openness, a wiki community will not be placed *a priori* in one of the quadrants just because it allows to collaboratively produce **content**. It will be only after a careful analysis of the **procedures** – textual as well as at the level of code – through which people are legitimized to take part in activities of content production, that it will be given a place in one of the quadrants.

Lastly, the classification system proposed provides us with a further result. Looking at Figure 1, no correlation between the two variables LCA and DVO can be noticed: all four quadrants include some cases and none is empty. A further analysis using the Kendall's tau-c method statistically excludes strong correlation between the two variables. As Table 5 shows, the coefficient is 0,231 for the pair of variables, showing that only a **weak positive correlation** exists between them.

Table 5. Correlation coefficient between LCA and DVO variables (Kendall's tau-c method)

	Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Kendall's tau-c	,231	,331	,699	,484

The emptiness of the lower-right and upper-left quadrants, and a higher correlation coefficient, would have suggested a positive correlation between "good" texts and open groupware architectures. On the contrary, the correlation is weak: completely open architectures do not correspond to well-deployed accounts.

However, it should be noticed that the lower right quadrant includes only one case.[11] While cases showing a "brief chain" value for variable LCA tend to show also a "low visibility" value for variable DVO, cases showing a "long chain" value for LCA show either a "low visibility" or a "high visibility" value for DVO. It follows that cases whose entry forms follow deterministic explanations tend to develop websites where non-members have few or no opportunities to participate. Conversely, cases whose textual accounts are well-deployed do not assure for this sole reason a coherent degree of openness of the groupware architecture.

Following this result, it might be affirmed that it is more probable for OC in the dataset analysed to be brought into existence as an open actor-network when it comes to textual accounts, rather than when it comes to code. We might consider different explanations for this result. First, it could reflect effects of maturation. In their early stages, communities might be more open and solicit membership in order to reach a critical mass, while once critical mass is achieved, they might become more selective to avoid "tragedy of the commons" problems.

Second, the cases examined were submitted in a period (2004-2007) of considerable diffusion of UGC platforms and SNS, which are mainly located in the upper-left quadrant of my scheme. As a matter of fact, Tim O'Reilly coined the expression "Web 2.0" precisely in 2004 to indicate "applications that harness network effects to get better the more people use them" [32].

Third, if we label "fully open" those groupware architectures that do not reject *a priori* (i.e. at the stage of code development) the potentiality for non-members to enter the community, then we might conclude that in the dataset analysed **the field of the political constituted through software tends to exert more resistance** to new elements striving to enter the network than the one constituted through text. Further evidence should be brought to this hypothesis by extending the analysis to a wider portion of the sample. If further inquiry confirmed that the field of the political constituted through software shows an "**inertial tendency to closeness**", some noteworthy implications could be drawn. Notably, it would corroborate arguments according to which current ICT applications represent the beginning of a **phase of technological enclosure** [28] [32].

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