Mapping online creation communities: Models of infrastructure governance of collective action and its effects on participation size and complexity of collaboration achieved

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Abstract

Previous literature on democratic quality of political actors website and on the governance of online communities did not take attention to the role of infrastructure for collective action online. This paper presents an empirical analysis (based on 50 cases of online creation communities) on how infrastructure governance shape the community generated. First, the paper presents a mapping of online creation communities according to their infrastructure governance. The main axes of order in the infrastructure governance are open *versus* closes to community involvement in the provision organizing. Then, the other significant axes is knowledge policy which in term of infrastructure governance influences the level of freedom and autonomy of the collective action in regards to the infrastructure. According to these two axes five models of infrastructure governance resulted: corporate service, university network, representative foundations, mission oriented enterprises, and assamblearian self-provision. Second, the research provides an empirical explanation of the governance models which are most likely to succeed in creating large-size collective action in terms of the dimensions of participation and complexity of collaboration. Infrastructure governance based on closeness to community involvement in the platform provision and for profit strategies generates bigger communities. Instead, open to community involvement and non-profit generates smaller communities, even smaller if they are informal. Conditions which favor community freedom and autonomy generate smaller communities also, but interestingly, they resulted to be the conditions that increase collaboration among the participants.

I. Introduction

First studies on the Internet and politics mainly concentrated on well-established and traditional actors such as parliaments and political parties (Coleman, Taylor & Van de Donk, 1999; Norris, 2002; Trechsel, Kies, Mendez, & Schmitter, 2003; Römmele, 2003; Cuhna, Martin, Newell & Ramiro 2003; Gibson, Nixon, & Ward 2003; Gibson & Ward, 1998; Margolis, Resnick & Wolfe 1999). The debate was followed by an interest in empirical research on interest groups, NGOs and social movements (della Porta & Mosca, 2006; Navarria, 2007; Sudulich, 2006; Van Aelst & Walgrave, 2005; Vedres, Bruszt & Stark, 2005). From my point of view, the debate on the Internet and politics could benefit from expanding further to consider actors with mainly an online base. Following this reflection, this paper addresses collective action in the digital era with the empirical case of online creation communities (OCCs) and among them, those of global scale. The term OCC refers to a particular type of online community: those whose goal is knowledge-making and sharing. Online Creation Communities (OCCs) are a set of individuals that communicate, interact and collaborate; in several forms and degrees of participation which are eco-systemically integrated; mainly via a platform of participation on the Internet, on which they depend; and aiming at knowledge-making and sharing.[1]

A part of the interest of the OCCs linked to the growing socioeconomic importance of forms of knowledge-making in a knowledge - base society (Castells, 2000), the OCCs as examples of collective action offer an opportunity to see how various problems of democratic governance evolve and are solved in a digital environment. In other words, OCCs are interesting for what they can tell us about democratization more generally. OCCs can help us to analyze **how governance shapes and favors the handling of increases in size and complexity** in a context of the digital revolution and globalization in which the global dimension is larger in scope and the political agenda more complex.

Additionally, OCCs are an interesting collective action forms from two points of view. OCCs are interesting because they constitute spaces for civic engagement through the dissemination of alternative information and for participation in the public sphere which could contribute to enriching public discussion in a representative democracy. OCCs are also interesting from the point of view of the conditions in which citizens engage in the provision of public goods and services based on a *commons* approach that is the provision of public goods not necessarily linked to the state or other conventional political institutions. In this regard, in a context of transition in which the institutional

1 It might be worth mentioning that in new technologies of information (NTIs) research areas, including this paper, the term knowledge is used in a broad sense as information and data elaboration, and does not refer only to scientific knowledge. More concretely, knowledge-making in the framework of this paper is defined as *the process of creation and systematization of socially dispersed information and knowledge resources and cognitive capabilities resulting in evolving bodies of shared knowledge*.

principles of the nation state are in a state of profound crisis, and those of the private market are undergoing dramatic change, networks (Castells, 2001; Powell, 1990), commons (Ostrom, 1990) or commons-based peer production (Benkler, 2006) are forms which can provide insights for the building of institutions in a network society.

Researching OCCs

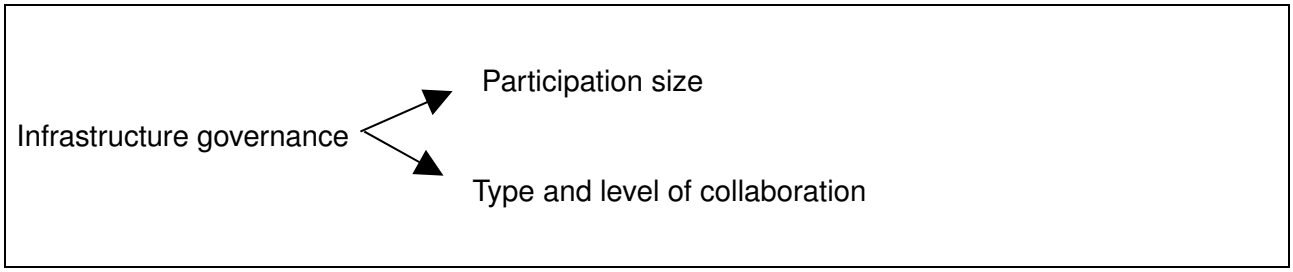
Some authors agree that if we regard OCCs as collective action, which on some occasions constitutes large performances and produces elaborate outcomes, a number of questions emerge (Eisenhardt & Santos, 2000; Patriotta, 2003; Tsoulkas, 1996). How can complex knowledge-making and sharing take place? How can dispersed activities nevertheless lead to the creation of a complex product such as software code or an online encyclopaedia? What are the basic mechanisms underlying the coordination of knowledge-making and sharing in OCCs, and where are they embedded? (Lanzara & Morner, 2003, 2006). In addition, in my doctoral research, the governance forms of the OCCs are explored.

In order to approach OCCs it is useful to make an analytical distinction between two spaces. On the other hand, there is a platform of participation where participants interact and which can grow enormously. On the other, there is a generally small provision body that provides the platform on which the community interacts. For example, the Wikimedia Foundation is the provider of the infrastructure within which the community of participants which build Wikipedia interact. NTIs lower the costs of established forms of collective action (Benkler, 2006). However, they still depend on interaction within an infrastructure. The provision of this infrastructure cannot be seen as a dysfunction or unimportant; instead it solves some of the questions this type of online collective action necessarily raises. For example, platform provision involves the control of servers and the domain name and other important components which sustain the interaction both technically and legally. Previous analyses of OCCs have dedicated little attention to this and infrastructure governance is considered a “backstage” question. In my view, in the analysis of OCCs’ governance there is instead a need to look at both spaces (community around the knowledge-making and infrastructure provision) and their particular connections, because both are important and have functions in the governing of OCCs.

A characteristic of the OCCs that contrasts with previous experiences of collaborative knowledge-making is the high quantitative jump in the number of people involved in the process. Historically, the local and small communities are presented as having better conditions for democratic organization. Local and small communities may develop control over decision-making processes more easily; information may more easily reach all members or participants and increase participation. However, OCCs are participative processes which are able, in some

occasions, to engage very large communities and develop very complex outcomes. This bring us to the question: how do OCCs organize and govern themselves in order to increase participation and collaboration in the achievement of their goals? The goal of this paper is to address the question*: does infrastructure governance shape the community in terms of participation levels, and type and level of collaboration? And, which organizational strategies for infrastructure provision lead to an increase in participation, and the complexity of collaboration* (see Figure I)?

Figure I: Analytical process



The first general hypothesis concerns whether infrastructure governance shapes the community generated. I hope to demonstrate that infrastructure governance shapes the community generated. In particular, I hope to demonstrate that infrastructure governance shapes the community in terms of size, and complexity of collaboration. If my expectations are confirmed by the empirical research, the research results will throw light on a limitation present in the current literature analyzing the democratic quality of political actors' websites (Davis, 1999; della Porta & Mosca, 2005, 2009; De Landtsheer, Krasnoboka, & Neuner, 2001; Navarria, 2007; Norris, 2003; Gibson, Nixon, & Ward, 2003; Römmele, 2003; Sudulich, 2006; Trechsel, Kies, Mendez, & Schmitter, 2003; Van Aelst & Walgrave, 2005; Vedres, Bruszt & Stark, 2005). These body of literature did not consider the dimensions of democratic quality linked to infrastructure governance, while I expect to throw light on its centrality.

My hypothesis on the impact of infrastructure governance in terms of shaping the community also questions the previous literature on the governance of OCCs. Most of the analysis on the governance of online collective action is focus on the interaction among the participants at the online platform (Burke & Kraut, 2008; Ciffolilli, 2003; Kittur, Suh, Pendleton, & Chi, 2007; Kriplean, Beschastnikh, McDonald, & Golder, 2009; Loubser & Pentzold, 2009; O'Neil, 2009; Reagle, 2005, 2007; Stadler & Hirsh, 2002; Tkacz, 2007; Viégas, Wattenberg & Mckeon, 2007)[2]; however, I expect to demonstrate that it is relevant when analyzing the governance of OCC to consider also the provision of the platform.

Finally, my analysis search to enrich Benkler's (2006) analysis of OCCs (or common-base

2 For a notorious exception on considering infrastructure governance for the FLOSS case see O'Mahony (2007).

peer production) as my research does not leave the infrastructure aspects as environmental institutional conditions; but integrates in the analysis the necessary interface of CPBB, with its environment and how it (and its governance) shapes community action.

The empirical analysis is based on a large N analysis based on a sample of 50 units, a codebook, the collection of digital data threads, and producing a statistical analysis of the data. I should stress that in the case of OCCs, random selection is difficult given that the universe is unknown. Nevertheless, I tried to reflect the heterogeneity of OCCs. However, I cannot say that my sample is representative of the (unknown) universe of OCCs. For the sampling, a snowball method was used. The strategy employed in selecting the units for the sample was based on selecting the cases which fulfilled the OCC definition and had a global scope. From the cases that conformed to these two criteria, I selected in the cases in order to cover a variety of OCCs following several sampling guidelines: equilibrium between more recent and older organizations; a balance between the several types of technological base and knowledge goal (i.e., multi-media archives, libraries, encyclopedias, dictionaries, information nodes, software programs, collective social memory, among others).

II. Infrastructure governance

The OCCs can be classified in terms of how their provision spaces function. Two main axes concerning the infrastructure provision strategies can be distinguished: open *versus* closed to community involvement in infrastructure provision, and freedom and autonomy *versus* dependency on the infrastructure (netenabler *versus* blackbox).

There is a qualitative difference between the OCCs where it is possible for participants to present themselves as candidates for or be part of the administrative body and those where such options are not available, in other words between **"closed" provision spaces and "open" or accessible participative provision spaces.**

Participation in the provider space is considered closed where it would require a capital investment or being a member of an institution (such as a university). Participation in the provider space is considered partly open where this depends on the fulfilling of certain criteria related to participation in the platform (such as a number of contributions). It is considered open when participation in the provider space is possible for anyone, that is, participation is regulated through self-selection.

In order to clarify the meaning of openness to community involvement in the platform, it is worth mentioning that a salient characteristic of the OCCs is the small dimension of their provision bodies. The ratio between the number of people required to create the infrastructure for online

collective action and the total number of people involved in the collective action is small. From the cases with available data, 70% number less than 30 people in the provision body. This is so independently of whether the model is open to community involvement in the provision space or not. With this data, which sheds light on the small size of the provision bodies in OCCs, I aim to make it clear that the open character of provision does not mean that everybody in the platform gets involved in the provision body, but merely that the *possibility* for people to involved in provision exists.

The freedom and autonomy *versus* dependency on the infrastructure (netenabler *versus* blackbox) dimension is linked to the knowledge policy, in concrete the copyright license and to the type of software used. Netenabler conditions are defined by a copyleft license and the use of Free/Libre Open Source Software (FLOSS) code, while blackbox conditions are defined by copyright and proprietary software.[3] On the one hand, the importance of knowledge policy is linked to the observation that knowledge-making is the goal of OCCs. In this regard, the conditions of access and use of the resulting knowledge could be considered as a "right" of the contributors as "authors" and so subject to democratic organizing.

On the other hand, knowledge policy can be understood as referring solely to the conditions of access to the "knowledge outcome" of the community, yet from a broader perspective knowledge policy governs the relationships in online environments.

First, relationships in the online environment are founded upon the exchange of information which is subject to copyright law. The management of the information also governs the relationships that can be established online. In other words, the management of the information dictates the protocols of the relationships. Relationships are "restricted" to a confined copyright regime, but can flow freely if the management of information does not restrict the information flow.

Secondly, in large online interactions, the social contract between the parties is less defined by any direct agreement between them than by the platform's design. The code of the platform regulates the information exchange and the architecture of actions that can be developed (Castells, 2009; Lessig, 2000). Open code platforms make the regulatory dimension more transparent, but also allow recoding or intervention in the regulatory dimension.

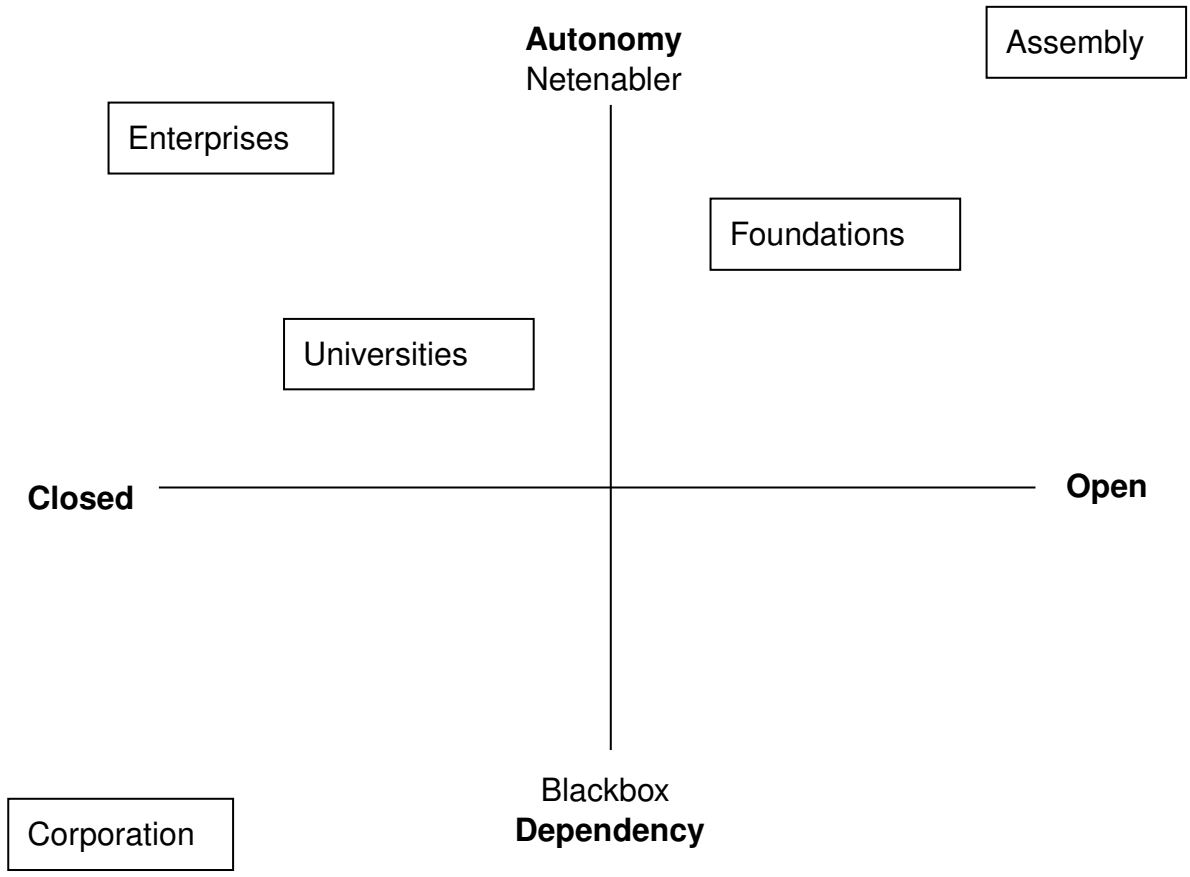
Third, and perhaps most importantly, there is a qualitative difference between relational settings in which the collective action is "locked" into the platform, and those where the collective action is free and autonomous with respect to the platform. If the platform cannot be reproduced, the community relationship is "closed" within the specific platform which is dependent on the provider. If the platform can be replicated, the relationships are free from the specific platform provider. FLOSS and copyleft licensing allow platforms to be replicated, while proprietary software

3 Copyleft refers to the set of licences which favor a less restrictive information regime than traditional copyright.

and copyright regimes do not. In other words, the use of FLOSS and a copyleft license creates conditions in which the community can have greater autonomy and freedom from the platform provider, as well as allow for the possibility of other combinations of collective relationships and interventions in the regulation of those relationships. The role of the provider thus evolves from being there "exclusively" to allow the collective action to happen. This is an essential aspect of community empowerment.[4]

According to these two axes, from the sample, five **provision models** can be defined: university network, corporation service, mission enterprise, autonomous representational foundation and assemblearian self-provision models.

Figure II. Models across the two axes of infrastructure governance



Legend: Y = Freedom and autonomy of community from the provider; X = Involvement of the community in the provider body. See figure IV for a further specification of the distribution of the cases and models across the two axes of infrastructure governance.

4 Copyleft type licenses are an innovative use of existing copyright law to ensure that work remains freely available. The GNU General Public License, originally written by Richard Stallman, was the first copyleft license to see extensive use. Creative Commons, a non-profit organization founded by Lawrence Lessig, also provides copyleft licenses under the Share Alike formula. See the Wikipedia entry on copyleft (2010) or consult the guide to licenses by Laurence Liang (2004).

Concerning, **the open *versus* closed to community involvement in the provision body distinction** (axis X), there is a qualitative difference between OCCs in which it is possible to take part in the provider body, which is the case of the foundation and assembly models, and those in which this is not possible, as is the case for the university network, corporation and enterprise models, as presented in figure II.

Among the open OCCs, there is also a substantial difference in the levels and ways in which the provider body is open in terms of **formality *versus* informality**. While the foundation model is based on the formal organization of participation in provision and establishes more, the assembly model is based on informal organization and participation is less restricted. The operationalization of formality is based on the presence or otherwise of a legal entity, and the limitation (or not) of participation to members of a board.

On this axis, a distinction can also be established between **for-profit strategies *versus* non-profit strategies**. Profit strategies are by definition close to community involvement. corporation and enterprise models are for-profit, while university network, foundation, and assembly models are non-profit. The for-profit *versus* non-profit characteristic is operationalized by looking at the character of the legal entity of the providers.[5]

The **netenabler *versus* blackbox** (axis Y in Figure III) refers to knowledge policy. Netenabler conditions are based on a copyleft license and FLOSS code; on the contrary, blackbox conditions are based on copyright (restrictive access) and proprietary code. Only the corporation model tend to be blackbox. The other cases are netenabler models, albeit to different degrees.[6]

In order to define models of infrastructure provision I consider the two dimensions of democratic quality linked to infrastructure provision (the open *versus* closed to community involvement in the provision body distinction (axis X in Figure II) and, netenabler *versus* blackbox (axis Y). According to how the cases in the sample perform along these two dimensions, I classified the sample as distributed in five clusters of experiences, which constituted the five models of infrastructure governance.[7]

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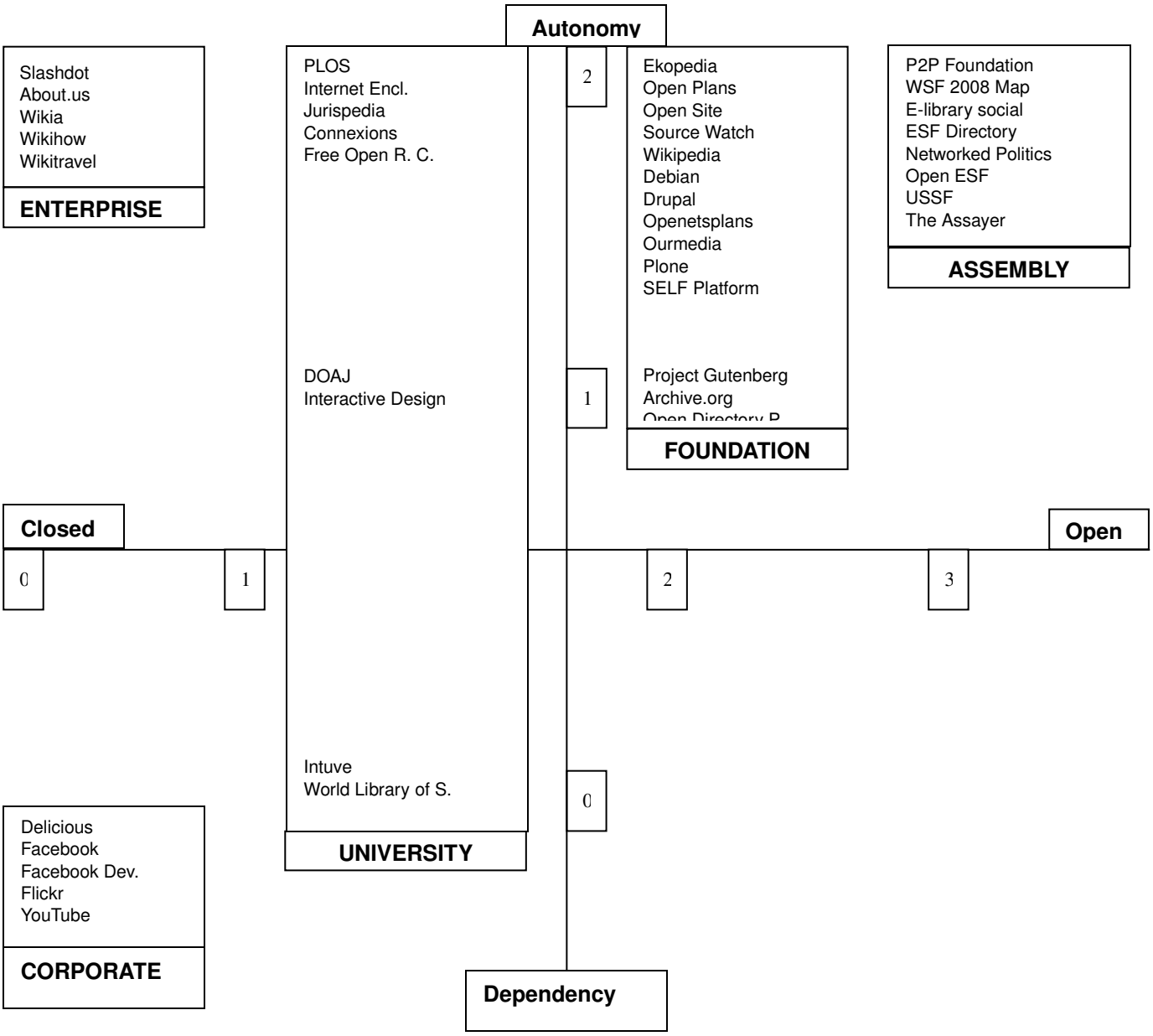
5 The informal groups with no legal entity are considered non-profit.

6 It might be worth mentioning that among the netenabler models there is more variability in terms of the type of license than in software. In other words, FLOSS is more easily adopted than free licenses.

7 In order to place the models as seen in Figure II, I used the quantitative value of their performance on the two axes. Figure III shows the distribution of the sample along the axes, and the resulting value coordinates for each model. Assembly models group the cases positioned at coordinates 3,2, that is the maximum values for both openness to infrastructure provision and level of freedom and autonomy of participants. The foundation model included the cases found at 2, 1 or 2,2; the university model includes the cases positioned at coordinates 1,3, 1,2 and 1,0, that is the university model is a closed model, but it varies in terms of levels of freedom and autonomy. The enterprise model represents the cases situated at the coordinates 0,2, that is the maximum levels of closeness to involvement in provision decision-making but also maximum levels of freedom and autonomy of participants in the infrastructure. Finally, the corporate model groups the cases situated at the coordinates 0,0, that is the more closed level and the lowest levels of freedom and autonomy.

Figure III. Distribution of the sample and the models across axes of infrastructure governance



Legend: X = Level of openness to the community involvement in the provision body. X = 0 refers that community members can participate at the provider body only by doing a capital inversion; X = 1 by becoming a member of an institution; X = 2 according to fulfilling merits or becoming a member of an association (may require the payment of a low fee); X = 3 refers to participation by self-selection (everybody who wants to join). Y = Level of freedom and autonomy of participants from the infrastructure provider. Y = 0 Proprietary software and copyright license; Y = 1 use of FLOSS or copyleft license; Y = 2 use of FLOSS and copyleft license.

In this section, each model of infrastructure governance will be presented in detail. The presentation of each model will be carried out according to the data presented in table I.

Table I. Ranking of each model based on performance on the dimensions of democratic quality (compare means, One-Way ANOVA, Tamhane's T2)

RANKING (MEAN)	*Participation provision body*	*Netenabler versus backbox*
Foundation	Open(2,0)	3 (1,7857)
Enterprise	Closed (1,0)	2 (1,8000)
Corporation	Closed (1,0)	5 (,0000)
University	Closed (1.0)	4 (1,3333)
Assembly	Most open(2,8)	1 (2,0000)

Legend: The scale runs from the best performance (1) to the worst (5)

Mean values in brackets

The multiple comparison of the five models is developed by comparing the mean performance of each model on each dimension as compared to that of the other models. The comparison of how the cases perform on each of the dimensions allows us to build a ranking system for the models (see Table I).[8]

In order to extract the ranking of each model based on performance on the dimensions of infrastructure governance, the mean score for each model's performance on each dimension was calculated and then compared. The model with the highest mean is the first in the ranking. For example, the cases based on the assembly model score a mean of 2,0 (of a maximum of 2) on knowledge policy. As none of the other models scores higher on this dimension, we can conclude that the assembly model is the first in the ranking for performance in terms of technical accessibility, according to the mean comparison of the models. With SPSS, this ranking through multiple-mean comparisons was calculated using One-Way ANOVA (Tamhane's T2).

The **corporation model** applies to cases of communities owned by communications companies with large pools of technological skills such as Google, the provider of YouTube. The other cases which are characterized as corporation models are: Facebook (a social networking site); Facebook developers (which is a platform for software programming linked to Facebook) which are both provided by the Facebook company; Delicious (a social bookmarking site); and Flickr (a photo-sharing repository), the latter two are both provided by Yahoo!.

The corporate model of infrastructure governance is characterized by a provider body closed to participant involvement and based on blackbox conditions.[9] It follows a for-profit strategy. Participants are "trapped" in the platform, as the copyright and proprietary software framework restricts the freedom and autonomy of the participants in the platform.

The corporation model is more open to participation in platform provision only compared to

8 The comparison of the mean scores of each of the models was calculated using the one-way ANOVA formula. The mean difference is significant at the 0.05 level.

9 In the sample, corporation models are significantly more likely to be blackbox in contrast to the enterprise model, the foundation model and the university network model. The mean difference is significant at the 0.05 level.

the university model. But it is slightly less open to participation in platform provision than the foundation, enterprise and assembly models.

The **university network model** of infrastructure governance describes an alliance between several university bodies to provide a platform which facilitates the free accessibility (through an open access form) of academic research materials or specialist results. The university network model is less closed than the corporation model. However, only universities can get involved in the provision of the space. Additionally, in contrast to the corporation model, the university model is non-profit, and, importantly, it is partially netenabler. Partially netenabler means that only 70% of the cases are fully netenabler.[10] In this regard, university models are less netenabler than assembly, enterprise and foundation models.

An example of the university network model is the Public Library of Science (PLOS), which is a library of open access articles. Another example is Jurispedia, which is an encyclopedia on different national legal systems. The other examples of the university network model in the sample are Worldcat library search, the Directory of open access journals (DOAJ), Information Visualization (a repository of knowledge on visualization techniques), Connexions and Intute: Education and Research (both resource repositories on education and research resources), Free Open Research Community (a library of FLOSS research articles), and an Internet Encyclopedia.

The **mission enterprise model** is characterized by being for-profit, and hence closed to participant involvement. Importantly, the enterprise model is based on netenabler conditions, which favor the autonomy of collaboration. Furthermore, the enterprise model guarantees more netenabler conditions than the foundation model. The enterprise model is the case of startups, which maintain independence from big communications companies. It is a strategy for developing new business models which are compatible with netenabler conditions. One example is Wikihow, a how-to collaborative manual, or Wikitravel, a collaborative travel guide, both provided by small start-ups. The other cases demonstrating the mission enterprise model in the sample are Slashdot (a collaborative news site), aboutus.org (a directory of websites), and Wikia (a wiki farm).

The **autonomous representational foundation model** is characterized by a provider body which is (relatively) open to participant involvement as it uses some formal filters. This model is also characterized by promoting the freedom and autonomy of collaboration (netenabler). Additionally, they are non-profit. Being relatively open to participant involvement implies that they are formal, and not open in terms of the self-selection of participants, but open in terms of filters of requirement. In this regard it could be considered a hybrid form (partly open, partly closed). OCCs following this model are less open than the assembly model which is based on total openness of

10 There are two cases that only fulfill one of the criteria considered necessary to be a full netenabler (copyleft license and FLOSS), DOAJ and Information Visualization, and two cases which are not netenabler, Worldcat library search and Intute: Education and Research.

the provision body. They are also less netenabler than the assembly and enterprise models. The foundation model comprises the cases of Wikipedia, a collaborative encyclopedia, and FLOSS communities, which in this sample includes the cases of Debian, Drupal, Open Plans, and Plone. The other examples of the foundation model are Open Directory project (a directory of websites), Archive (a multi-media archive), Project Gutenberg (e-books repository), Ekopedia (a wiki on alternative lifestyles), Open site (an Internet encyclopedia), Ourmedia (a collaborative news platform), SELF platform (on FLOSS documenting), and Openstreetsplans (collaborative mapping).

The **self-provision assembly model** is characterized by being the most open in terms of provision. A self-selected community of participants can be part of the provision body in this model. It follows an informal organizing logic (without a board or legal entity) and is non-profit oriented. Additionally, the assembly model assures the most netenabler conditions. The assembly model applies to OCCs promoted within the framework of the GJM; for example, those promoted by the social forums, such as a map of a day of action, BioTech Indymedia, an open publishing media site specializing in biotechnology, or the calendar of actions, Protest.net. Additionally, there is one case that falls into the definition of this model where provision is managed by a single person. This is the case of The Assey, an archive of specialist articles. Finally, other cases of the assembly model that form part of the sample are: p2pfoundation.net (a repository on P2P), Networked Politics (collaborative research on new forms of political organizing), and E-library for social transformation. In addition, there are a variety of sites linked to the social forum process at a variety of levels: global (WSF 2008 Map of actions, and WSF Process); European, (the ESF Directory of organizations, and Open ESF (an organizational networking platform), and United States (USSF).

III. Explanatory analysis: the effect of infrastructure governance on community size, and collaboration

The previous section presented the models of infrastructure governance. This section will commence with an explanatory analysis of how infrastructure governance relates to community size, and collaboration. *Do corporation strategies attract bigger communities? What are the conditions for complex collaboration?* These and other questions will be addressed in the following sections.

III. I Participation levels: how does infrastructure governance affect participation increase? How are participation levels managed in different online environments?

The question of participation levels has been an important element of the discussion on

democratic organizing for a long time (Michels, 1962).

The size of the community of the OCCs refers to the number of people involved in community activity. From the data available from the sample, the size of OCCs (data available only for numbers of people registered) can range from 50, in the case of Elibrary for social transformation, to 350 million people in the case of Facebook. However, more frequently OCCs number 1000, some 10,000 or some 100,000 registered members.

For several reasons, the more people use (or produce) the information resource more successful the OCC will be considered. The strength of motivation for contributing to OCCs is usually proportional to the size of the community. As the size of the potential audience increases, so does the attraction of writing and contributing. As more people begin to participate, the aforementioned motivation will also increase, creating a virtuous cycle in which more participation begets more participation, and the information resource's value is linked to its number of participants. In conclusion, high levels of participation are considered positive and a sign of success in OCCs.

This should not give the illusion that community sizes are unlimited. On the contrary, the size of an OCC depends on its potential "market", which is shaped by Internet penetration, visibility (Google search rankings), and interest in the specific issue or activity to which the community is dedicated. For example, the Free Open Research Community case's (opensource.mit.edu) goal is the creation of a library of FLOSS research articles. The number of people interested in FLOSS research, and indeed the total number of articles dedicated to FLOSS is limited, as well as being limited to the size of this OCC. In contrast, the number of people and content that a video repository such as YouTube can attract is substantially larger.

OCCs tend to follow a growth curve with an initial period of slow but constant growth, followed by a period of intense growth and finally, a period of stability.[11] The stability period generally comes about when the contents of the OCCs are built and the OCCs goals then change, aiming to maintain the work or content, which requires less participation. For example, Wikipedia grew only slowly for the first 3 years of its existence from 2001 to 2003, followed by intense growth from 2003 to 2009 (Zachte, 2009). In 2009, a discussion was opened at Wikipedia because some indicators showed flat growth.

It is worth mentioning **problems of size and growth operationalization**. The total size of the community in an OCC refers to the total number of visitors to the platform. The size of participation takes into account considers visitors who do not take action nor intervene in the work or content. Although each action taking place in an online environment can be recorded and

11 Growth in OCCs is forecast using the Bass diffusion model. The Bass diffusion model was originally conceived to describe the process by which new products are adopted depending on the ratio between users and potential users.

measured, and the size of the community easily recorded, data on size is not always publicly available. Furthermore, when data on the total number of visitors are available, they are not always presented in similar ways. The OCCs use different technological solutions and it is difficult to define common indicators for all them.

As the number of visitors was not available on most OCC sites, an alternative indicator was adopted. Each site's Alexa ranking (a ranking of the most visited and connected Web sites) was taken as a measurement of size. Nevertheless, using Alexa rankings as an indicator of community size presents several problems. Alexa is more a measure of "success" and visibility than the number of people mobilized. In order to measure growth over time an index was built. The index of growth over time was based on the difference between the size in 2010 to the size in 2008.

Finally, concerning the central question of the **effect of infrastructure governance models on community size**, the comparison of mean scores for the Alexa Ranking for each model allowed me to build a scale of community size for the models (see data in Table II).

In order to extract the ranking of each model based on size, the mean of Alexa performance between the cases of each model was calculated (with the analysis of multiple means comparison One-Way ANOVA, Tamhane's T2). Once the mean per each model was calculated, the ranking was built comparing the means of the models. The model with a lower mean is the first in the size ranking.

Table II. Ranking of infrastructure governance models: effects on size 2010 (compare means, One-Way ANOVA, Tamhane's T2)

RANKING MEAN	*Ranking*	*Std. Deviation*
Assembly	1 (1,6667)	,70711
Enterprise	2 (1,3000)	,83666
Foundation	3 (1,0769)	1,03775
University	4 (,8889)	1,05409
Corporation	5 (,0000)	,00000

Legend: The scale ranges from best performance (1) to worst (5)

Mean Alexa Ranking in brackets

The corporation model creates the largest communities. Comparing the coverage of the different models, the corporation model creates larger communities than the rest. Corporation model communities are much bigger than those of the assembly model, the university and foundation models, and just slightly bigger than those of the enterprise model. The Web 2.0 explosion, referring to very successful platforms provided by large corporations, such as Facebook, Flickr or YouTube, with their millions of participants, could explain this result. The corporation model's hegemony in terms of creating the biggest communities is reinforced over time from 2008 to 2010. These results also imply that blackbox conditions generate larger communities.

The mission enterprise model comes second in the ranking and is relatively similar to the corporation model.

The third in terms of size of communities is the foundation model.[12] The foundation model appears to have witnessed a reduction in community sizes from 2008 to 2010. The foundation model is followed after a large interval by the university model, and then, after an even larger interval, the assembly model.

In this regard, the assembly model creates the smallest communities. Although it should be mentioned that this model records the greatest variability in sizes. This trend, whereby the assembly model generates smaller communities than all the other models, is significant for all the cases in 2008 and seems to be reinforced over time from 2008 to 2010. However, the reinforcement of this tendency over time cannot be calculated with any high degree of accuracy because several of the assembly cases actually ceased to exist between 2008 and 2010.

III. II Collaboration: how does infrastructure governance affect collaboration?

What does collaboration between individuals mean? What does it mean when we say that OCCs are collaborative? Within the bounds of this paper, collaboration is regarded not in terms of individual decisions on whether to collaborate or not, but in terms of the structural conditions of collaboration. Collaboration is regarded in terms of the architecture of participation. The central questions are: *does the architecture of participation encourage collective collaboration or not and if so at what level of complexity?*

Collaboration is defined as a recursive process in which two or more people work together and interact to achieve common goals, where interaction is defined as the dynamic of the changing sequence of social actions between the individuals who modify their actions and reactions in consequence of the actions taken by their interaction partner(s). In a collaborative architecture of participation, contributing requires engagement in a joint negotiation of understanding, and it leads to the creation of a single and coherent integrated and interrelated body which combines all the contributions. A key aspect which distinguishes online collaborative architectures from other forms of collaboration is that the online process is mediated by the work being created and the overall environment, as opposed to mediation by direct social interaction as in other forms of collaboration.

In the analysis of how infrastructure governance shapes collaboration in OCCs, the level of collaboration, named *collaborativeness,* and the type of collaboration was considered. In what follows, how *collaborativeness* and type of collaboration were defined is described, followed by an

12 Looking at the number of links, it is interesting to note that even if the enterprise model creates bigger communities than the foundation model, the foundation models are better linked. Enterprise models also have than corporation models.

explanation of how infrastructure governance shapes them.

For the **operationalization of *collaborativeness***, three aspects were considered: the presence of things achieved in collaboration and at what level; the complexity of putting together all the activity; and the intention of building something together.

Firstly, to indicate collaboration I considered whether the participation involved doing something together, and at what level this took place. I distinguished doing something together only at the level of organizing and putting together the material (metadata), or at the more complex level of creating the basic units of significance together.[13] For example, in the case of Flickr, a picture is the basic unit of significance, but this basic unit is not collaboratively built at the platform; in the case of Wikipedia, the basic unit of significance is an article, which is collaboratively built at the platform.

The level of complexity required to integrate the modules or basic units is the second indication of *collaborativeness*. Different levels were distinguished.[14]

Thirdly, the presence or otherwise of the intention to build something in common was examined (latent common goal) as well as if this was present in the goals of the OCCs. This was analyzed by looking at the statement defining the OCC's mission. For example, these two statements mention a collective goal: *"OpenStreetMap creates and provides free geographic data such as street maps to anyone who wants them done by people like you"* or *"The Open Directory Project is the largest, most comprehensive human-edited directory of the Web. It is constructed and maintained by a vast, global community of volunteer editors"*. The following two examples of mission statements do not mention collective goals: "*Broadcast yourself"* (YouTube mission) or *"Share pictures. Know the world"* (Flickr mission).[15]

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13 The indicator for collaborative meta–data has some difficulties and limitations. The use of different technologies in the OCCs of the sample made it difficult to find a common indicator allowing comparisons. Furthermore, the meta-organization of the work involves many different aspects other than participants tagging or not. In this regard the results and meaning of this indicator should be regarded with caution.

14 A first basic level of complexity involves undertaking a set of individual actions carried out in the same place. Only one case was based on this social (personal) networking. A second level of complexity is joining pieces (such as archives of multi-media pieces, directories or libraries) which represents almost half of the sample (49% of cases). A third level of complexity is the integration of the basic units through working in groups systematizing several works (such as techno-political tools for activism networking, research groups or information nodes that host several types of data) which represented 24,5% of the cases. Finally, the highest level of complexity is writing something together (such as writing software, dictionaries entrances or encyclopedia articles) which also represents 24,5% of the sample.

15In order to operationalize collaborative architecture, I looked at the type of relationships used to build the content and the intentions of the OCCs. However, the content has some limitations as an indicator. On the one hand, independently of the willingness to engage in collaboration or not, the type of content or work may shape the possibilities for collaborative architecture. For example, while pictures are generally taken by one person (an individual base), writing texts or software code is more open to collaboration by various people. Another limitation associated to these indicators is that they are based on how the system is designed or the intentions of the community. Yet this does not guarantee that interaction actually takes place; to ensure that collaboration takes place an analysis of what actually happens is required, looking at participation distribution data and not only at the architecture design or the OCCs intentions.

Concerning the type of collaboration, three types can be distinguished: a first type based on free content or facilitating access to content rather than the collaborative development of content; a second type based on a sum of individual contributions, or album type of collaboration; and the third type, based on merging participants' contributions or a collage type of collaboration.

Two main motivations are present in OCCs: **freedom *versus* collaboration**. On the one hand, OCCs are driven by the purpose of providing free access to knowledge, by sharing resources. This is an element which is present in the entire population analyzed. The second aspect is their collaborative character. However, there are two main approaches to collaboration. One is based on inclusion in collaboration by expertise and the other on openness to participation in collaboration to any person available. This provides two first classifications of OCCs. The first, labeled ***free-oriented* OCCs**, are driven by providing access to information and knowledge already built. The goal is not to raise and articulate participation at the platform, but to to facilitate free access to knowledge. This is the case of OCCs dedicated to open access to academic research materials or specialist results. Only researchers or experts are asked to intervene in the creation of the work; on some occasions there is collaboration among academics or experts, but the possibility to establish collaboration is not provided by the platform. In other words, they are collaborative, but not openly collaborative. The main goal of the platform is the open access to knowledge. The channels of participation in these platforms are very limited (for instant providing the possibility to give feedback) or not present at all. In the sample, these cases are a minority (such as Plos – Public Library of Science, DOAJ – Directory of Open Access Journals or Intute: Education and Research).

The second type, ***free and openly collaboration-oriented*** is guided both by the purpose of providing free access to knowledge and by hosting the openly collaborative development of the work. A large majority of the sample is characterized by this approach.

The first contribution from the analysis of collaboration is to differentiate between **two *main levels or types of collaboration: Sum versus merge or album versus collage***.[16]

In the first type of collaboration, participants share the platform as a common meeting place but contribute their work independently of one another. In some cases, participants engage in the collaborative development of the meta-organization of the resulting "album" of contributions (for example through the use of tags), but not necessarily. In some cases participants also engage in commenting on the contributions of others. The individuals do not necessarily have to engage with other participants nor in the integration of the work in order to participate, but they can if they wish to. Even if the contribution does not necessarily involve "doing something with someone else", the sharing of a common place and the ability to insert an individual creation is understood as a

16 It is worth mentioning that the organization of the information in OCCs follows a *principle of modularity*. The overall goal is to divide work into small basic units such as pages or files. The *principle of modularity* applies to both types of collaboration.

collaborative action. The resulting “digital commons” of this logic is an **album** created from a “synergetic sum of contributions”. The contributions are added together and the contribution of each individual remains identifiable. The synergy of the meta-data organizes the overall set of contributions. For example, del.icio.us is a social bookmaking repository. It is based on individuals who create bookmarks at the site. The integration of the individual’s contribution is a synergetic sum of that contribution and all those made previously. In del.icio.us’ words: *“Your bookmarks will organize themselves. Tag your bookmarks. Collections will naturally emerge”.* In this case, collaborating in the integration of the contributions, if it occurs only at the meta-data and the basic significant unit level, is developed individually.

In the second type of collaboration, the individuals have to engage in a collaborative action in order to contribute. Integration and collaboration in the contributions occurs at the basic level or unit of significance. In addition, the integration of the basic units can be carried out at several degrees of sophistication. In this second type of collaborative basic unit, the meta-data is generally also developed collaboratively. The **collage or merge type** is based on a cumulative superposition and merging of the contributions (“doing things together”). This type is characterized by collective interaction in the development of the significant units. The contributions of each individual have no meaning on their own. Individuals function and coordinate with other individuals. For example, the case of “Information Visualization” aims to build a collaborative manual on techniques of information visualization. All the sections are written by the members, with distinction of who writes what, and contributions are then amalgamated in common pages.

The collage type of collaboration implies more *collaborativeness* (and more complex integration) than the album type, and participation in the album type is on more based on individual acts than the collage type. However, interestingly, a declared collective goal is present in both types of collaboration.

With regard to ***collaboration and infrastructure governance***, that is, how the different models perform in terms of *collaborativeness* and type of collaboration, several important results emerged from the analysis.

In terms of the level of ***collaborativeness****,* not all the models are able to raise the same levels of *collaborativeness* (see table III).

Table III. Infrastructure governance models and collaborativeness ranking (compare means, One-Way ANOVA, Tamhane's T2)

RANKING (MEAN)	*Ranking*	*Std. Deviation*
Foundation	1 (4,2308)	1,78670
Enterprise	2 (4,2000)	1,78885
Assembly	3 (3,8889)	1,36423
University	4 (3,2222)	2,10819
Corporation	5 (2,0000)	,70711

Legend*:* The scale ranges from best performance (1) to worst (5)
Mean scores in brackets

In order to extract the ranking of each model based on collaboration, first an index of collaborativeness was built. The index of collaborativeness is the ponderation and sum of the three indicators of collaborativeness.[17] Then, in order to extract the ranking of each model based on collaboration, the mean of collaborativeness indexes of the cases of each model was calculated (with the analysis of multiple means comparison One-Way ANOVA, Tamhane's T2). Once the mean per each model was calculated, the ranking was built comparing the means of the models. The model with a higher mean of collaborativeness is the first in the size ranking.

The foundation and enterprise models are more able to induce collaboration than the other models. The assembly and university network models follow in the ranking of the most collaborative models. Finally, the corporation model displays the lowest level of *collaborativeness.* In addition, the foundation and assembly models are significantly more collaborative than corporation models.

It is worth looking specifically at one of the indicators of *collaborativeness*: the presence of a common goal. The corporation model is based on the absence of a common goal. From these results, it could be said that the models based on for-profit strategies and blackbox conditions are the least based on common goals.

Concerning common goals and infrastructure governance, a latent common goal is present in most of the OCCs' missions (81,3% of the cases). However, no latent common goal is present in the corporation model of governance infrastructure. The corporation model is significantly less based on a common goal than the university network model. In corporation cases the goals are described as individual actions - for example, the aforementioned cases of YouTube and Flickr. Both the foundation and the assembly models are based on the presence of a common goal, followed in this ranking by the university and enterprise models. From these results it could be also said that for-profit strategies do not sit well with collective common goals.

17 The index of *level of collaborativeness* is the level of achieving things together (if the basic unit is based on collaboration or not (vary from 0 to 1; ponderated per 2), plus, if the tag system is collaboratively or not (vary from 0 to 1), plus, the complexity of putting together all the activity (vary from 0 to 3); and, the intention of building something together (vary from 0 to 1).

The **types of collaboration** and governance models are not independent of one another. There are some models which fit better with some types of collaboration, while others fit better with the remaining types of collaboration. University network and corporation models tend to be based on the album type of collaboration. In addition, the corporation model is significantly more likely to be coupled with an album type of collaboration than the university, assembly and foundation models. Enterprise, assembly and foundation models, in that order, tend to be coupled with collage types of collaboration.

From another perspective, these results could lead to the conclusion that models based on netenabler conditions (assembly, enterprise, foundation and university) favor higher levels of collaboration (favoring engagements with more complex collaboration) than the collage type of collaboration. In other words, a knowledge policy which favors access and reuse (copyleft and FLOSS) increases collaboration and expands the possibilities to develop certain goals in a collaborative way. Black box conditions on the other hand (like those found in the corporate model), which limit access and reuse, generate less collaboration, less complex collaboration and an album type of collaboration. The same type of impact seems to occur to a lesser degree with regard to open provision and not-for-profit strategies. That is, open provision and non-profit strategies favor more *collaborativeness*.

In conclusion, conditions of community control over platform provision and autonomy and freedom to collaborate in the infrastructure favors complex collaboration and commons-based collective action. Conditions of control over platform provision and freedom and autonomy from the infrastructure providers are not required for collaboration based on the sum of individual actions in a shared space.

IV. Conclusions

According to the large *N* analysis, several models can be differentiated concerning infrastructure governance. Infrastructure governance is defined according to two main axes: open *versus* closed to community involvement, and autonomy versus dependency on the infrastructure provider (netenabler *versus* blackbox). Other sub-categories which also contribute to defining the infrastructure model are for-profit *versus* non-profit, and formal *versus* informal. According to these axes, five models were found in the sample: university network, corporation, enterprise, foundation and assembly models. Concerning open versus closed access, assembly and foundation models are open, while corporation, enterprise and university models are closed in terms of community involvement concerning the composition of the provider. Although some are open and others are closed, all providers share the characteristic of being very small in size in terms of people involved

in relation to the size of the community. With regard to the autonomy versus dependency axis, the corporation model is the only blackbox model, the rest being netenabler models to different degrees. In order from the most netenabler to the least; assembly, enterprise, foundation and university models.

In addition, the large *N* analysis provides important insights for testing the general hypothesis of the study (*infrastructure governance shapes the community generated. In particular, infrastructure governance shapes the community in terms of size and complexity of collaboration)*, according to the analysis, infrastructure governance shapes the community.

Firstly, not all the models are able to generate the same size of communities. Secondly, not all the models are able to increase collaboration levels. Thirdly, some models are more suited to more complex collaboration than others.

Concerning the two axes on the ordering of infrastructure governance, dependency on the infrastructure (blackbox) favors an increase in size of communities, but lacks collaboration. Autonomy and freedom from the infrastructure (netenabler conditions) favors more complex collaboration, but lacks the size of the community.

Concerning the axis of open versus closed to community involvement, the effect is more complex. Openness to involvement in provision favors collaboration where there is some formal organization of participation. Being closed to participation in provision favors an increase in size, but only where provision is based on a for-profit strategy.

Although some conditions favor size while others favor collaboration, I wish to avoid concluding that size and collaboration are negatively correlated. There is no actual correlation between the two.

Table IV. Models ranked in terms of size, and collaboration

Model	**Size**	**Collaborativeness**	**Type of collaboration**
Corporation	1	5	Album
Enterprise	2	2	Collage
Foundation	3	1	Collage
University	4	4	Album
Assembly	5	3	Collage

Legend: The scale ranges from best performance (1) to worst (5)

In terms of how each of the five models shapes the community, infrastructure governance models that are closed to community involvement in platform provision, that are not autonomous (blackbox) and that are based on for-profit strategies, in other words the corporation model, generate larger communities. However, the corporation model also generates less collaboration among participants. In other words, blackbox conditions allow for an increase in individual participation, but do not favor collaboration between participants. This is coherent with the finding

that the corporation model tends to be based on an album type of collaboration.

From the analysis it also emerged that the models based on for-profit strategies and blackbox conditions do not frame their activities in terms of common goals.

The assembly, enterprise, foundation and university models, which are based on netenabler conditions, generate smaller communities, but provide the conditions for higher *collaborativeness* and more complex goals. This is consistent with the idea that the assembly, foundation and enterprise models tend to be based on collage types of collaboration.

The openness of the assembly and foundation models has a similar effect to their netenabler conditions. It favors smaller communities, but these are more collaborative. However, the informality of the assembly model resulted in a worse performance than the foundation model in terms of both size and collaboration. In other words, more formal strategies for providing platforms favor better OCC performances.

In the light of this statistical part of the analysis, it could be argued that formal organizing is a source of success in terms of infrastructure governance. Among the open providers, the more formal organization of the foundation model generates larger communities than the informal assembly model. In addition, the informal assembly model is that least able to sustain activity over time; it is the model with highest number of cases to stop activity between 2008 to 2010. However, the informal organization of the assembly model does generate more collaboration. Olson (1965) has pointed to the importance of formal organization as one means to overcome collective action dilemmas, however, the statistical analysis partially reinforces Olson's conclusion and Michels' iron law (1968).

Finally, the enterprise model has all the qualities needed for OCCs to increase participation levels and *collaborativeness* combined. Closed and for-profit, the enterprise model favors big communities; being a netenabler, the enterprise model also favors more collaboration. This type of model seems to successfully contrast a lack of openness in terms of community involvement in provision (representational power) with extensive autonomy and freedom for participants.

The university model is also based on closed and netenabler conditions, however, the university model OCCs are so to a lower degree than those of the enterprise model. In addition the university model is not for-profit, which results is rather small, and not particularly collaborative, communities.

In conclusion, none of the models combine a large community size and *collaborativeness*. The corporation model generates the biggest communities, based on lower levels of collaboration; the foundation and enterprise models are able to raise mid-sized communities, and are more collaborative communities. Finally, the assembly model is the weakest in terms of generating successful OCCs.

V. Bibliographic references

Benkler, Y. (2006). *The wealth of networks: How social production transforms markets and freedom*. New Haven, CT: Yale University Press.

Burke, M. & Kraut, R. (2008). Administrators: Mopping up: modeling wikipedia promotion decisions. *Proceedings of the 2008 ACM conference on Computer supported cooperative work*. San Diego, CA, USA, 27-36.

Castells, M. (2000). *The rise of the network society.* Malden, MA: Blackwell.

Castells, M. (2001). *The Internet galaxy: Reflections on the Internet, business and society*. Oxford, UK: Oxford University Press.

Ciffolilli, A. (2003). Phantom authority, self-selective recruitment and retention of members in virtual communities: The case of Wikipedia. *First Monday, 8 (12)*. Retrieved from http://www.firstmonday.org/issues/issue8_12/ciffolilli/

Coleman, S., Taylor, J., &, Van de Donk, W. (Eds.). (1999). Parliament in the Age of the Internet. *Oxford: Oxford University Press.*

Copyleft. (2010). In Wikipedia, the free encyclopedia. Retrieved December 19, 2010 http://en.wikipedia.org/wiki/copyleft

Cunha, C., Martin, I., Newell, J., & Ramiro, L. (2003). Southern European parties and party systems, and the new ICTs. In Gibson R., Nixon P. & Ward, S (Eds). Political Parties and the Internet (pp. 70-97). London: Routledge.

Davis, R. (1999). *The web of politics: The internet's impact on the American political system.* Oxford, UK: Oxford University Press.

De Landtsheer, C., Krasnoboka, N., & Neuner, C. (2001). La facilidad de utilización de los websites de partidos políticos. Estudio de algunos países de Europa del Este y Occidental [The facility of use of websites of political parties. Study of some countries of Western and East Europe]. *Cuadernos de Información y Comunicación (CIC), 6*, 107-140.

della Porta, D., & Mosca, L. (2005). Global-net for global movements? A network of networks for a movement of movements. *Journal of Public Policy 25*, 165-90.

della Porta, D., & Mosca, L. (2009). Searching the net. Web sites' qualities in the Global Justice Movement. *Information, Communication & Society, 12, (6),* 771 - 792.

Eisenhardt, K., & Santos. (2000). Tacit knowledge and organisational performance: Construction industry perspective. *Journal of Knowledge Management. 11*, 115-126

Gibson, R., & Ward, S., (1998) U.K. Political Parties and the Internet: "Politics as usual" in the New Media?. *Harvard International Journal of Press/Politics 3(3),* 14-38.

Gibson, R., Nixon, P., & Ward, S. (Eds.) (2003) *Political Parties and the Internet. Net gain?.* New-

York and Londres: Routledge.

Kittur, A. Chi, E., Pendleton, B., Suh, B., & Mytkowicz, T. (2007, April-May). Power of the few vs. wisdom of the crowd: Wikipedia and the rise of the bourgeoisie. *Proceedings of the 25th Annual ACM Conference on Human Factors in Computing Systems (CHI 2007).*

Kriplean, T., Beschastnikh, I., McDonald, D.W., & Golder, S. A. (2009) Community, Consensus, Coercion, Control: CS*W or How Policy Mediates Mass Participation. GROUP 2007 - ACM Conference on Supporting Group Work.

Lanzara, G. F., & Morner, M. (2003, July 3-5). *The knowledge ecology of open-source software projects.* Paper presented at the19th European Group of Organizational Studies (EGOS) Colloquium. Copenhagen, Denmark.

Lanzara, G. F., & Morner. M. (2004). *Making and sharing knowledge at electronic crossroads: The evolutionary ecology of open source*. Paper presented at the Fifth European Conference on Organizational Knowledge, Learning and Capabilities, Innsbruck, Austria. Retrieved from http://www2.warwick.ac.uk/fac/soc/wbs/conf/olkc/archive/oklc5/papers/j-3_lanzara.pdf

Lessig, L. (2004). *Free culture: How big media uses technology and the law to lock down culture and control creativity*. New York, NY: Penguin Press.

Liang, L. (2004). A Guide To Open Content Licences. Rotterdam: Piet Zwart Institute. Retrieved from http://www.pzwart.wdka.hro.nl/mdr/research/lliang/open_content_guide

Loubser, M., & Pentzold, C. (2009). Rule dynamics and rule effects in commons-based peer production. Section: Internet and Politics. Panel: Contemporary Collective Action Dilemmas. 5th ECPR General Conference, Potsdam/Germany, 10-12 September 2009.

Margolis, M., Resnick, D., & Wolfe, J. (1999). Party Competition on the Internet in the United States and Britain. *Harvard International Journal of Press/Politics 4(4):* 24-47.

Michels, R., (1962). *Political parties: a sociological study of the oligarchical tendencies of modern democracy*. Imprint New York: Free Press.

Navarria, G., (2007). Reflections on beppegrillo.it: A successful attempt of innovation and active promotion of political participation through the web?. Paper prepared for the 4th ECPR General Conference, Pisa (Italy), 6-8 September, 2007. Section: "Emerging Patterns of Collective Action" Panel: “The use of ICTs for innovative forms of participation”.

Norris, P. (2002). *Democratic phoenix: Reinventing political activist*. Cambridge, UK: Cambridge University Press.

Norris, P. (2003). Preaching to the converted? Pluralism, Participation and Party Websites. *Party Politics, 9 (*1*)*, 21-45.

O’Mahony, S. (2007). The governance of open source initiatives: what does it mean to be community managed?, *Journal of Management and Governance, 11*, 139–150.

O'Neil, M. (2009). *Cyberchiefs: Autonomy and authority in online tribes*. London, UK: Pluto Press.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. London, UK: Cambridge University Press.

Patriotta, G. (2003). *Organizational knowledge in the making*: *How firms create, use and institutionalize knowledge*. Oxford, UK: Oxford University Press.

Powell, W. W. (1991). Expanding the scope of institutional analysis. In W. Powell & P. DiMaggio (Eds.),*The new institutionalism in organizational analysis* (pp. 183-203). Chicago, IL: University of Chicago Press.

Reagle, J., Jr. (2005). *Do as I do: Leadership in the Wikipedia.* Retrieved from: http://reagle.org/joseph/2005/ethno/leadership.html

Reagle, J., Jr. (2007). Do as I do: Authorial leadership in Wikipedia. In WikiSym '07: Proceedings of the 2007 International Symposium on Wikis. ACM Press, New York, NY, USA. Retrieved from http://ws2007.wikisym.org/space/ReaglePaper

Römmele, A. (2003). Political parties, party communication and new information and communication technologies. *Party Politics, 9,* 7-20.

Stalder, F., & Hirsh, J. (2002). Open source intelligence. *First-Monday, 7(6)*. Retrieved from http://www.firstmonday.dk/issues/issue7_6/stalder/

Sudulich, M. L. (2006). ICT and SMO: something new?. Paper presented at the “Cortona Colloquium 2006 – Cultural Conflicts, Social Movements and New Rights: A European Challenge”, 20-22 October 2006, Cortona, Italy.

Tkacz, N. (2007). *Power, Visibility, Wikipedia. Southern Review, 40, (2),* 5-19.

Trechsel, A., Kies, R., Mendez, F., & Schmitter P. (2003). *Evaluation of the use of new technologies in order to facilitate democracy in Europe: E-democratizing the parliaments and parties of Europe*. Retrieved from http://www.erepresentative.org/docs/6_Main_Report_eDemocracy-inEurope-2004.pdf.

Tsoulkas, H. (1996). The firm as a distributed knowledge system: A constructionist approach", *Strategic Management Journal, 17*, 11-25.

Van Aelst, P. & Walgrave, S. (2005). *New Media, new movements? The role of the Internet in shaping the anti globalization movement.* In Van De Donk, W., Loader, B., Rucht, D., & Nixon, P. *Cyberprotest: New Media, Citizens and Social Movements.* London: Routledge.

Vedres, B., Bruszt, L., & Stark, D. (2005a). Organizing technologies: Genre forms of online civic association In Eastern Europe. *The Annals of the American Academy of Political and Social Science 597*, 171-188. doi: 10.1177/0002716204270504

Vedres, B., Bruszt, L., & Stark, D. (2005b). Shaping the web of civic participation: Civil society websites in Eastern Europe*. The Journal of Public Policy*, *25*, 149-163.

Viégas, F., Wattenberg, M., & Mckeon, M. (2007) The Hidden Order of Wikipedia. *EOnline Communities and Social Computing,* 445-454.

Zachte, E. (2009, September). *Wikipedia in numbers*. Presentation at Wikimania 2009. Buenos Aires, Argentina. Retrieved from http://wikimania2009.wikimedia.org/wiki/Proceedings:144