

Lindeberg, Fredrik

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Internet Governance: The visible and the invisible hand

Fredrik Lindeberg

Department of Management and Engineering, Linköping University

Who governs the *Internet* is a hotly debated subject, and there seems to be a lack of consensus. In this text I aim to show how central *Internet* functions are coordinated and which consequences that have on how we can consider the *Internet* to be governed. I show that the *Internet* has no governor, not even *ICANN*, and that there are several important actors for the development and function of the *Internet*, of which the *ISPs* stand out as the most influential since they can define what *Internet* access is for most *Internet* users in the short term.

On a longer term there appears to be outside pressure in need of increased regulation which *ICANN* seems to respond to with amended bylaws and a more formalized multistakeholder model.

ICANN, although not a governor with regulatory power, is shown to have governance consequences just by existing as the administrative home of the *IANA* function. Also fills an organizational void and prevents others from assuming the role of coordinating the *Internet's* unique identifiers.

If viewed as an organization the *Internet* fits into the adhocratic form in the typology of Mintzberg (1993).

The text is based on interviews, informal discussions and literature.

Introduction

Although there are political debates and news articles (Economist, 2014, 2016) portraying the *Internet* as being governed by *ICANN* and literature implicitly assuming *ICANN* is in control (Weber, 2009) or explicitly being worried about their power (Mueller, Mathiason, & Klein, 2007), there are in reality many more actors whose actions have consequences, as implicitly seen in Zittrain (2008) and argued in van Eeten and Mueller (2012). In particular, I find limited research investigating the effects that unintended and unplanned day-to-day operations of *Internet*-actors, such as *ISPs* fighting botnets (van Eeten & Mueller, 2012) or dealing with users wanting to set up mailservers, have on the governance of the *Internet*. Thus there is a need of understanding how these informal governance actions interact with those of more formal *Internet* governors, such as *ICANN* and the *Internet Governance Forum*.

My research aims to map the practical governance roles, formal and informal, of a number of central *Internet* organization, and to use an ecology perspective to further the understanding of how each actor affects the *Internet*. I see the primary contributions from this paper as two-fold: first, practitioners can use the ecology model for better understanding governance actions of their operations, and second, the academic contribution will be a more nuanced view of *Internet governance* by using ecologies as a metaphor for the complex network of actors and infrastructure that is the *Internet*, a nuanced view that gives room to the practicalities of a reality with multiple actors with different interests.

I start off this paper by going through the method used and

how it relates to my research interests, after that I present some key concepts and definitions. Then comes my semi-exhaustive overview of *Internet* institutions and actors; followed by how they coordinate and ending with my view of how the *Internet* is governed in practice and the answers to my guiding research questions:

1. In what ways can *ICANN* be claimed to govern the *Internet*?
2. Who, together or alone, are the de facto *Internet* governors?

Method

In this text I refer to several discussions and conversations during April, May and June of 2017, of which five were formal face to face interviews, shown in Table 1. The interviews were semi-structured in that they started with questions and discussions regarding definitions and views, and then on average contained a one hour long discussion about the interviewees view and opinions on *Internet* and *Internet governance*. I noticed that I have a better understanding of the different views and perspectives after the interviews than before because I came into the interviews read up on theory but unprepared for the real world. But since the formal interviews were recorded I have been able to listen through them again to try to avoid personal bias based on my understanding at the time of the interview.

During the interviews I found it helpful to be knowledgeable in the technical side of the *Internet*, I believe I would have gotten different answers if I had walked in without prior understanding of the often semi-technical matters. To reinforce

Type of Organization	Role	Reference
ccTLD	Security officer	ccTLD 1 (2017)
ccTLD	Security officer and CEO	ccTLD 1 and ccTLD 2 (2017)
IXP	Research director	IXP 1 (2017a)
IXP	Research director	IXP 1 (2017b)
N/A	EU-politician	Politician 1 (2017)

Table 1

Formal interviews used in this paper

that I think it matters who does the interview; I was given the comment during one interview that the old men of the *Internet* might be too impatient with those who lack knowledge, although I was given this comment in a discussion about the age composition of people involved in *Internet governance*.

In addition to the formal interviews I will also draw on informal communication.

I also refer to panel discussions and opinion pieces available online, such as youtube-recordings and blogs, which I value as important sources of opinion but I take the contents with a grain of salt since the discussions are made with the explicit or implicit purpose of swaying opinions.

Regarding language I have been interviewing both in Swedish and in English. I used Swedish in the cases where Swedish was the native language both for me and the interviewee, and English in all other scenarios. I do not consider my level of English as native, but good enough to be technically correct, even though I at moments had to ensure I had understood a certain idiom or expression correctly. A specific I have noticed is that in Swedish the *Internet* lacks an article, whilst it in English seems to be more common to say *the Internet* rather than just *Internet*.

I am in this text saying that I have not found literature on certain topics, and for avoidance of doubt: That means I have not found the literature, it does not mean it does not exist. I have through colleagues at other universities been given access to articles I could find on Google-scholar, i.e. know of their existence, but not available in full-text at Linköping University library, this should count as an indicator that there is academic literature I am missing.

Another issue I have had with academic literature is that there is a multitude of texts which concerns *Internet governance*, in any sense of the definition, but which does not consider itself to be *Internet governance*, just as van Eeten and Mueller (2012) points out, which increases the possibility of me missing important texts.

I do not consider my interviews nor literature overview to be exhaustive, which I have taken into consideration in the validity of my conclusions by interpreting that the data I have is valid, but it does not permit me to say anything about what is missing. What I find particularly lacking is that I have yet

to hold formal interviews with representatives from *ICANN*, *ISOC*, *ISPs* and the *UN* or *ITU*.

Concept of the hand

The *invisible hand* is a concept used by Smith in *An Inquiry into the Nature and Causes of the Wealth of Nations* (commonly referred to as *The Wealth of Nations*) and other works, and is by him the concept of self regulation for optimal efficiency and implicitly financial gain (Smith, 1776). In this text I will use the concept of the *invisible hand* as not centrally regulated or controlled, rather than self-regulation for economic self-interest, in the meaning that organizations and individuals can act as if guided by an *invisible hand*. This in contrast with the *visible hand*, which would be laws and regulation coordinating and controlling actors.

What is the *Internet*?

There are many questions regarding how the *Internet* is run and how it should be run today. I have here chosen to focus on *ICANN*, a Californian non-profit, who seems to play a central role in *Internet governance*. But before we start off on this journey some definitions are in order.

One problem I see today is that *Internet* in itself is very rarely defined, and in different contexts it seems to have different meanings. During my interviews I encountered two primary definitions which I present below:

Internet as a part of telecommunications

In this concept *Internet* is seen as a part of telecom, it happens to be something that runs *on* telecommunications infrastructure. This means that *Internet* in this scope roughly encompasses the concept of digital communication today. I have encountered two flavours of this concept as well, which differentiates themselves on whether the web is a part of the *Internet* or not. In my interviews Politician 1 (2017) uses the flavour that the web is part of the *Internet*.

Internet as a means of end-to-end communication

This definition of *Internet* comes from interviewees who explicitly stated that the *Internet* is not a part of

telecommunications, they might share the same infrastructure sometimes, but are fundamentally different in that telecommunications is regulated top-down while the *Internet* is regulated by a bottom-up process. This *Internet*-concept does not encompass the web or any other implementation which might use the *Internet*, and as the Wikipedia entry on the *Internet* states; “Not to be confused with the World Wide Web” (Wikipedia Contributors, 2017a). This concept is explicit on that the *Internet* is the concept of end-to-end communication using pre-agreed upon standards for digital communication, where one such standard might be IP. In my interviews this view is favored by ccTLD 1 (2017), ccTLD 1 and ccTLD 2 (2017), IXP 1 (2017a).

In the literature I find the first definition to be most prevalent, which is in accordance with van Eeten and Mueller (2012) except they refer to *formalized institutions* and *Internet governance* rather than *telecommunications* and the *Internet*.

I will in this text use the *Internet as a means of end-to-end communication* definition of *Internet* when I refer to the *Internet*. This has consequences on what *Internet governance* is, since *Internet governance* naturally has to be dependent on how we define the *Internet*.

Another definition we need for a useful discussion is *Internet governance*, of which there seems to exist multiple definitions today. One often used definition for *Internet governance* is WGIG (2005) which reads:

Internet governance is the development and application by governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet (WGIG, 2005)

This can be contrasted with another proposed *Internet governance* definition which reads:

Internet Governance is collective decision-making by owners, operators, developers, and users of the networks connected by Internet protocols to establish policies, rules, and dispute resolution procedure about technical standards, resource allocations, and/or the conduct of people engaged in global internetworking activities. (Mueller et al., 2007)

Without going deeper into the definition of *Internet* these two definitions are similar, but not identical. I find the WGIG (2005)-definition, in my interpretation, to include both intentional and unintentional governance actions, whilst the Mueller et al. (2007)-definition in my interpretation does not leave enough room for unintentional governance actions since it focuses on decision-making and dispute resolution

rather than including all informal activities which could contribute to governance. Also, in my interpretation “[...] governments, the private sector and civil society [...]” (WGIG, 2005) includes all possible actors, which not everyone would agree with. I would argue that there are those who would not include the public in the civil society.

I will therefore use *Internet governance* in accordance to the definition in WGIG (2005), and I will use *Internet governance* even though it can be argued that *Internet coordination* is a more suitable term since *governance* can be misunderstood as only being top-down (IXP 1, 2017b). What this means in conjunction with the previously mentioned definition of *Internet* is that *Internet governance* in this text is all of the actions which affect the way we can use end-to-end communication on the *Internet*. If I use the *Internet* or *Internet governance* in any other sense I will be explicit.

This is different from using the telecommunications definition of the *Internet* and the *Internet governance* definition of Mueller et al. (2007) which together would focus more on intentional regulatory and policy actions of a governing actor. To exemplify, then spectrum auctions could be seen as part of *Internet governance*, but I do not see them as such.

By using this definition of *Internet governance* I am limiting my *Internet governance* ecology to the end-to-end communication influences, i.e. routing and address resolution are key aspects of this. Some might argue that address resolution, i.e. *DNS*, is not a part of the *Internet*, but I believe unique human readable addressing is vital to the *Internet*'s function. For readers uncomfortable with my usage of the *governance* concept, think of it as *the management of the Internet* or *the organization of the Internet*.

Coordination and collaboration

In this text I will borrow the coordination concepts of Mintzberg (1980, 1993). He considers there to be five different methods of coordination in an organization, of which three are different forms of standardization. With *mutual adjustment (MA)* individuals are in charge of their own work and coordinate by communicating informally. In *direct supervision (DS)* a supervisor controlling the work of others by direct orders. Then there are three different forms of standardization; *standardization of work process (SPW)* when the doing of the work itself is coordinated by the imposition of standards, *standardization of outputs (SO)* when the output of the work is coordinated by the imposition of standards and *standardization of skills (SS)* where the work is coordinated and standardized by skills and knowledge. Mintzberg (1993) argues that it is very possible for an organization to use a combination of methods for coordination, and that his concepts should be considered as guiding when identifying

the important coordination concepts in an organization. He also defined five organizational forms matched to each of the different primary coordination mechanism, the important in this text being the *adhocracy* based on *mutual adjustment (MA)*.

I will here use his concepts to describe how institutions and organizations are coordinated I and hope readers of Mintzberg (1980, 1993) can accept this usage. For example regulation will fall under either *direct supervision* or *standardization of work process* depending on formulation.

In addition to Mintzberg I will also use Olve, Cöster, Iveroth, Petri, and Westelius (2013) and their typology of organizational actors. They suggest using a business ecology lens for understanding an organizational context, and divide ecologies into settings comprised of several actors types from the perspective of one actor, i.e. A might be a supplier to B, but a competitor to C. Olve et al. (2013) are explicit in that their actors are not exhaustive but rather a suggestion of where to start to identify important forces in a business ecology.

Suppliers are suppliers in multiple levels.

Customers are the chain of customers all the way to the end-user or consumer.

Distributors and intermediaries.

Competitors are already existing alternatives to the service or product being supplied.

Substitutes are potential non-existing competitors.

Financiers and other type of financing who could or not have a stake in the outcome of the organization.

Standardizers are organizations who's main product is standardization for a market or ecology.

Regulatory organizations are often governmental organizations with legalislative power. Differs fundamentally from standardizers in that they are not providing a service or product.

Politicians and influencers are those who could have an impact on, for example, which business models are good or not.

The civil society and the public often form opinions on what is considered good and not good.

Consultants and other types of concept or idea marketers usually impacts which impulses will act to form a market or ecology in the future.

These texts are written with different readers in mind; Mintzberg (1980) is a conceptual article presenting his initial ideas, Mintzberg (1993) is a book aimed at practitioners (i.e. managers) and Olve et al. (2013) is a book aimed at

practitioners describing the concepts of business ecologies, business models and strategic pricing.

Role of ICANN

I cannot seem to find a consensus on how the *Internet* is governed or where actual power lies, but *ICANN* has a central role so we start our journey there. I have been looking for such consensus but found none, and I even got a comment that it is beneficial for researchers like me that no such consensus exists (IXP 1, 2017a), since our jobs are dependent on there not being a consensus.

The *Internet Corporation for Assigned Names and Numbers (ICANN)* as an organization is bound by its bylaws, which among others state that "ICANN does not hold any governmentally authorized regulatory authority" (ICANN, 2016a) and that their mission, in short, is to *coordinate* allocation and assignments of names in the root zone and IP and AS numbers, to *facilitate coordination* of the operation of *DNS* and to *collaborate* with other bodies. The *ICANN* mission statement, i.e. *Section 1.1 MISSION* of "BYLAWS FOR INTERNET CORPORATION FOR ASSIGNED NAMES AND NUMBERS," does not contain the word *govern* in any form. During all of the interviews ccTLD 1 (2017), ccTLD 1 and ccTLD 2 (2017) and IXP 1 (2017a) I was given explicit answers that *ICANN* does not govern the *Internet* but rather facilitates coordination, and that *ICANN* should not go outside of that mandate. Although noteworthy is that the bylaws prior to October of 2016 described *ICANN*'s primary mission to be "coordination" (ICANN, 2016b) whilst the current bylaws rather focus on "ensuring" stable and secure operation of the *Internet* (ICANN, 2016a).

To contrast Politician 1 (2017) implies that *ICANN* has governmental-like authority by explicitly stating that it is problematic that there is no governmental regulation of *ICANN*.

Internally *ICANN* has several supporting organizations, who in turn depend on or consist of members of other organizations. *ICANN* also has several advisory committees. All of these can be seen as being part of the multi-stakeholder model (see Figure 1).

ICANN, as the bylaws state, are focused on naming and numbering; where naming broadly can be divided into ensuring a functional domain name system for *ccTLDs* (country codes such as dot-se, dot-de and dot-uk), *gTLDs* (generic top level domains such as dot-com, dot-org and dot-biz) and others (reserved names such as dot-local, dot-arpa and dot-onion), and numbering IP-address allocation.

ICANN has the following supporting organizations and advisory committees:

Address Supporting Organization (ASO)

Contractually ASO is only bound to ICANN with a *Memorandum of Understanding* which specifies that *Number Resource Organization (NRO)* shall fulfill the role, responsibilities and functions of the ASO as defined in ICANN (2016a), and in turn the board of ASO consists of representatives of the *RIRs* (ASO, 2004). ASO handles IP-address related issues (i.e. the numbering). ASO is the name of the ICANN facing organization, whilst NRO is the RIR facing organization, even though technically NRO is the actual organization (ASO, 2017).

Country Codes Names Supporting Organization (ccNSO)

According to CcNSO (2017) the ccNSO is a naming-related body within the ICANN structure which indirectly is managed by the ccTLDs. This makes the ccNSO slightly different from the ASO in that the ccNSO is fully a part of ICANN whilst ASO technically is a separate organization. The ccNSO acts as a supporting organization for ccTLDs and their managers.

Generic Names Supporting Organization (GNSO)

The GNSO is comparable to the ccNSO but for gTLDs, although as a whole GNSO is broader and try to encompass a wider range of interests. GNSO divides their stakeholders into four groups; commercial, non-commercial, registrars and registries (GNSO, 2013).

At-Large Advisory Committee (ALAC)

The ALAC as an advisory committee which represents the *Internet* users through a series of *Regional At-Large Organizations* and *At-Large Structures* (ALAC, 2016), and is the only advisory committee with a board position at ICANN (ICANN, 2016a). The ALAC work to ensure that the *Internet* serves the public interest (ALAC, 2016).

Governmental Advisory Committee (GAC)

The GAC represents governmental interests, and acts as an advisory committee to the board of ICANN (GAC, 2015).

Security and Stability Advisory Committee (SSAC)

The SSAC advises the ICANN board on matters relating to the security and integrity of the *Internet's* naming and address allocation systems (ICANN, 2017e), and does not represent a particular group but rather interested individuals (IXP 1, 2017a).

Root Server System Advisory Committee (RSSAC)

The RSSAC advises the ICANN board on matters relating to the *Internet's Root Server System* (ICANN, 2017d). The RSSAC consists of representatives from the thirteen root-server operators in the world (ICANN, 2017d).

ASO, ccNSO, GNSO, ALAC and GAC together form the *Empowered Community (EC)* (ICANN, 2016a, 2017f) which takes the role of a chapter meeting in a contemporary organization. Worth noting is that SSAC and RSSAC are *not* part of the EC, according to IXP 1 (2017b) because neither the RSSAC nor the SSAC are interested in being anything other than advisory to the board regardless of who sits on the board.

The EC has most powers associated with a chapter meeting, such as electing the board and amending the bylaws (ICANN, 2016a), but also more uncommon powers such as rejecting *PTI* governance actions (i.e. those connected to the *IANA* function, which I will get back to), recalling and appointing board members at any time and selling assets (ICANN, 2016a, 2017f).

The EC was created in conjunction with the *IANA* stewardship transition in October of 2016, before that the EC didn't exist, and it has turned into a powerful structure lacking members (IXP 1, 2017b). Also the processes shown in ICANN (2017f) are expensive and cumbersome to maintain (IXP 1, 2017b).

The Internet Foundation In Sweden (IIS), the ccTLD for .se, released a book in 2010 describing *Internet governance* from a Swedish context, without fully detailing what that would entail, where Jonson divides *Internet governance* into three universes; the *ISOC*-universe, the *ICANN*-universe and the *UN*-universe (Jonson, 2010). I will use this division of universes since it together with my interviews provides a good demarcation of different important organizations.

The *ICANN*-universe is described as the necessary universe to bridge the technical *ISOC*-universe to the US and other states (Jonson, 2010). *ICANN* as an organization is described as being very close to the *Internet Assigned Numbers Authority (IANA)* function as well as the US state through *National Telecommunications & Information Administration (NTIA)* and the Department of Commerce (Jonson, 2010), up until the *IANA*-stewardship contract expired and the formal relation was dissolved (Gruenwald, 2016). Both the *NTIA* and the Department of Commerce are US government entities.

ICANN today is primarily funded through reselling of gTLDs, and their revenues are increasing year upon year, which could be problematic in the long run since *ICANN* is no longer dependent on the *Internet* community as a whole (ccTLD 1 & ccTLD 2, 2017). In 2010 *ICANN* had a revenue of \$65 M and in 2016 closer to \$200 M where the absolute majority of the increase comes from gTLD sales and applications (ICANN, 2010, 2016c).

The board of *ICANN* consists of sixteen (16) voting directors and four (4) non-voting liaisons (ICANN, 2016a). In total eight (8, seats 1-8) of the board members are nominated

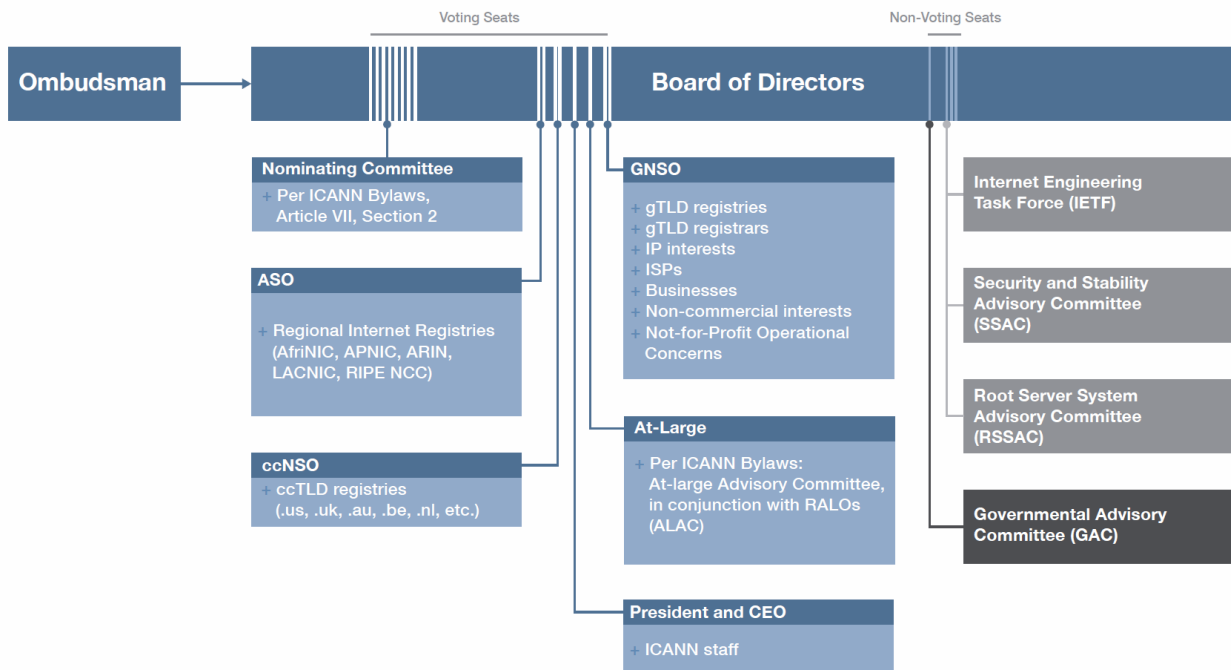


Figure 1. Organization of ICANN (ICANN, 2017b)

by the nomination committee, six (6, seats 9-14) by ICANN supporting organizations, one (1, seat 15) by the *At-Large Advisory Committee (ALAC)* and the last director (seat 16) is the president of ICANN. The four (4) non-voting liaisons are selected by the *Governmental Advisory Committee (GAC)*, the *Root Server System Advisory Committee (RSSAC)*, the *Security and Stability Advisory Committee (SSAC)* and the *Internet Engineering Task Force (IETF)*. The IETF-liaison is the only member appointed by a non-ICANN constellation. Also interesting to note is that the ALAC elect a voting member while the other advisory committees elect non-voting liaisons (ICANN, 2016a). Previously the *Technical Liaison (TLG)* appointed one member as well (GNSO, 2012), so in a sense the technical and standards community has gone from two seats, i.e. IETF and TLG, to only one liaison seat with IETF.

The board of ICANN elects its chairperson on an annual basis, and the chairperson has to be a director of the board other than the president (ICANN, 2016a). Also, the board elects all officers, including but not limited to the president, and they are nominated by the chairperson (ICANN, 2016a), and I am unsure whether this practically means that it is impossible to appoint officers which are not favored by the chair or not.

Repeatedly under my interviews I hear that the most important aspect of ICANN is ensuring that people and organizations keep talking and that the IANA function remain func-

Seat	Nominates	Elects	Voting
1-8	NC	EC	yes
9,10	ASO	EC	yes
11,12	ccNSO	EC	yes
13,14	GNSO	EC	yes
15	ALAC	EC	yes
16	Chair ¹	board	yes
N/A	GAC	GAC	no
N/A	RSSAC	RSSAC	no
N/A	SSAC	SSAC	no
N/A	IETF	IETF	no

Table 2
ICANN board composition (ICANN, 2016a)

tional (ccTLD 1, 2017; ccTLD 1 & ccTLD 2, 2017; IXP 1, 2017a). One implicit purpose of ICANN is to take up space, so there is no vacuum for the UN or other organization to rush in and take control of the Internet coordination mechanisms (IXP 1, 2017a).

IANA function

The IANA function today lies under ICANN via the *Public Technical Identifiers (PTI)* organization (NRO, 2017). Technically IANA is responsible for the coordination of IP-address and ASN allocation globally, which is done via the RIRs and

NRO-ASO (NRO, 2017). It is often implied that the *IANA* function is the most important function of *ICANN* (Aerts, 2007; ccTLD 1 & ccTLD 2, 2017; Dolderer & Bäss, 2006; IXP 1, 2017a; Oleg & Chahadé, 2015).

TLG and TEG

Both *Technical Liaison (TLG)* and *Technical Expert Group (TEG)* are groups in *ICANN*, with the *TLG* consisting of representatives from *European Telecommunications Standards Institute (ETSI)*, *International Telecommunications Union's Telecommunication Standardization Sector (ITU-T)*, *World Wide Web Consortium (W3C)* and *Internet Architecture Board (IAB)* (*ICANN*, 2012). The *TEG* consists of all *TLG* members, *ICANN* board and invited participants (*ICANN*, 2017c).

In *TEG* (2016), a meeting transcript from a *TEG* meeting, it can be seen that neither the line between policy and standard, nor domain name and protocol specification is completely clear. With standards and protocols technically belonging in the *IETF* sphere and policy and domain names in the *ICANN* or *IANA* sphere (Carpenter, Baker, & Roberts, 2000).

ISOC-universe

Jonson (2010) describes the *ISOC*-universe, and indirectly *Internet Engineering Task Force (IETF)*, to be what he calls the technological governance of the *Internet*. He describes the initial processes to be *ad-hoc* and *bottom-up*, which Mintzberg (1980) would describe as coordination by *mutual adjustment*, and points to two forms of *ad-hoc*-standardization documents, *Request for Comment (RFC)* and *Best Current Practices in the Internet (BCP)*. Where *BCPs* usually are connected to *RFCs*, where *RFCs* can be seen as the de facto standardization document and *BCPs* as recommendations in those cases standardization would be unsuitable (Postel, Li, & Rekhter, 1995). The mission of *ISOC* is to “Keep the *Internet* going”, where I assume they are using the end-to-end communication definition of the *Internet* since Jonson (2010) argues that *ISOC* roughly is the “technical association of the *Internet*”. The “The Tao of IETF: A Novice’s Guide to the Internet Engineering Task Force” describes decisions as being based on consensus and indirectly bottom up.

The *IETF* in itself is an open membership engineering group for *Internet* standards, and is described as being a semi-functioning old boy’s club (ccTLD 1, 2017). According to IXP 1 (2017a) *IETF* has problems with agreeing and saying yes to suggestions since all decisions in the *IETF* board has to pass a consensus process, this might be part of the problem that *IETF* today is seen as slow moving, such as in Li (2015b).

Other actors in the *ISOC* sphere include *Internet Architecture Board (IAB)* and *Internet Research Task Force (IRTF)*. *IAB* is committee of *IETF* and acts as an advisory body of *ISOC*, and according to Li (2015b) it used to be another functioning old boy’s club which got overthrown and got inefficient. *IRTF* are the research aspect where *IETF* is the engineering aspect, and are primarily distinguished in that *IETF* produces standards but *IRTF* produces research (Floyd, Paxson, & Falk, 2006). There is circumstantial evidence that *IETF* is guided by commercial interests (Floyd et al., 2006) and *IRTF* is lacking traction in the academic community (Li, 2015b). According to IXP 1 (2017a) it is not problematic if commercial interests are guiding *IETF*, since organizations often have a stake in what they do, but I would argue that it would be possible for organizations to use *RFCs* for their own commercial interest, for example I assume that *RFCs* can be seen as standards by the non-initiated, and therefore it gives a market advantage by being able to show that your products fulfill *RFCs*. As of June 2017 there are approximately 8100 *RFCs* available and in Table 3 I show the number of *RFCs* authored or co-authored by a number of organizations. I got the numbers from using

```
> grep -il $PATTERN rfc*.txt | wc -l
```

where *\$PATTERN* is the organization’s name in a directory containing all *RFCs*. This goes through all *RFCs* and counts how many match *\$PATTERN* without taking case into account. So technically it is not a correct representation of authorship but should give a rough estimation. As seen, in Table 3, Cisco is part of as many *RFCs* as IBM, Microsoft, Juniper, Yahoo and Facebook together. Academia is intentionally left out in the table due to lacking a key term to search for.

Org	Authors
*	8082
Cisco	2074
IBM	811
Microsoft	609
Juniper	369
Yahoo	159
Facebook	21

Table 3
RFCs per organization

IXP 1 (2017a) does not see a problem with that businesses have a large impact in the *IETF* standardization process, and says that in many cases it is beneficial since they then have an interesting in their standards being used, and in this case standards is nothing but a different kind of product.

ISOC itself is funded mostly through contributions and grants (*ISOC*, 2015b), and is listed as *Programme Support* in their financial statement and amount to \$32 M (*ISOC*,

2015a), and is probably coming from *PIR* (*Public Interest Registry*) and is sales of dot-org, dot-ngo and dot-ong domain names. The revenue of *ISOC* is roughly \$40 M (*ISOC*, 2015a).

UN and ITU

Last in Jonson (2010) is the *United Nations (UN)* and *International Telecommunications Union (ITU)*, two world wide organizations who's members are states, where *ITU* is the *UN*'s specialized agency for information and communication technologies (*ITU*, 2017a). Neither the *UN* nor *ITU* has a technical or governing role in the *Internet* infrastructure (Lee, 2012), but there are interests that want to put the *UN* in a more central role of the *Internet* ecosystem (*IXP 1*, 2017a; Politician 1, 2017).

In 2012 *ITU* held *World Conference on International Telecommunications (WCIT)* 2012 where the role of *UN* in the *Internet* was discussed, and in short the states decided that the *Internet* should be free and not governed by states (Dourado, 2012; *IXP 1*, 2017a). *IXP 1* (2017a) reasons that fundamentally there is nothing wrong with governing the *Internet* by *UN*-like means, but then all countries have to be working democracies and voting power somehow related to population. Dourado (2012) cites US Ambassador Terry Kramer as saying “*Internet* policy should not be determined by Member States, but by citizens, communities and broader society” (Dourado, 2012), i.e. implicating that member states are not perfect representations of citizens, communities and the broader society. *IXP 1* (2017a) is explicit in that the problem is not the *UN* itself, but rather that all of its members are not democratic enough. Most of the western states voted against the resolution, even though a majority of all states voted in favour for it (Cherryil, 2012; *ITU*, 2012; Masnick, 2012). *IXP 1* (2017a) reasons that the question is bigger than it first might seem, and that the resolution was not only about the *Internet* but also concerns how states are to relate themselves to international fragmentation and nationalism, i.e. should the *Internet* transcend national borders or not.

I want to highlight that *ITU* predates the *UN* with eighty years or so, being incorporated in 1865 as the *International Telegraph Union*, starting with the role of supervising the agreement for international telegraphing and over the years including telephony, radio, television, space and satellites, the *Internet* and mobile connectivity (*ITU*, 2017b). Worthy of note is that *ITU* (2017b) are neutral when presenting the history of the telegraph, the radio and telephony and describe how the *ITU* was created as a necessity, but while discussing the *Internet* the text loses neutrality and describes how “hardly anyone would be able to use this powerful resource without *ITU*-brokered and approved global standards” (*ITU*, 2017b). I believe they refer to the telecommunication stan-

dards set by the *ITU*, but they are not mentioning any specific standards. *ITU* (2017b) does not contain the word *governance* nor does it define the *Internet*.

Both *ITU* (2017b) and Jonson (2010) describe *WSIS* as an informal series of meetings discussing the development of the *Internet*, which after the last meeting in 2005 was replaced by the *Internet Governance Forum*, an annual *UN* hosted forum.

Even though the *ITU* is part of the *UN* and transparency seems to be important, there are still those, such as Dourado (2012), *IXP 1* (2017a), Lee (2012), who state that the *ITU* is not transparent enough. Dourado (2012) exemplifies by saying that even though the plenary sessions of *WCIT* 2012 were open, most discussion and decision making was made behind closed doors. This in contrast with *ICANN* where *ccTLD 1* (2017) argues that it is not possible to say that *ICANN* is not transparent, even if you might disagree with some of *ICANN*'s policy.

ccTLDs

ccTLDs are the national level registries and registrars for country code top level domains. The actual code for each country is the corresponding ISO two-letter country code. *ccTLDs* in general are connected to *ccNSO* but they are not forced nor are they needed to be members. *ccTLDs* are in general not contractually bound to *ICANN*, but can rather be seen as constituents of *ICANN* (*ccTLD 1* & *ccTLD 2*, 2017). *ccTLD* registries are in general funded by *ccTLD* sales (*ccTLD 1* & *ccTLD 2*, 2017).

gTLDs

gTLDs are generic top level domains, such as dot-com and dot-gov, as well as the “new” *gTLDs* such as dot-xxx and dot-google. *ICANN*, and not *GNSO*, approves all new *gTLDs*. The *gTLDs* speculated that they would turn a profit by investing in a new *TLD*, but some *gTLDs* have issues with keeping subscribers, such as dot-xyz who lost 30 million out of 35 million subscribers when it was time to pay (*IXP 1*, 2017b).

RIRs

Regional Internet Registrars (RIRs) are closely connected to the *NRO* (and *ASO*) and their primary activity is distributing IP-addresses and ASNs to *ISPs* and other actors. If a *RIR* runs out of IP-addresses they ask *ICANN* and the *IANA* function for more. *RIRs* are distributing numbers and are a key aspect of the *IANA* numbering function.

ISPs

As mentioned earlier, one weakness in this study is the lack of formal input from *ISPs*, which I find particularly disheartening since IXP 1 (2017a) said that the real power lies with the *ISPs* since they can implement whatever they want no matter what has been decided elsewhere. Although I also was told that *ISPs* in general are not interested in *Internet governance* (IXP 1, 2017a).

In this text I will limit the use of *ISPs* to being the vendors of *Internet* access to *Internet*-users, and they are in effect a wholesaler for *Internet*-access. And therefore they are in more or less complete control of what *Internet*-access is for the ordinary user, since their *ISP* can prevent certain services (Netflix, Google, Facebook etc), protocols (Bittorrent, Telnet, SMTP etc) and ports (incoming port 25 (mailserver), 80 (webserver), 443 (secure webserver) etc connections). Most users do not have to financial ability nor interest to connect to an *IXP* and peer with other networks (IXP 1, 2017a) and therefore are at an *ISPs* mercy. *ISPs* also own a large part of the *Internet* infrastructure, i.e. cables and equipment at both edges and inside AS:s.

In large parts of the world there is legislation in place to regulate *ISPs* into not modifying or otherwise changing, inspecting or logging traffic going through their networks, with the laws in Europe being quite prominent (IXP 1, 2017a).

IXPs

IXP stands for *Internet Exchange Point* and are a place where *Internet* traffic and access is exchanged. *IXPs* exchange traffic at layer-2 (IXP 1, 2017a), i.e. one layer below IP, even though there are *IXPs* out there which theoretically could switch at layer-3.

ISOC (2015c) argues that governments and other entities should help foster *IXPs* since they are vital for a working *Internet*-infrastructure ecology, and says that *ISPs* have cost incentives to collaborate and start *IXPs*. Usually *IXPs* are another *Internet*-access wholesaler actor-type, which sells access in a different magnitude than *ISPs*. Usually *ISPs* are the customers of *IXPs*. Usually the traffic through an *IXP* is high enough that filtering or monitoring of traffic is impossible (IXP 1, 2017a), but *IXPs* could always shut of their services or perhaps other organizations with sufficient resources could be interested in having on-site equipment.

Also *IXPs* are often regulated in law, but less commonly so since legislation sometimes only regulated traffic operators or service providers, and some national legislation does not consider *IXPs* as such (IXP 1, 2017a).

ISC

The *Internet Systems Consortium (ISC)* is a public benefit incorporated in the US who operates a root server and are a major contributor to the *BIND DNS* software. *BIND* is the most commonly used *DNS* software for root servers in use today (ccTLD 1, 2017; Wikipedia Contributors, 2017b).

Coordination

On the previous pages I have tried to give an overview of organizations I deem important for the governance of the *Internet*, and here I will focus on how these and others interact and what I believe the consequences are.

Let us start from my first research question, *Does ICANN govern the Internet?* I argue with reasonable reliability that *ICANN* does not, in any sense of the word, govern the *Internet*, given the earlier overview of *ICANN*. They do, on the other hand, have an impact on how and who actually has power over the *Internet* and how the *Internet* can be used, which I will spend the rest of this text discussing.

Internet governance as I previously defined it concerns everything that effects how the users might communicate end-to-end with the *Internet* now and in the future. In Figure 2 and Table 4 I show the organizations I found interesting in a *Internet governance* context and how they coordinate and connect.

Figure 2, although not exhaustive, highlights how organizations are connected in a different manner than Table 4 where I rather focus on coordination. In Figure 2 a harder and darker line implies greater influence, with the strongest lines being from *gTLDs* to *GNSO*, *ccTLDs* to *ccNSO* and *RIRs* to *ASO* since they are the constituents of the supporting organizations. Currently the *Empowered Community* is not in the figure due to drawing limitations, but the *EC* is *GNSO*, *ccNSO*, *ASO* and *GAC* in conjunction.

Governments are regulating businesses and communication in general, and also provide regulation which could be seen as standards. The other two main contributors to *Internet* de juro and de facto standards are the *ITU* and *IETF*. Businesses in Figure 2 include but are not limited to *ISPs* and *IXPs*.

In Figure 2 the civil society represents not only organizations but also individuals and academia, in the same manner as I interpret civil society in the WGIG (2005) *Internet governance* definition. And the civil society can lobby towards governments as well as the *UN*, although it should be noted that lobbying usually requires funding and is hard for a single individual to do Politician 1 (2017), and *ALAC* is the *ICANN* organization for the civil society.

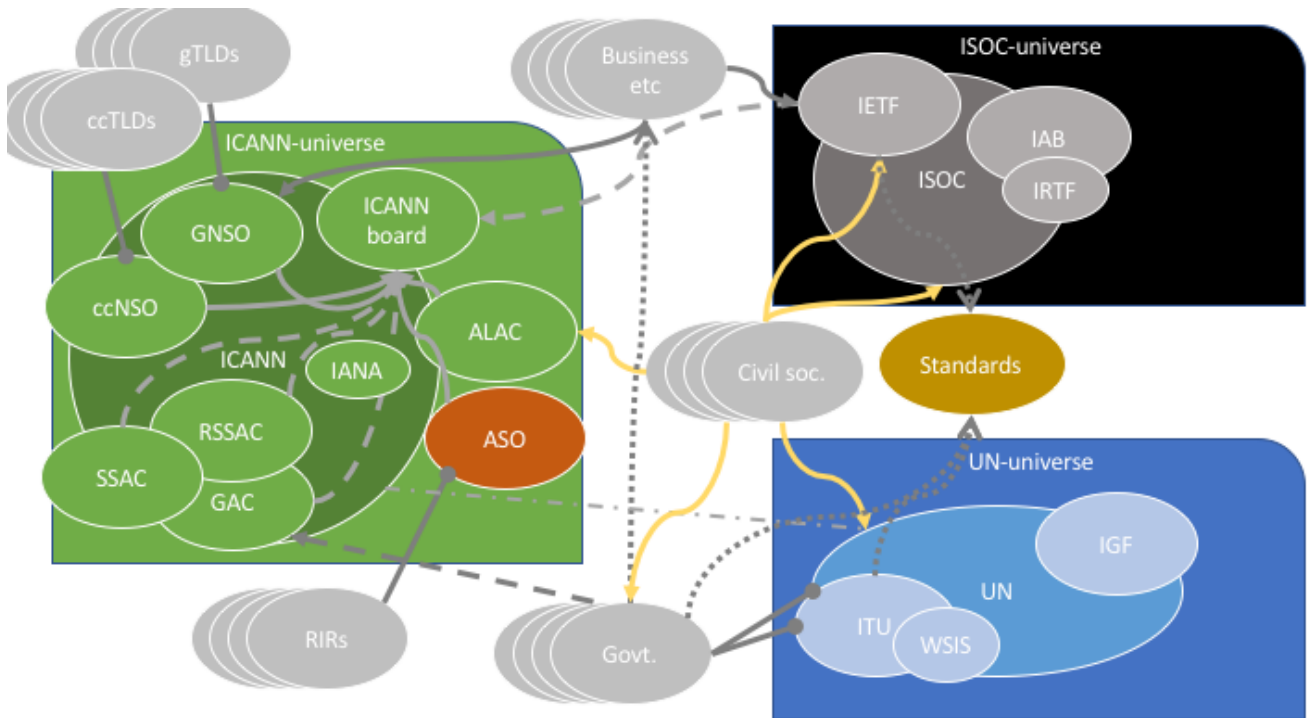


Figure 2. An Internet-ecology overview

I find it interesting that *ICANN* receives funding from *ccTLDs* even though they originally were not contractually bound to each other, although there are more and more contracts being written in the later years (*ICANN*, 2017a). For example the Swedish *ccTLD* dot-se is held by *IIS* but they do not have a contract with *ICANN*, rather an exchange of letters (Aerts, 2007). In these letters *IIS* acknowledge that *ICANN* exists, and that as the performer of the *IANA* function, they are interested in having a mutual agreement in place, but also clearly state that they are not in a contractual relationship nor intend to be, as quoted: “It is the intention of both parties that this exchange of letters will not form the basis for any claim for any legal or equitable relief, or create reliance on the part of either party. For avoidance of doubt, nothing contained in this letter shall give rise to any liability, monetary or otherwise by either one of us to the other” (Aerts, 2007). According to *ccTLD* 1 and *ccTLD* 2 (2017) *IIS* chose not to contribute with funds to *ICANN* the last fiscal year.

ICANN has historically been funded to a greater extent by its constituents, such as *ccTLDs*, but today their financing primarily comes from sales of *gTLDs*, which could be problematic in that *ICANN* is gaining independence. As both Aerts (2007) and Dolderer and Bäss (2006) imply the main reason they, as *ccTLDs*, are contributing funds to *ICANN* is for the operation of the *IANA* function, and the *.de*-registrar in particular states in their letters of exchange; “In particular, we look forward to further improvements of the *IANA* function

as the core service *ICANN* provides to *ccTLDs*” (Dolderer and Bäss, 2006) without further specifying what such an improvement might be.

This coordination between *ICANN* and *ccTLDs* has been mutual adjustment over the years, but there are examples of contracts as well such as the *Accountability Framework* for the *ccTLD* of Ukraine.

In theory *ICANN* is a membership organization and it would be possible for its constituents to agree on another organization (*ccTLD* 1, 2017; *ccTLD* 1 & *ccTLD* 2, 2017; *IXP* 1, 2017a) but for practical reasons this would not happen. Even though *ICANN* from the theoretical perspective lacks decision rights in itself *ICANN* has influence on the process of *ICANN*- and similar meetings since they are planning them.

There are those that see the geographic closeness between both *ICANN* and *IETF* to the US as problematic (Lee, 2012; Politician 1, 2017), although it can be argued that similar problems might arise no matter where the organizations are located (*IXP* 1, 2017a) and the most important issue is that the *IANA* functions are hosted in a functioning semi-democratic environment. During the *IANA* stewardship transition period there were outcries against the US giving up control over the *Internet* (Raustiala, 2016).

IXP 1 (2017a) says that there is virtually the same people showing up again and again at most *ICANN* meetings, argu-

ing for the same thing over and over again and since there is no proper veto-mechanism in place in *ICANN* they sooner or later get their policy suggestions through. In addition IXP 1 (2017a) mentions that you encounter the same people in both *IETF* and *ICANN*, which gives fuel to a *Quora* answer to the question *What are the relationships among ICANN, IETF, and IANA?* by Li: “Heavily incestuous [spelling corrected]” (Li, 2015a).

On the context of participation and funding both ccTLD 1 (2017) and IXP 1 (2017a) mention that most of the founding organizations were not reimbursing or otherwise allowing for participants without funding to attend. ccTLD 1 (2017) mention that this has slowly changed over the years with *ICANN* today reimbursing many of the travels needed for representative duties.

Informally I have been told that there is a problem with many governmental processes that there is no well recognized difference between telecommunications and *Internet*, which lets telecommunication lobbyists set the *UN* and governmental agenda even for the *Internet*. Politician 1 (2017) mentions that there are many telecommunication lobbyist at an EU-level, but few which I would consider *Internet* lobbyists, and I believe this helps create the perception that telecommunications and the *Internet* are the same with regards to regulation. The reason for the telecommunication lobbyists outnumbering the *Internet* lobbyists is that the money is in telecommunications and not *Internet governance* (IXP 1, 2017b).

IXP 1 (2017b) suggests that there are two primary reasons for *Internet* and telecommunications being treated as one and the same;

1. You think telecommunications and the *Internet* are the same.
2. You want telecommunications and the *Internet* to be the same.

IXP 1 (2017b) argues that the first reason is due to not understanding the fundamental differences between what the *Internet* and telecommunications are, and can quite easily be solved through informative dialogue. And therefore the second type is much more dangerous for the *Internet* as it is today, since governmental long term pressure is the greatest threat to the *Internet* today (IXP 1, 2017b).

As mentioned before, *ICANN* seems to be the most prevalent organization in the public debate regarding *Internet governance*, I believe this is because it is easier to have a discourse regarding a *visible hand* than an *invisible* one, and in the context of *Internet* it opens up for a governance discussion without prior knowledge of *Internet* protocols and standards. As an example Raustiala (2016) sees *Internet governance* as a question whether the *Internet* should be governed by a multistakeholder or a multilateral model and does not go deeper

into the organizations constituting the *Internet*, and indirectly assumes that the naming and numbering function of the *Internet* implies great power, whilst IXP 1 (2017a) and ccTLD 1 (2017) say it is the other way around, i.e. that *ICANN* has power because they are given the right to coordinate numbering and naming. And that the power of coordinating the naming and numbering function of the *Internet* can be taken away.

But real power seems to lie in the hands of the *ISPs* since they are the de facto wholesalers of *Internet* access to end users, and therefore almost freely can decide what *Internet* access entails. IXP 1 (2017a) agrees with this conclusion. Practically it is not unusual for *ISPs* to block certain ports, for example port 25 which is necessary for a mail server to function properly, since it is sometimes in the interest of the *ISP* to control which protocols can be used. In the case of the mail server *ISPs* and others have a responsibility regulated in law, at least in Europe, to handle traffic which could damage or otherwise disrupt other networks or users (IXP 1, 2017b), which means they blocked the port needed for private customers to operate their own mail servers according to *IETF* agreed standards.

IXP 1 (2017a) mentioned that it is unfeasible for *IXPs* to monitor all traffic, but I believe that *ISPs* in general have more processing power closer to the end users, i.e. the *Internet*'s edge, where it actually would be feasible to filter or monitor traffic. They would for all intents and purposes define what *Internet* access is.

One interesting aspect of *ISP* power is BCP-38 (*Best current practice*), an *IETF* document describing best practice with regards to a DoS problem where the attacker is spoofing his IP-address (Ferguson & Senie, 2000). According to IXP 1 (2017b) the problem is easily solved at the *Internet*'s edge, and should be in the interest of all, but the problem is not solved. One of the reasons is that the BCP itself does not provide a guide for implementation but rather describes the problem (IXP 1, 2017b). Important to understand is that the only way to find if the source is address spoofing is at the edge of the *Internet*, i.e. at the edge of an *ISP*'s network facing a consumer, once the packet is on the *Internet* it is not possible to distinguish it from any other packet (IXP 1, 2017b).

On the topic packet filtering and priority the *EU* recently adopted a policy which requires prioritizing packets on the *Internet*, IXP 1 (2017b) reasons simply not possible and stems from either reason 1) or 2) as they are stated previously, and that regulation like this could either be enforced or ignored, which then would lead to further undermining of the concept of the *Internet* as being bottom-up governed.

In Table 4 I list actors and their relations and classify them in a Mintzberg (1980) coordination fashion. I have taken liberties with the typology and see appointments as *direct*

Organization 1	Organization 2	Type	Relation
ICANN	ccTLD	MA	<i>Accountability Framework</i> (contractual) or <i>Letters of Exchange</i> (non-contractual). Usually the ccTLD supports ICANN financially to perform the IANA function.
ICANN	ISPs		Technically ISPs can be members of a GNSO stakeholder group and through that sway policy decisions at ICANN. ICANN has no power over ISPs in general, except via IANA and RIRs.
ICANN	IXPs		As with ISPs IXPs can be members of a GNSO stakeholder group, but formally ICANN has no power over IXPs.
ICANN	IANA	DS?	ICANN is the administrative seat of the IANA function.
IANA	RIRs	MA	A coordinating relation for distributing number resources, such as IP-addresses.
ICANN	IETF	MA	IETF appoints an ICANN non-voting board liaison.
EC	ICANN	DS	EC more or less control ICANN.
RIRs	ASO	DS	RIRs together constitute the ASO board.
ASO	ICANN	DS	ASO appoints an ICANN director.
ccTLDs	ccNSO	MA	Most ccTLDs are ccNSO-members and coordinate themselves through ccNSO.
ccNSO	ICANN	DS	ccNSO appoints an ICANN director.
GNSO	ICANN	DS	GNSO appoints an ICANN director.
RSSAC	ICANN	MA	RSSAC advises ICANN.
SSAC	ICANN	MA	SSAC advises ICANN.
IETF	ISPs	SO	It is usually in the interest of ISPs to adhere to enough IETF standards, since they are wholesalers.
IETF	IXPs	SO	As with IETF- ISPs, it is in the interest of IXPs to adhere to enough IETF standards.
IXPs	ISPs	MA	Usually ISPs buy access to an IXP so they can peer with other network owners, since it is in the interest of the ISP to give better access to their customers.
ISPs	ISPs	MA	Usually ISPs peer with each other since it is in their interest to increase to reach of their customers.
ICANN	UN	MA	There does not seem to be a formal connection, they clearly recognize each other, and a majority of UN members seem to want increased control over the Internet.
ICANN	ITU	MA	See ICANN- UN relation.
ITU	UN	?	Technically ITU is a part of the UN, but their members differ slightly.

Table 4

Internet-actors and their relations

supervision (DS) since they are direct application of influence. I use *mutual adjustment* (MA) for relations which are not formal but there is interaction and *standardization of outputs* (SO) for standardization processes. I prefer *standardization of outputs* rather than *standardization of work process* or *standardization of skills* since the standardization concerns outputs or handover of data between networks rather than focusing on training (i.e. SS) or actual implementation (i.e. SPW). All of the relations shown in Figure 2 are not shown Table 4, the purpose of Figure 2 is to show organizations and actors related to each other and primarily to their universes, and in Table 4 to focus on particularly important relations in a coordination context.

As seen in Table 4 most of the coordination of *Internet* mechanisms can be seen as done by *mutual adjustment*, but there are clear streaks of *direct supervision* with the implementation of the *Empowered Community*. Also most formal *Internet governance* power is related to the ICANN universe, even though ICANN is not powerful within the *Internet* community ICANN has perceived power from a governmental and regulatory perspective.

In the terms of Olve et al. (2013), if we consider the *Internet* to be a service providing a best effort end-to-end packet delivery solution, the external, i.e. non-*Internet* actors, most influential actors are customers and the civil society. Regulatory, legislative and political influence seem to play a small

role in how the *Internet* has developed and is developing. Among the *Internet* actors there is no clear regulator, but rather two coordinators; *ICANN* with the *IANA* function for numbering and naming and *IETF* for *Internet* standards. Interestingly enough I find little pressure from the civil society within or among *Internet* actors, but rather towards politicians and governments, which probably is based on my limited interviews.

As previously mentioned there are legislative and regulatory pressure from governments towards *ISPs*, such as traffic priority regulation, which lacks greater impact. Although there is need from legislators for the *Internet* to be *governable*, in the top-down policy making sense of the word.

Both the typologies of Mintzberg (1993) and Olve et al. (2013) have been useful in analyzing the *Internet* ecology, especially when reasoning how coordination is done and where power lies even in the event of informal and non-contractual connections, something conventional network models can have issues with.

Out of the previously mentioned organizations *ICANN* is growing the fastest, both in terms of employees and revenue, and a glance at the financial reporting shows us that the majority of the revenue increase is from *gTLD* related. Although it is important to consider that some of the revenue gathered by *ICANN* in the last few years is temporary (IXP 1, 2017b), but we do not know how much yet. In general many of the organizations I have mentioned are growing, but at a much slower pace. To put the revenue into perspective *IIS* and *DENIC* (the German *ccTLD*) were together contributing around \$100 000 per year (Aerts, 2007; Dolderer & Bäss, 2006) to *ICANN* and the *IANA* function, whilst *ICANN* has increased over \$100 000 000 in revenue the last seven years (*ICANN*, 2010, 2016c), which is roughly 1000 times as much. And it begs me to consider if the role of *ICANN* might change over the coming years, or if the mission of the organization stays the same even though their revenue seem to be ever increasing, although IXP 1 (2017b) says that running a root zone inherently is just a cost, and that *gTLDs* will only bring an income as long as customers see a value in owning them.

If we try to see the *Internet* as an organization, the organization is clearly using *mutual adjustment* as primary coordination mechanism and decisions are in general taken by those close to the problem in lieu with how Mintzberg would define an *adhocracy*. As argued by Mintzberg (1993) having a primary coordination mechanism does not mean that other forms of coordination are not used, only that if there is contradictory coordination from different mechanisms, the coordination given by the primary mechanism is the one adhered to.

As an example, if your boss tells you to do one thing (*DS*),

your colleague asks for help on something else (*MA*) and your training to do something different (*SS*). Then if you are in an *MA* dominated environment (i.e. *adhocracy*) you would probably do what your colleague asked, whilst if you are in a “simple organization” do what your boss told you (*DS*) or follow your training if you are in a professional bureaucracy (*SS*). Since the *Internet* has most tendencies of an *adhocracy* it would be expected for *Internet* actors to rather do what their peers expect them to rather than what being told (for example regulation).

As another example Mueller and Chango (2008) discusses the issue of why the *WHOIS* system prevails even though it is contradictory with data protection laws, i.e. why does the *WHOIS* service not follow regulation and common global governance understanding? Given that the *Internet* could be considered as an *adhocracy*, it would be expected that the *WHOIS* system would prevail since it coordinated by *mutual adjustment* rather than *direct supervision* or *standardization of work process* (in this case regulation).

Another important aspect of *adhocracies* is that they are hard to change in the perspective of forcing change through the organization, they rather tend to do what they want (Mintzberg, 1993), which has the very important implication that there is no someone or something which can change the *Internet* on its own, and also representing the organization of the *Internet* externally is problematic since there is no elected leader or authorized signatory for the *Internet*.

Method critique

I started my process with researching *ICANN* and took it from there, and even though my research is not exhaustive I argue that I have identified the most relevant *Internet* actors but may lack some perspectives on the coordination of the *Internet*.

I do believe that my ecology would have looked different if I did not have an interest in the *Internet* infrastructure itself, and rather than interviewing *ccTLDs* and *IXPs* instead interviewed governments and regulatory entities, the ecology would have been different. In particular I believe that I would have missed the distinction between the *Internet* and telecommunications, and rather perceived it as one black box in need of governance and regulation.

One strength of this study is that I have not assumed what the *Internet* is, and all formal interviews were started off with defining the *Internet*, which allowed me to capture distinctions of what the *Internet* is to different people and organizations.

Conclusions and further research

As previously mentioned, I say that *ICANN* does not govern the *Internet* in the traditional sense of the world, the visible hand is not enforcing, but I do not think I have exhaustive material on who does so the invisible hand remains partly invisible.

ISPs have the possibility to shape what *Internet*-access is and to that extent they are very powerful actors. *IXPs* seem to have a role to play in ensuring bottom-up governance. On another level there is *ICANN* and their multi-stakeholder solution, which formally takes into consideration a more diverse set of actors than a comparable *UN* or *ITU* multilateral process, even though there is circumstantial evidence pointing to the fact that the most important role of *ICANN* in the current *Internet* ecosystem is ensuring that no one else takes the *IANA* stewardship role, in that sense the visible hand is only there for show.

Over time the *Internet* and its governing mechanisms seem to have gone from being bottom-up and self organized where decisions are taken where necessary, a mutual adjusted ad-hocracy to use the terms of Mintzberg (1993), but the structures have become more formal and standardized. One example of this is *ICANN*'s detailed policy process through the *EC* which puts the organization of *ICANN* more into the standardization by process in the Mintzberg-typology. External forces are pushing towards a standardized or formalized version of *Internet governance*, which puts *ICANN* in focus since it is one of the few organization functioning remotely like a government entity.

I do not judge any organizing to be objectively better than the other, but if the works of Mintzberg (1980, 1993) are to be believed, it is easy to go from mutual adjustment to other forms of coordination, but hard to go back since hierarchies, processes and structures have their own *raison d'être*. And the question we should ask is if standardization of processes is a necessary change to keep the *Internet* as the *Internet* as it grows, or if this will fundamentally change the bottom up organizing of the *Internet* into something different.

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