

NoC Internet Governance Case Studies Series: Multistakeholder Governance and Nodal Authority – Understanding Internet Exchange Points¹

Ben Wagner and Patricia Mindus

European University Institute and the Filosofiska Institute, Uppsala University

Editorial Note: Context, Character, and Purpose of the Case Study

This case study is part of a globally coordinated, independent academic research pilot project by the [Global Network of Interdisciplinary Internet & Society Research Centers](#) (NoC). Facilitated by the [Berkman Center for Internet & Society](#) at Harvard University, this study examines existing multistakeholder governance groups with the goal of informing the future evolution of the Internet governance ecosystem. Building upon the [NETmundial Principles and Roadmap](#), it contributes to current policy debates at the international level, including the [Internet Governance Forum](#), the [NETmundial Initiative](#), and other organizations and efforts.

Internet governance is an increasingly complex concept that operates at multiple levels and in different dimensions, making it necessary to have a better understanding of both how multistakeholder governance groups operate and how they best achieve their goals. With this need in mind, at a point where the future of Internet governance is being re-envisioned, colleagues from several [NoC institutions](#) around the world have written twelve [case studies](#) examining a geographically and topically diverse set of local, national, and international governance models, components, and mechanisms from within and outside of the sphere of Internet governance. Key findings from these cases are summarized in a [synthesis paper](#), which aims to deepen our understanding of the formation, operation, and critical success factors of governance groups and even challenge conventional thinking.

The research, based on twelve case studies, suggests that there is no single best-fit model for multistakeholder governance groups that can be applied in all situations. Rather, it reveals a range of approaches, mechanisms, and tools available for both the formation and operation of such groups. The analysis demonstrates that the success of governance groups depends to a large degree on the careful selection, deployment, and management of suitable instruments from this “toolbox.” As governance groups pass through different phases of operation, conveners and facilitators must remain alert to changes in circumstances that necessitate adjustments to the approaches, mechanisms, and tools that they deploy in order to address evolving challenges from inside and outside. This case study provides insights into how those instruments can be deployed and adjusted over time within such groups, and highlights how their interactions with important contextual factors may be successfully managed within given resource restraints.

The research effort is grounded in a diversity of global perspectives and collaborative research techniques. Adhering to objective and independent academic standards, it aspires to be useful, actionable, and timely for policymakers and stakeholders. More broadly, the Network of Centers seeks to contribute to a more generalized vision and longer-term strategy for academia regarding its roles in research, facilitation and convening, and education in and communication about the Internet age.

For additional information on the initiative, please contact Urs Gasser, Berkman Center for Internet & Society, at ugasser@cyber.law.harvard.edu.

¹ The authors can be reached at bwagner@europa-uni.de or <https://cihr.eu/contact/> and patricia.mindus@filosofi.uu.se. The paper was developed as part of a research project on Internet Governance at European University Institute with Giovanni Sartor and Alex Trechsel.

Abstract: This case study considers Internet exchange points (IXPs) as an example of governance processes in action. Internet exchange points are the points of connection between different Internet networks, which enable different networks to exchange traffic at a shared facility without cost to either party through a process known as “peering”. Three different IXP governance models representing large and influential IXPs are compared: the DE-CIX in Frankfurt, CAIX in Cairo, and KIXP in Nairobi. DE-CIX, the largest IXP in the world, is a subsidiary of the German Internet trade association eco, and is thus “owned” by the Internet industry in Germany. Though well functioning, this has meant that key stakeholder groups such as civil society, and the academic and technical communities are excluded from participating in discussions over policy decisions. In contrast, the Cairo Internet Exchange Point (CAIX) is run by a public authority, the Egyptian Ministry of Communications and Information Technology. Though it is governed by a broad set of stakeholders including private sector, government, and civil society representatives, its decision-making processes are somewhat opaque. Lastly, KIXP was founded by a Kenyan network engineer and is governed by a local trade association. While set up with multistakeholder coordination under the leadership of the private sector, its day-to-day operations and governance fall under private sector control. By tracing out the plurality of models used for IXP governance and comparing the processes of developing peering relationships, this case provides unique lessons for the governance process, particularly surrounding trade-offs between inclusiveness and effectiveness.

Table of Contents

- I. Introduction 1**
- II. A Brief Overview: What Are IXPs and Where Do They Come From? 1**
- III. Studying IXP Governance 4**
 - A. The German Internet Exchange (DE-CIX) 4**
 - B. The Cairo Internet Exchange Point (CAIX) in Egypt 6**
 - C. Kenya Internet Exchange Point (KIXP) 7**
- IV. Conclusion..... 8**

I. Introduction

Multistakeholder governance has spread throughout Internet governance in many shapes and forms. One of the most interesting examples is the governance of Internet Exchange Points (IXPs), the points of connection between different Internet networks that are crucial to the functioning of the Internet as a whole (Chatzis, Smaragdakis, & Feldmann, 2013). In particular, they enable different networks to exchange traffic at a shared facility without cost to either party, a process known as “peering.” IXPs are also important because they have produced such a diverse number of rules and procedures by which they are governed, warranting far greater academic inquiry than has been the case (Ryan & Gerson, 2012). The governance structures range from private for-profit, private non-profit, quasi-governmental, networked, and completely governmental, some of which are mapped out in this case study. Interestingly, at least some of these structures can be understood as instances of multistakeholder governance.

The following is based on the experience of organizing a workshop in Tunis together with the Agence Tunisien d’Internet (ATI) in Tunis in 2013 on the *Construction, Operation and Benefits of Internet Exchange Points*, where the representatives of ten different IXPs spoke and shared their experiences running and governing an IXP.² Several IXP governance structures are discussed in this case study as part of the wider debate on multistakeholder governance in Internet governance.

In particular, this paper studies three different IXP governance models that represent some of the largest and most influential IXPs in the world: 1) the DE-CIX in Frankfurt; 2) the CAIX in Cairo, Egypt; and 3) KIXP in Nairobi, Kenya. Each IXP shares a common function and common basic principles (enabling exchange of data), but they differ in regards to membership and governance structures. Hopefully, by taking a comparative approach to the governance of IXPs, it will be possible to better understand how multistakeholder governance is implemented in practice.

II. A Brief Overview: What Are IXPs and Where Do They Come From?

Internet Exchange Points (IXPs) are one of the main building blocks of the Internet. There are presently approximately 534 IXPs, more than half of which are in Europe and the United States.³

In simple terms, IXPs are a technical space where Internet service providers (ISPs) come together to link their different networks to each other. As has been noted elsewhere, the Internet is made up of a “network of networks” (Noam, 2001), and thus the points where those networks come together are of particular interest. The governance arrangements involving IXPs are interesting because they govern the core Internet infrastructure and in many cases have some traits of multistakeholder institutions.

² For further details see *Internet Exchange Points—Construction, Operation and Benefits*, Workshop organised in April 2013 in Tunis, Tunisia. Program available here: <https://cihr.eu/wp-content/uploads/2014/06/TNV417Tunis-IXP.pdf>.

³ *Packet Clearing House, Internet exchange point directory reports*. Retrieved on November 8, 2014 from <http://www.pch.net/ixpdir/summary>.

More specifically, ISPs and network operators need to exchange data, granting others access to their network. This can be done either by agreeing on a payment basis—for transit/upstream—or on a cost neutral basis, otherwise known as a peering agreement. In order for peering to work, IXPs offer a local network where any carrier, ISP, or network operator can connect and exchange traffic. The IXPs use switching equipment to build the local network by placing equipment in existing carrier neutral data centers and relying on dark fiber to connect those locations.

Over the last few years, IXPs have been established in many more areas and have in turn attracted greater Internet resources to those areas,⁴ decreasing the practice of “tromboning” traffic out of the region on long-haul routes. The availability of local points of exchange allows for more direct routing of traffic; by reducing the need to use long-distance transmission capacity for in-region traffic, it frees up existing long-haul capacity to handle out-of-region traffic.

Internet Exchange Points are the key locations defining traffic flows, as well as business and governance arrangements between Internet providers. That they have evolved as a leading part of the Internet is in no small part due to “norm entrepreneurs” like Packet Clearing House (PCH), an important enabler of IXP growth. The PCH is a non-profit research institute that supports operations and analysis in the areas of Internet traffic exchange, routing economics, and global network development. Its specific model of “neutral independent network interconnection”⁵ as embodied in most modern Internet Exchange Points has become the default standard for building Internet networks in large parts of the world (Ryan & Gerson, 2012). As an organization, PCH travels the world and provides both hardware to private sector organizations in the process of starting Internet Exchange Points, as well as normative governance models on how IXPs should be governed. In particular, PCH activities promote a “community-oriented” IXP model within which IXPs act as “neutral hubs” providing services to their members rather than as for-profit companies. This model has become dominant in Europe and many parts of the world except the US, where “non-neutral” commercial ISPs remain the norm. PCH is extremely open in how it vigorously promotes this IXP model, stating on its website that:

PCH facilitates a multi-phase process that typically takes about six months: we organize local stakeholders in an un-served region to form an independent, not-for-profit industry association; guide that association through the necessary decisions regarding organizational, financial, and governance structure; work with government in the region to ensure a beneficial regulatory climate; assist them with site selection and preparation.⁶

There is strong agreement in the technical community that IXPs in and of themselves are a good thing, and that more IXPs are better (Franck, 2012). Together with greater international connectivity, IXPs are typically seen as reinforcing the decentralized structure, and thereby the resilience, of national Internet connectivity (Cowie, 2012). This is because having several hubs through which communications flow is more likely to be resilient when any one point fails, thereby reinforcing a network design strongly advocated by large parts of the technical community (Franck, 2012).

⁴ Dates of establishment available at <https://prefix.pch.net/applications/ixpdir/>.

⁵ See <https://www.pch.net/home/index.php>.

⁶ See <https://www.pch.net/technology/operations.php>.

The PCH's efforts are flanked by that of the Internet Society (ISOC), another key Internet organization promoting a specific normative model of Internet governance. The ISOC also explicitly supports the development of IXPs and suggests that:

In many developing countries, poor connectivity between ISPs often results in the routing of local traffic over expensive international links simply to reach destinations within the country of origin. IXPs can also improve the quality of Internet services in a country by reducing the delays. IXPs also can be a convenient hub for hosting critical infrastructure within countries.⁷

At the same time Cisco Systems—the largest supplier of networking technology in the world—is one of the leading proponents of the creation of IXPs and often supports their development by donating networking equipment (Longwe & Rulinda, 2005). As such, Cisco can be seen as a key enabler of IXP growth.

One of key basic parameters for Internet Exchange Points (IXPs) seems to be a low level of government regulation. This point is emphasized by Patrick Ryan and Jason Gerson, who argue that:

IXPs and networks tend to thrive when governments do not regulate their conduct in excess. IXPs and large commercial network operators would thus benefit from doing more to regulate themselves so governments do not feel the need to intervene. Good governance tends to emphasize neutrality and affordability, and we find that the most successful IXPs have adopted organizational policies that are robust and fair—policies that allow them to act without undue influence from individual ISPs (Ryan & Gerson, 2012, p. 3).

Importantly, IXPs also enable a key technical and economic practice called “peering.” In this model, Internet service providers (ISPs) and other large network providers agree to link their networks without charging each other (Chatzis et al., 2013; Sowell, 2012). As running a network involves considerable costs, this commitment is quite notable as any individual network owner could conceivably send large amounts of traffic across the other networks and thereby considerably raise the latter's costs. The agreement to peer through an IXP essentially takes certain business models off the table and thus entails the promotion of a specific economic model. In fact, an efficient market for connectivity has developed based on voluntary contractual agreements. This should be contrasted sharply with that of traditional regulated forms of voice traffic exchange, which are not based on voluntary contractual agreements and adopt legacy pricing.

Operating in a highly competitive environment, largely without central organization and strong regulatory regimes, the Internet model of traffic exchange has produced comparatively low prices. Peering agreements play an important role in this market. A survey of peering agreements gathered responses from 4331 ISP networks, representing 86% of the world's Internet carriers, incorporated in 96 countries, and these ISPs reported 142,210 peering agreements. Of these, 141,512, or 99.51%, were “handshake” agreements in which the parties agreed to commonly

⁷ See <http://www.internetsociety.org/what-we-do/issues/internet-exchange-points-ixps>.

understood terms without creating a written document.⁸ However, no matter how well developed this peering model is, it is not without problems. On a general level, “interconnection agreements are unseen in that there are no directly relevant statutes, there is no regulatory oversight, and there is little transparency.”⁹ More specifically, recent years have witnessed a rise in issues pertaining to peering agreements. For example, French telecom Orange and the American ISP Cogent experienced a conflict over their peering agreement when Orange lamented receiving a flow thirteen times greater than that it sent, in large part due to the fact that data from file-sharing website MegaUpload transited through Cogent.¹⁰ There have also been cases in which connectivity has been jeopardized following such matters (e.g., in *Cogent vs. Sprint*).¹¹

IXPs provide a neutral space in which this specific technical and economic practice of no-cost exchange of data flows—“peering”—can take place. The typical agreements enabled through IXPs are so-called multilateral peering agreements, in which many networks meeting at an IXP join a single agreement rather than conclude separate bilateral arrangements. The average number of agreements reported was 32.8 for each of the entities in the survey. The distribution is long-tailed, with 62% of the respondents having ten or fewer agreements. It has therefore been possible to ensure global connectivity among two billion users by means of a relatively small number of agreements, less than 1% of a full mesh.¹²

As IXPs only allow such peering relationships among their members, they also create in essence a kind of “default contract” between networks wishing to connect. Despite the spread of such default contractual arrangements across the world, their role in creating the Internet as it exists today is only now beginning to become better understood (Chatzis et al., 2013).

III. Studying IXP Governance

IXPs are fascinating institutional spaces precisely because they are designed as “neutral” and “communal” spaces (ones that enable “peering,” which is often described as a neutral practice). While this would seem to suggest some form of multistakeholder governance (de la Chapelle, 2007), the actual operational control and governance of IXP arrangements is extraordinarily diverse.

The following short case studies serve to illuminate the overall nature of IXP governance in the three different cases: 1) the DE-CIX in Frankfurt; 2) the CAIX in Cairo, Egypt; and 3) KIXP in Nairobi, Kenya. The governance model in each case is examined in detail, with a focus on how it relates to conceptions of multistakeholder governance.

A. The German Internet Exchange (DE-CIX)

The German Internet Exchange was founded in 1995 and has since developed into the largest Internet Exchange Point in the world. As a project founded by three German ISPs, it grew to

⁸ D. Weller and B. Woodcock, “Internet Traffic Exchange: Market Developments and Policy Challenges,” OECD Digital Economy Papers, No. 207 (OECD Publishing, 2013), <http://dx.doi.org/10.1787/5k918gpt130q-en>.

Orange lamented receiving a flow thirteen times greater than it sent, in large part due to the fact that Megaupload data transited through Cogent.

⁹ L. DeNardis, *The Emerging Field of Internet Governance*, cit., p. 567.

¹⁰ For the 2012 decision, see http://www.autoritedelaconurrence.fr/user/standard.php?id_rub=418&id_article=1971

¹¹ P. Weiser, “The Future of Internet Regulation,” *University of Colorado Law Legal Studies Research Paper*, No. 09-02 (2009).

¹² D. Weller and B. Woodcock, “Internet Traffic Exchange.”

accommodate over 600 customers (i.e., participants at the peering platform) by 2014. Notably, DE-CIX also operates IXPs in Hamburg, New York, and Dubai, giving it considerable global reach.¹³

The organization of DE-CIX itself was founded with the support of the trade association “eco,” now also called the German Internet Association. DE-CIX has been institutionally attached ever since and is legally a complete subsidiary of the eco trade association. DE-CIX and eco share the same executive director, Harald A. Summa, and board members are elected by the members of the eco trade association. Apart from the private companies that are members of the eco trade association and eco staff, no other stakeholders have the ability to influence decisions made by eco about DE-CIX IXP. There is also very little transparency about such policy decisions, or about the exact relationship between DE-CIX and eco. Even on the DE-CIX Advisory Board, a consultative organ, one of the board members is allocated directly by eco, while DE-CIX customers elect the other four. The DE-CIX seems to maintain a model of strong corporate control. DE-CIX claims that it is neutral on its website, which reflects a conception of corporate stakeholderism not necessarily shared by other IXPs: “in order to be truly neutral, DE-CIX is entirely owned by eco—Association of the German Internet Industry—and is therefore “owned” by the Internet industry.”

Similarly to in other countries, there has been an ongoing struggle between the incumbent Internet service provider in Germany, Deutsche Telekom, and the rest of the industry about the usage and role of the IXP. While almost all other Internet service providers in Germany have agreed to use DE-CIX and “peer” their traffic there, Deutsche Telekom has thus far refused, instead making individual private agreements with other network providers (Heise Online, 2013). Thus, the common normative space created by DE-CIX is explicitly contested by Deutsche Telekom, as is the norm of “peering.”

More recently, DE-CIX has been brought into a considerable disrepute due to its complicity in German foreign Internet surveillance. The German BND has publicly “acknowledged tapping data flowing through a key Frankfurt Internet exchange point” (Preuschat & Troianovski, 2014), which led to considerable public debate in Germany. However, DE-CIX was apparently unable to tell the public that its connection was under surveillance due to Germany’s G-10 laws (Ermert, 2013). There are open questions as to how long this surveillance took place, whether eco or DE-CIX resisted attempts at surveillance, which traffic is still being monitored, and whether this type of mass surveillance is still on-going (Ermert, 2013).

When the overall structure of DE-CIX is observed, it seems relatively clear that it is operated, managed, and governed by the eco trade association, as well as the companies that are members of eco. Thus, a specific subset of the German private sector organized by eco has the exclusive ability to manage and govern a key Internet resource. Gerson and Ryan (2012) have suggested that DE-CIX should be considered a “managed non-profit [in which] DE-CIX thus views its ISPs as customers, not members or shareholders” (12). This seems to correspond to the vocabulary preferred by DE-CIX that, indeed, conveys that the “customer summits.”¹⁴ Other actors, like the German government or BND, are able to regulate DE-CIX, but only by virtue of being part of the German government and an intelligence agency. They are not involved in the governance

¹³ See <https://www.de-cix.net/about/>.

¹⁴ See <http://www.customersummit.net/home/>.

structures of DE-CIX *per se* and can only regulate from outside. The involvement of other stakeholders is neither possible nor expected.

As much as DE-CIX would wish to absolve themselves of responsibility for these problems, this remains a considerable challenge to both democratic and multistakeholder governance: many of the actors affected by the policy decisions and public statements (or lack of them) of DE-CIX and eco have no seat at the table. This lack of representation of key stakeholder groups such as civil society, the academic and technical communities, and even other branches of government in a crucial Internet institution seriously challenges the legitimacy of DE-CIX. While it is certainly a very well-functioning private company, it fails to live up to many of the claims of multistakeholder Internet governance.

B. The Cairo Internet Exchange Point (CAIX) in Egypt

The Cairo Internet Exchange Point (CAIX) was founded by the Egyptian Ministry of Communications and Information Technology (MICT) in 2002. As such, it is unusual among IXPs in that it was founded and is run by a public authority. This is interesting, because in certain cases the global IXP community has chosen not to recognize Internet Exchange Points that were not considered to be run following the standards of the global community. This was the case for Tunisia for many years, and while its technical infrastructure seemed to suggest an exchange point, it was not recognized as an Exchange Point by the IXP association Euro-IX until 2011.¹⁵ ISPs are typically allowed into the Euro-IX community by accepting certain basic standards and business models, most fundamentally the “peering” model, but also standards regarding non-discrimination of customers. Thus, Euro-IX could be considered to be an exclusive club whose members decide which new members are allowed to join.

CAIX was founded in 2002 and initially only linked to two Internet service providers. Over time it gained more and more members, and today all of the large and medium sized ISPs in Egypt are part of the exchange.¹⁶ The governance of the Cairo Internet Exchange Point has also changed substantially, with authority transferred from the Ministry of Communications and Information Technology (MICT) to the National Telecommunications Regulatory Authority (NTRA). However, the NTRA board is chaired by the Minister of Communications and Information Technology, and includes representatives of the Council of State, the National Security Authority, the Ministries of Defense, Interior, and Finance, as well as a representative of the Radio and Television Union.¹⁷ Interestingly, this means that it is governed by a broader set of stakeholders than DE-CIX, including what could be considered private sector, government, and at least some “civil society” representatives. Despite the breadth of participation, the decision-making processes under CAIX lack transparency and it is very difficult to discern—based on the public information available—how key decisions about CAIX are made.

¹⁵ Under the former regime, all ISPs were obliged to route their traffic via the ATI to facilitate internet filtering and surveillance. See <https://www.euro-ix.net/ixps/370-TunIXP> As of early 2013, however, a decision by the ICT Ministry to amend regulatory provisions resulted in Tunisiana and Orange Tunisie now being able to bypass the ATI for incoming and outgoing international internet traffic, see https://freedomhouse.org/report/freedom-net/2013/tunisia#.VF5I6_TF-RN.

¹⁶ See <http://caix.net.eg/index.php/aboutcaix>.

¹⁷ See http://www.tra.gov.eg/english/DPages_DPagesDetails.asp?ID=175&Menu=5.

In an important case, the NTRA was directly implicated in the Internet and mobile phone shutdown during Tahrir Square protests in the spring of 2011. This at the very least raises questions about whether the NTRA can be considered an impartial and neutral governance authority for a neutral Internet Exchange Point in Egypt (Freedom House, 2012).

C. Kenya Internet Exchange Point (KIXP)

Kenya's Internet Exchange Point is particularly interesting because it has been held up as a leading example of multistakeholder Internet governance by US Assistant Secretary for Communications and Information, Lawrence Strickling, who is also the head of the US National Telecommunications and Information Administration (NTIA). Strickling has remarked: "where Africans have chosen the path of openness and inclusion—two key attributes of the multistakeholder process—the rewards have been great. Take the example of the Kenya Internet Exchange Point" (Hutty, 2011). These remarks suggest KIXP is a potential model of multi-stakeholder governance. So how was KIXP founded and how is it governed in practice?

The inception of the IXP can be traced back to a Kenyan network engineer attending an Internet Society networking workshop for developing countries in San Jose, California, US (Longwe & Rulinda, 2005). After obtaining support in the form of free networking equipment from Cisco Systems and funding from the United Kingdom's Department for International Development and the Telecommunications Service Providers of Kenya (TESPOK), it was possible to found KIXP in 2001. Interestingly at the time there was considerable mistrust between Internet Service Providers (ISPs)—the main future clients of KIXP—with some refusing to collaborate and others fearing such an institution would be misused for "undue and possibly unethical advantage" if hosted by a competitor (Longwe & Rulinda, 2005).

Despite these trust and collective action problems, KIXP was created on "neutral" ground in 2001, only to be engaged almost immediately in a legal battle with the incumbent telephone & Internet provider, Kenya Telecom, over licensing issues (Longwe & Rulinda, 2005). Such conflicts between IXPs and incumbents are not uncommon, and similar problems can be observed in Tunisia and Germany, where telecommunications incumbent support for IXPs is highly limited.

Following a vigorous response from all other Internet Service Providers (ISPs) in Kenya, KIXP was eventually granted a license to operate, which they continue to hold to this day. The local trade association TESPOK governs KIXP, although it is unclear based on publically available information how the board of directors is appointed and how it makes decisions. It seems that similar to DE-CIX, governance of KIXP takes place within the TESPOK trade association, which includes most telecommunications service providers in Kenya. Notably no additional stakeholders, such as civil society, academia, government, or international organizations, are involved in the governance or day-to-day operations of KIXP. Thus it could be argued that KIXP was set up with multistakeholder coordination under the leadership of the private sector, but the day-to-day operations and governance of KIXP are entirely in the control of a private sector trade association.

While this makes NTIA Director Strickling's endorsement of KIXP as a model of multistakeholder governance very puzzling, it is possible that this is exactly what he meant. Private sector governance and management of systems is indeed by far the most prominent example of multi-stakeholder governance, and in most cases the default. While this seems

perfectly reasonable for the day to day management of systems, the larger governance questions surrounding IXPs—for example, the German intelligence agency BND tapping DE-CIX—raise questions about who the stakeholders are and who should be involved. It also raises the question of what is meant by “the path of openness and inclusion—two key attributes of the multistakeholder process” (Lawrence Strickling, in Hutty, 2011).

IV. Conclusion

Internet Exchange Points (IXPs) are a fascinating and under-researched part of the modern Internet. From the perspective of the social sciences, IXPs are also extraordinary places for promoting highly plural and diverse local governance models, while still keeping a core of common norms and principles. In this sense, Internet Exchange Points are an excellent place to study institutional development in a globalized world. Following the excellent comparative governance analysis by Ryan and Gerson (2012), this paper attempts to provide an additional critical institutional analysis of IXPs in an international context.

It seems relatively clear that the core international “norm setters” or “enablers” of international IXP governance can be found at the Packet Clearing House and the Internet Society. These organizations have extensively promoted the core “peering” model over the past two decades and have thus considerably contributed to its spread across the world. By providing expertise and access to free networking equipment, both organizations are well positioned to support the internationalization of these institutions.

At the core of an IXP are the peering relationships between the organizations that connect to it. IXPs constitute a common pool resource and neutral ground in which competing private actors agree to collaborate rather than compete. While this would seem to fly in the face of any modern national competition policy, it actually seems to stimulate Internet growth in some areas (Chatzis et al., 2013). This development is then supported by other institutions like Euro-IX, which provides a kind of club accreditation system which only IXPs are able to join and can exchange experiences in regular meetings.

Moreover, once some commercial partners began following this model, it quickly spread and became the default model for cooperation among networks. In this context it doesn't seem to matter whether the IXP is publicly or privately governed, or whether it is non-profit or for-profit, as long as it fosters the principle of “peering” and sees to its members' needs in a way that can be considered effective. Why legal form seems to not matter much in the context of the questions asked in this case study is unclear, and further research will be required to develop a compelling answer.

Thus the actual commonality of governance forms between IXPs is actually very small. It is perhaps this “non-political” nature of IXP governance that has made the IXP model so successful, and caused IXPs to spread across the world. In other words, the commonality of IXP governance is not their internal governance or legal status—which may differ substantially—but their promotion of peering and output oriented effectiveness. This also implies that looking at the inclusiveness of these governance structures may not be key to understanding their perceived legitimacy in the global Internet community. From a multistakeholder perspective, many potential stakeholders may be left out, from governments to end-users. The perceived legitimacy seems to be more closely linked to the efficacy and efficiency of IXPs. This considerably limits

their inclusiveness, which is perhaps not unreasonable given that so few people know what an IXP is in the first place.

What is consistent, however, across the cases is the conflict with the incumbent operator, typically a former state monopolist in the country where the IXP is based. These actors normally have little interest in the principle of “peering,” and their resistance to the IXP model is evident in Germany and Kenya, as well as other cases not discussed here, such as Mexico. Ryan and Gerson note that: “Mexico has been unable to develop a successful IXP due to incumbents’ unwillingness to cooperate” (2012, pp. 22–23). This suggests that IXPs do not just promote a “neutral” collaboration model, but are likely to promote competition between networks and may also help to open markets. While this may be a positive development for the Internet as a whole, it may not be in the commercial interests of incumbent Internet providers and indeed of states wishing to protect some form of communications monopoly.

Where then is multistakeholder governance left in all of this? Multistakeholderism is generally guided by the idea that the inclusion of those affected by, or who affect the outcome, is good for achieving the process’ stated objectives. However, this is not always the case: the viability of a multistakeholder process can also be determined by its effectiveness. In the case of IXPs, this seems to be the guiding principle, as their primary objective is to lower the costs of transit and reduce routing time. If this is the goal, then focusing on efficiency rather than inclusiveness seems reasonable. If inclusiveness is to be reached, then perhaps the scope of the objectives need to be broadened. Since there is no single uniform and accepted definition of what a “stake” might involve (e.g. interest, legal obligation, moral right) or who can be said to have one, defining “stakeholders” is also a problem. Stakeholders can be such because they are seen to have some legitimate claim in the operations of the institution because they are affected by its actions, or because they subjectively perceive themselves to be stakeholders. In this sense, perhaps a warning would be appropriate: the very conception of “stakeholder” in this study is left rather general so as to encompass many different views.

To a certain degree, the public sector was involved in some of the Internet Exchange Points mentioned here. Through legislation, the public sector is occasionally also involved in regulating and thereby governing IXPs, as is evident in both the German and Kenyan experience. However, it is notable that civil society and even large parts of the private sector outside of the Internet economy have been so far entirely unable to have a stake in IXPs. While this seems perfectly reasonable in regard to the day-to-day operations and management of an IXP, it seems more difficult to justify when these external stakeholders are equally affected as those within the process, and yet have no influence over important policy changes.

It seems evident that IXPs are part of what leading proponents consider multistakeholder governance. It is not uncommon for multistakeholder governance arrangements—when studied more closely—to end up looking a lot like private coordination, common-pool resources, or private clubs (Wagner, 2013). This does not necessarily have to be the case. For example, the Top-IX Internet exchange point in Turin seems to be an interesting example of multi-stakeholder governance with greater levels of transparency in its decision-making processes than the examples discussed here.¹⁸ While further research is required to properly verify this claim, initial

¹⁸ For further details, see <http://www.top-ix.org/en/consorzio/> for further details.

conversations with those involved in the governance of Top-IX suggest that a far broader set of stakeholders are involved.

Finally there are serious human rights issues raised by the misuse of IXPs for mass surveillance, national censorship, or the mass disconnection of Internet communications. These issues have arisen in different countries across the world, such as Germany, Tunisia, and Egypt. The absence of influence by stakeholders affected by this misuse seems to be part of what is creating the problem.

This again does not necessarily mean that expanding the multistakeholder governance of IXPs is the answer to these problems; however, it can reasonably be suggested that more inclusive governance of IXPs could have helped prevent—or at least mitigate—many of the human rights concerns that IXPs raise. Importantly, however, broad claims that IXPs inherently follow “the path of openness and inclusion” (Lawrence Strickling in Hutto, 2011) do not provide the full picture. Instead, further research is required to fully understand the governance of IXPs and their role in promoting development, growth, and trust in the Internet ecosystem, as well as a far more critical analysis of their governance structures.

Bibliography

- Chatzis, N., Smaragdakis, G., & Feldmann, A. (2013). On the importance of Internet eXchange Points for today's Internet ecosystem Categories and Subject Descriptors. *Cryptome.org*.
- Cowie, J. (2012). Could It Happen In Your Country?—Renesys. *Renesys*. Retrieved July 31, 2014, from <http://www.renesys.com/2012/11/could-it-happen-in-your-countr/>.
- De la Chapelle, B. (2007). Multi-Stakeholder Governance—Emergence and Transformational Potential of a New Political Paradigm. In D. Helbing (Ed.), *Managing complexity: insights, concepts, applications*. Springer.
- Ermert, M. (2013). NSA-Abhörskandal PRISM: Internet-Austauschknoten als Abhörziele. *heise online*. Retrieved August 19, 2014, from <http://www.heise.de/newsticker/meldung/NSA-Abhoerskandal-PRISM-Internet-Austauschknoten-als-Abhoerziele-1909604.html>.
- Franck, P. (2012). Peter Franck zu Freiheit und Sicherheit im Netz. *eco e.V. Verband der deutschen Internetwirtschaft*. Retrieved from <http://www.eco.de/2012/news/peter-franck-zu-freiheit-und-sicherheit-im-netz.html>.
- Freedom House. (2012). Egypt. In S. Kelly, S. Cook, & M. Truong (Eds.), *Freedom on the Net*. Washington D.C.: Freedom House.
- Heise Online. (2013). Das DE-CIX und das “Schland-Netz”: Betreiber empört über Telekom-Pläne zum “Schengen-Routing.” *heise online*. Retrieved August 19, 2014, from <http://www.heise.de/netze/meldung/Das-DE-CIX-und-das-Schland-Netz-Betreiber-empuert-ueber-Telekom-Plaene-zum-Schengen-Routing-2044731.html>.
- Hutty, M. (2011). US places Internet Exchanges at centre of Internet Governance debate. *LINX Public Affairs*. Retrieved August 19, 2014, from <https://publicaffairs.linx.net/news/?p=5446>.
- Longwe, B., & Rulinda, C. (2005). Of Gateways and Gatekeepers: The History of Internet Exchange Points in Kenya and Rwanda. In F. Etta & L. Elder (Eds.), *AT THE CROSSROADS: ICT Policymaking in East Africa*. Nairobi, Kenya: East African Educational Publishers/IDRC 2005.
- Noam, E. (2001). *Interconnecting the network of networks*. Cambridge: MIT Press.
- Preuschat, A., & Troianovski, A. (2014). German Intelligence Admits to Frankfurt E-Mail Tap—Digits—WSJ. *Wall Street Journal*. Retrieved August 19, 2014, from <http://blogs.wsj.com/digits/2013/10/09/german-intelligence-admits-to-frankfurt-e-mail-tap/>.
- Ryan, P. S., & Gerson, J. (2012). A Primer on Internet Exchange Points for Policymakers and Non-Engineers. *SSRN Electronic Journal*. doi:10.2139/ssrn.2128103.
- Sowell, J. (2012). Empirical studies of bottom-up Internet governance. In *Telecommunications Policy Research Conference (TPRC)* (pp. 1–31). Washington D.C.: George Mason University.
- Wagner, B. (2013). *Governing Internet Expression: The International and Transnational Politics of Freedom of Expression*. European University Institute.