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An Experiment With Social Network Analysis: Assessing the scope and scale of IISD's relationships on Internet governance to test the usefulness of social network analysis for network evaluation

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An Experiment With Social Network Analysis: Assessing the scope and scale of IISD's relationships on Internet governance to test the usefulness of social network analysis for network evaluation

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Introduction

This report is an exploration of the use of social network analysis (SNA) as a tool in understanding the composition, reach and effectiveness of networks of experts and institutions working on policy issues. IISD's network of relationships in the domain of Internet governance was used as the basis for the experiment. While the study provided useful insights into the program's relationships on Internet governance, it also has provided both insights and caveats on SNA as a network monitoring and evaluation tool.

IISD's Network of Relationships on Internet Governance as the Case Study

Internet governance has been defined as "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 programs that shape the evolution and use of the Internet" (WGIG, 2005).

IISD's former Knowledge Communications program[1] began in 2007 to work on issues related to the governance of the Internet with the view that the outcomes of the current debate on Internet governance (and its issues of access, openness, participation and knowledge exchange) will affect the world's ability to manage the social, environmental and economic aspects of sustainable development. IISD's program needs to better understand what its current network of relationships is with other actors, stakeholders and decision makers on this issue in order to make strategic decisions about how to position itself and strengthen its influence on the debate.

This study incorporates a social network analysis methodology and tools in order to assess the current structure and quality of the IISD network. Part I provides an overview of the literature on social network analysis and network governance and also provides a summary of applications of social network analysis in ascertaining performance and network governance which are relevant to this study. Part II outlines the methodology used in this study that includes a combination of one-on-one interviews as well as a survey in order to gather the necessary data and information. The analytical approach will also be outlined. Analysis of the data will be provided in Part III, including results as well as graphs and images generated as a result of the analysis. Conclusions and implications are provided in the final section.

[1] At the time of publication, the program was renamed "Global Connectivity."

1.0 Literature Review

Technology is rapidly evolving, and knowledge and expertise are globally and institutionally dispersed. Accessing resources and knowledge, creating new knowledge and disseminating that knowledge require collaborative activities (both formal and informal) that often cut across geographical and institutional boundaries. This draws the investigator into "fuzzy" territory that lies within the overlap of public and private sectors, cross-national boundaries and inter-organizational projects. Evaluating performance or understanding the structure of relationships or networks that operate in and around these grey lines is difficult. Additionally, traditional analytical approaches appear to be incomplete and ineffective in capturing the nuances of social capital and in evaluating the governance capacity of such networks.

Social capital is an important and, as previously alluded to, often undervalued part of the governance equation. Jacobs (1965) defines social capital as networks of strong personal relationships that are developed over time and provide the basis for trust, cooperation and collective action. Similarly, social capital has been defined as social organization, norms and trust that facilitate cooperation and coordination efforts for mutual benefit (Putnam, 1993) as well as innovation (Fountain, 1997). Social capital, in the form of relationships, can be facilitated through a wide range of activities from the formal (contracts, joint ventures and common memberships in organizations or institutions) to the informal—activities such as face-to-face conversations, attendance at common events and exchanges of information or documents. Less-formal social exchanges often set the stage for more formal future engagement or activities and can affect the success of collaborative ventures or governance activities in any context. People and expertise are important factors in creating and exchanging all types of knowledge in order to generate or effect change.

These "softer" notions of social activity or capital are important factors but are often overlooked in both theory and practice in terms of evaluation and measurement. Overarching nation-state "results-based" approaches are ambiguous, and project indicators do not necessarily capture the nuances of social capital. Academic-based approaches, on the other hand, are often not easily translated into practicable, models for real-world application, nor are they easily understood by policy-makers. Social network analysis may have the potential to address this gap.

To clarify: the "network" is where actors (individuals and institutions) can come together formally and informally to access, exchange and recombine knowledge. Thus, social network analysis (SNA) holds promise as a diagnostic tool for collecting and analyzing relevant data with respect to patterns of relationships among individuals involved in a given network. According to Wellman, SNA is a powerful method for "explaining variances in resources, social behaviour and socio-economic outcomes" (PRI/SSHRC/StatsCan 2004:7). Social networks are defined as "a collectivity of individuals among whom exchanges take place that are supported only by shared norms of trustworthy behaviour" (Liebeskind, Oliver, Zucker, & Brewer, 1996). The related concept of a "community of practice" is defined by what it is about, how it functions and what capabilities it produces (Wenger, 1998). Wenger suggests that these communities of practice are vehicles for collective learning where common interests and associated social relations are pursued. The social network is the vehicle wherein various types of knowledge are brought together in order to create new (types of) knowledge—thus expanding or sustaining the network and its output over time. In its application, social network analysis identifies patterns of interaction of individuals or actors and knowledge flows within a network. It shows how knowledge-intensive work is done or can illustrate complex communication channels within a network. As a tool for analysis, SNA views "actors and actions . . . as interdependent" units, acknowledges that "relational ties" between actors provide "channels for transfer or how of resources" and can also create "opportunities for or constraints on individual action" (Wasserman & Faust, 1994, p.4). SNA can help to identify individuals or institutions that can span boundaries that act as gatekeepers for information or access to other and those that create bottlenecks. SNA can also identify under- and over-utilized individuals or organizations.

Network analysis can also be applied at multiple levels. Ego-centred network analysis focuses upon an individual agent and his/her relationships with others. This approach allows the researcher to paint a picture of an agent's "sphere of influence."[2] It determines agent contacts and qualifies the nature of those inherent relationships. This approach, focusing on the individual agent, is useful when boundaries are difficult to define in a large population (Wellman, 1982; as cited in Mead, 2001). Whole network analysis, alternatively, describes all of the agents and their relationships within a network. A whole network analysis approach is constructive when the boundaries are easily established within such structures as organizations, departments or projects and when data can be collected from all members of a given network.

Network analysis has its mathematical roots in matrix algebra and graph theory but its application has moved between disciplines over time. Anthropologists adopted it in the 1950s and 1960s and sociologists took it on in the 1970s and have been dominating its use ever since. Network analytical capabilities improved with integration into computational practice in the 1980s. By the 1990s, the social network analytic methodology had spread rapidly into every discipline and, more recently, is linked with physicists in the "new science" and examination of small world and scale-free networks. Social network analysis is fundamentally a multi-theoretical approach. It is distinctive in that it is most interested in the relationship between a dyad or among a set of agents. The relational ties can be characterized as kin-based, role-based, or may represent affective relationships (who likes whom). Agents within the network are connected by edges (undirected (or binary)) or arcs (directional). The capacity to incorporate weighted data to characterize edges or ties is software dependent. Correlations between agents include not only the discrete tie between a dyad (i.e., two actors) but may also include the individual nodes' ties to other nodes or events. In terms of the data set, the latter is commonly referred to as two-mode data.

The relationships among agents make up what is known as the "network structure." This structure may vary from being quite dense with many connections amongst agents (relative to the total number of possible links) within the network, to being sparsely knit with few links connecting agents. From a structural standpoint, it is just as important to identify gaps within a network as it is to identify and quantitatively assess links. Structural hole theory (Burt, 1998) explores the nature of network gaps and suggests that such gaps may, in fact, be a positive network attribute. Given this assumption, structural hole theory predicts a negative association between networks that are dense (without structural holes) and performance. Burt's Structural Hole theory reflects Granovetter's theory of the "strength of weak ties"[3] (1973 & 1983). This latter supposition assumes that weak ties or gaps within a network structure provide opportunity for connection (or "bridging") to outside sources and resources, helping the network to remain flexible and responsive to external changes and less likely be constrained by "group think." According to Burt (2005), although higher density networks may result in higher information flows within the network, flows may be limited from outside the network (i.e., constrained). Burt's argument states that it is not tie strength that is important, but simply the existence of structural holes which suggests that an actor or agent would have non-redundant ties as a result. Weak ties tend to be non-redundant. Networks with structural holes consist of individuals who "know about, have a hand in, and exercise control over, more rewarding opportunities" (10). According to Burt, "brokers" bridge structural holes or networks, and provide links to extra-network contacts. This is similar to Granovetter's term of "bridges" or "bridging relationships" that can reduce path distance

[2] Organizational Risk Analysis (ORA) (current version 1.54) is a network analysis tool that detects risks or vulnerabilities of an organization's design structure. ORA utilizes over 50 measures categorized by which type of risk they can detect (Carley & Reminga, 2004). ORA offers a way in which to measure the sphere of influence of principal agents in ego-centred networks.

[3] According to Granovetter's theory, a weak tie is "a (probably linear) combination of amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which characterize the tie" (1973, p. 1361).

between networks or clusters (Burt, 2005). Constraints, on the other hand, are associated with those networks that have a limited number of contacts, contacts that do exist but are too interconnected or contacts that are connected indirectly through a central person (i.e., the network tends to be hierarchical in nature) (Burt, 2005). Rosenthal (1997) investigated structural hole theory with a study of intra-organizational teams hypothesizing that there must some sort of optimal point between productive structural holes and density. Her research indicated that teams whose networks extend beyond the boundaries of the team (and span these structural holes) are more likely to be successful. Similarly, Valente et al (2007) explore density as it relates to community coalitions in health program delivery. According to the results of the study, too much density may be indicative of network-centric connections that "do not provide sufficient pathways for information and behaviours to come from outside the group" (15), while low density leaves a network ineffective at mobilizing resources for adoption of prevention strategies.

Network visualisation is an important component in the analytical process. The "graph" generated through SNA software is the symbolic representation of a network. Current network analysis software such as UCINET,[4] InFlow[5] or ORA utilize graph theory and algebraic constructs to analyze data in a mathematical sense. However, the mechanics of the software also offers ways (either alone or in combination with other software) in which to visualize networks. In addition to calculating metrics, the software enables the researcher to better identify subgroups in a given network, such as clusters of actors or individuals, or to pinpoint isolates or those agents or nodes that appear to be disconnected from the larger network. Such analyses also enable the characterization of such networks into categories such as core-peripheries or emergent groups.[6] A core-periphery network structure is such that it can be partitioned into two sets: a core whose members are densely tied to each other and a periphery whose members have more ties to core members than to each other. An emergent group, at least at first, does not have clear boundaries or clear membership. They arise out of pairwise interactions and are informal structures (unlike classes or formal membership groups).[7] Additionally, the flexible nature of SNA software allows practitioners strategically to impose changes to a given network and to view network impacts in light of such changes: a "rewiring" of sorts, so to speak. Network images generated by software are never true representations of real life structures. The "distance" is geodesic, an abstract representation of the ties that lie between actors or agents in the networks and extrapolated from the data outlined in the matrix.

In addition to providing a qualitative picture, SNA software generates a number of measures to illustrate quantitatively the nature of a given network that may be otherwise unobservable in the real social setting. One commonly used measure is "centrality." The concept of centrality refers to the importance of a particular actor and the hierarchical nature of an entire network. In general, centrality measures are used to "describe and measure properties of actor location in a social network" (Wasserman & Faust, 1994, p. 169). Centrality, applied at the node level, is a family of measures each answering a different theoretical question. A very important centrality measure is "total degree centrality." It is defined as the actual number of linkages that one actor has to others within a given network population relative to the total number of possible links. It is the normalized sum of the degrees of the ties affiliated (both in and out) with a particular actor. This measure is zero for any actor that has no connections with other network actors.

[4] UCINET (current version 6.0) is a comprehensive package for the analysis of social network data as well as other 1-mode and 2-mode data. Integrated with UCINET is the NetDraw program for drawing diagrams of social networks. In addition, the program can export data to Mage and Pajek for visualization of graphs (Borgatti, Everett, & Freeman, 2002).

[5] InFlow performs network analysis and network visualization in one integrated product (Krebs, 2005).

[6] Emergent groups, at least at first, do not have clear boundaries or clear membership. They arise out of pairwise interactions, are informal structures (unlike classes or formal membership groups). Emergent groups are found through clustering algorithms that uncover patterns of interactions among network agents and events or activities.

[7] Emergent groups are found through clustering algorithms that uncover patterns of interaction among network agents and events or activities.

The total degree of centrality is 1.0 if an actor is linked with every possible partner. Power, in the network sense, is not just how many connections an agent or node has, but how central other actors or agents are that it is connected to. According to Bonacich (1972), power is a function of centrality plus the centrality of others, weighted by the distance and number of links between the central node and other agents. The Eigenvector measure, one measure of power, provides useful insight into this. An actor or agent who is high in terms of Eigenvector calculates an actor's centrality relative to the sum of the degrees of the actors or agents they are connected to (Carley & Reminga, 2004). The actor or node with high Eigenvector centrality is connected to many actors who are themselves connected to many actors, thus multiplying their risk and/or opportunity within the network.

Another important measure in SNA is network density. The density measure (applied at the whole network level) is useful for assessing the overall strength of activity or relationships within a network. The formula to measure density (below) calculates the total number of links or ties within a network relative to the total ties possible.

$$\text{Density}_{\text{Network}} = \frac{L}{n(n-1)}$$

(where L is the total number of links or ties within a given network of n actors)

It is often assumed that dense networks are more productive networks, thus leading to overall improved performance. This is a common conjecture in communication-based analyses wherein more and stronger ties between agents result in improved performance or capacity. Mead (2001) employs this approach and supports this assumption in his analysis of communication linkages in construction project networks. However, relying exclusively on density measures to examine one or even to compare two or more networks may not always be a good gauge of network capacity. For example, two networks comprised of 30 actors have almost identical densities yet can be very different in terms of overall structure. Network structures may influence a number of outcome variables. One group may have connections distributed throughout the network with little clustering (e.g. core-periphery structure) while the other may have concentrated connections among several sub-clusters in the network (e.g.. clique structures). Again, both may have identical densities, but the theoretical and practical implications of the structures may be widely different. The social network analysis model is not new but in this context can uniquely account for those "softer" factors affiliated with network governance and collaborative activity. There are a number of examples of the use of SNA. It appears to be a fairly flexible tool that has been applied in many fields including transportation (Bell & Iida, 1997) in identifying and evaluating terrorist networks (Fellman & Wright, 2004; Krebs, 2002) , spread of disease such as HIIV/AIDs (Rothenberg et al., 1998), health and mental health (Provan & Milward, 1995), development projects (Moore et al., 2003), business transactions or relationships (Todeva, 2002) and trends in international collaboration and co-publishing in areas of research in disciplines such as astrophysics, geophysics, soil science and virology (Wagner, 2005). Relevant to this study, social networking models or approaches have also been applied in various ways to assess both regional and/or international networks (Coenen, Moodysson, Ryan, Asheim, & Phillips, 2005; Procyshyn, 2004) and at the network level (Theodorakopoulou & Kalaitzandonakes, 1999). Depending upon how the methods are constructed, they can take into account a number of dynamic elements, such as knowledge, social capital and an array of intermediate inputs and outputs related to the system or network of interest. More complete approaches have been applied within recent years including those of Ryan and Katz (in press) and Ryan (2007). These latter two approaches apply a novel methodology taking into consideration key social dynamics of collaborative behaviour and performance outcomes. In particular. Ryan and Katz (in press) explore network connections comparing high- and low-density networks according to whether or not links are "mutually" recognized among actors.

2.0 Methodology

The following outlines a number of factors of interest for this experiment, based upon the literature review and the objectives of IISD.

First, an organizational profile needs to be developed which includes an understanding of the key IISD agents, their roles, responsibilities, history and experience. Second, the community of interest or the "network" needs to be defined. Who are key network actors and with which institutions are they affiliated? Where are they located geographically? Finally, the character of the links that the key IISD agents have with the identified network actors is of interest. What is the strength of connections? How valuable are those links?

The process for gathering and analyzing information and data as it relates to these factors of interest is an adaptation of one developed by Ryan (2007). The following outlines, in steps, the approach taken to assessing the character and quality of the network of relationships that IISD agents have in the field of Internet governance.

1. Develop an IISD organizational profile

- Who are the key IISD-related agents of interest to Internet governance and what is their role with the organization?
- Conduct one-on-one interviews with these actors to gather qualitative information and data.

2. Define boundaries of the network of relationships in Internet governance

- Who are they? What institutional affiliations do they have? Where are they located?
- Circulate to key IISD agents and assimilate data.

3. Develop matrix survey of identified network actors and distribute to key IISD agents to complete in terms of:

- Strength of connections
- Nature of connections
- Value of connections

4. Analyze network of interest

- Ascertain density of network (how connected is the network?)
- Identify central actors (to which actors are the IISD agents most connected?)
- Ascertain geographic scope of the network
- Ascertain institutional scope of the network (which institutions are most connected?)

5. Visualize results using a combination of UCINet and NetDraw

- Develop network graphs of overall IISD network, illustrating:
    - Nature of connections: more formal or less formal
    - Strength of connections: low to high
    - Value of connections: low to high
    - Institutional type links: NGOs/IGOs; Academic; Canadian federal government, other national governments, business, other
- Develop geographic representation of IISD's network of relationships, illustrating:
    - Distribution of network actors by region
    - Aggregated character of connections (value and nature)

The results of the analyses provide a visual structure of IISD's network of relationships on Internet governance, based upon multiple attributes: institutional type and affiliation, strength and nature of connections to actors and perceived value of those links.

3.0 Analysis

3.1 Structure of the IISD Network of Relationships

Mapping the network of relationships focused on those individuals and organizations with which key IISD agents interact on the issue of Internet governance. Quantitative analysis of the network consists of the evaluation of the data collected from IISD agents on network structure (number, strength and nature of ties to others working on Internet governance) and the perceived value of those ties.

A significant first step in ascertaining network structure is calculating network density. In terms of absolute ties or links, a calculation of network density indicates a measure of 44.8 per cent, based on a calculation of IISD key agents (n=4) and identified network actors (n=143).

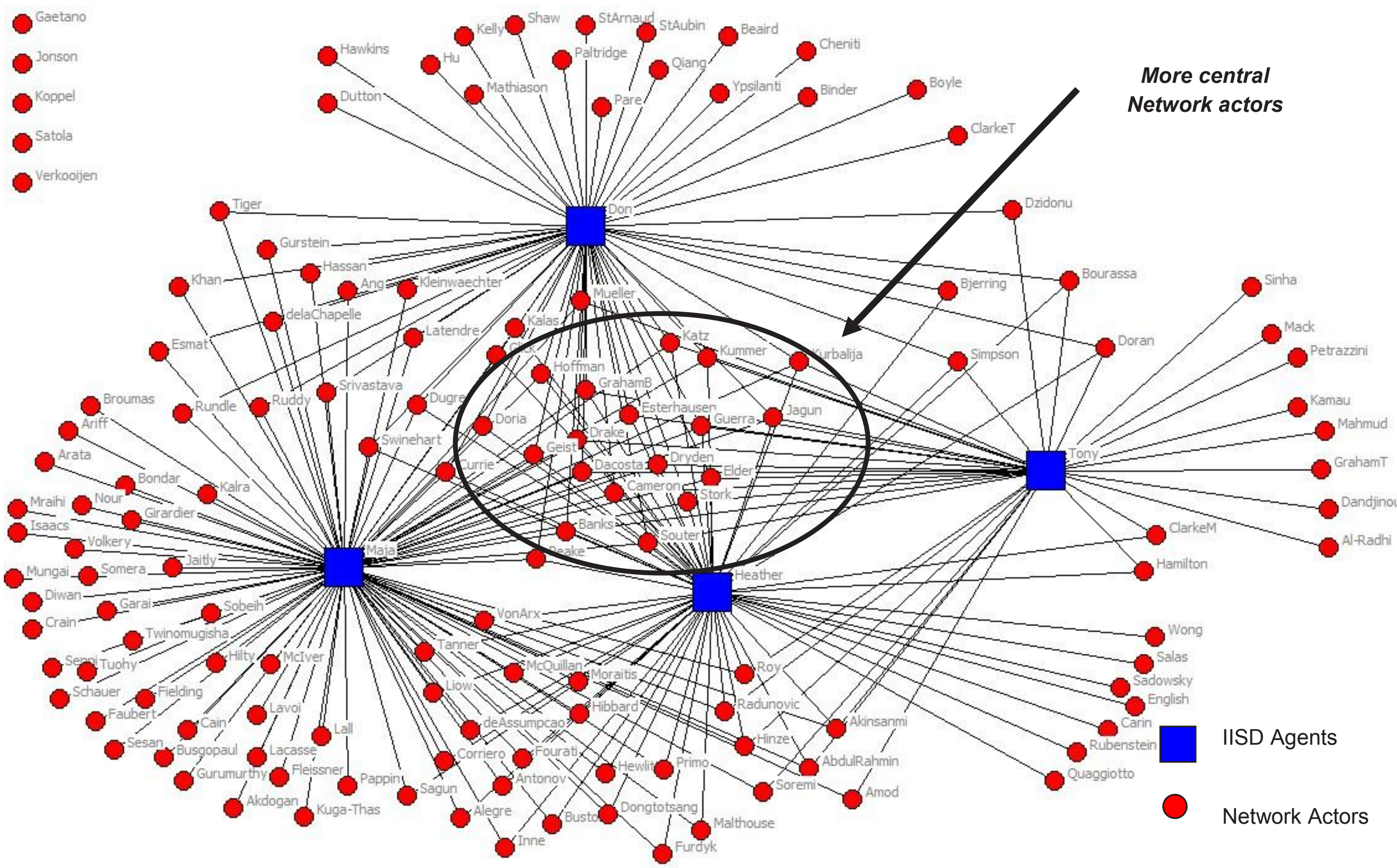
Next, centrality measures indicate various levels of connectedness amongst key IISD agents and network actors.

- Agent 1: connected to 60 per cent of all network actors
- Agent 2: connected to 43 per cent of all network actors
- Agent 3: connected to 41 per cent of all network actors
- Agent 4 (a recent addition to the team): connected to 26 per cent of all network actors.

In terms of the identified network actors, 15 (or 10.4 per cent) of the 143 actors are completely connected to key IISD agents. In other words, IISD key agents all identified a link with each one of these individuals. Of these 15 individual network actors, 53 per cent (8) represent non-governmental organizations (NGOs)/intergovernmental organizations (IGOs), 20 per cent (3) are with the Canadian federal government, 13 per cent (2) represent academic institutions, while the remaining two are categorized as representing other institutional types.

Of the 143 identified actors, 33 are considered to be highly connected with centrality measures of 75 per cent or greater. Diagram 1 illustrates the centrality of the network of relationships:

DIAGRAM 1: CENTRALITY



The nature of these links is represented and defined in the following table.

TABLE 1: FORMAL AND INFORMAL RELATIONSHIPS

NATURE OF RELATIONSHIP	DEFINITION
More formal	• Contractual arrangements, joint projects, collaborative arrangement • Invitations to e-conferences • Participants in e-conferences
Less formal	• Attendance at a common event, conference • Personal contact

Diagram 2 depicts a "hub and spoke" model for the formality of relationships. Less-formal links appear to be synonymous with more peripheral actors and, not surprisingly, more central actors appear to have more formal links to IISD. Diagram 3 illustrates the strength of ties between IISD and identified network actors. Thicker lines indicate stronger ties, while thinner ones indicate weaker ties between IISD and network actors. IISD appears to have more links to NGOs and IGOs working in the Internet governance domain than to any other institutional type (44 per cent). Notably, links to the private sector are marginal, at 5 per cent.

DIAGRAM 2: FORMALITY OF RELATIONSHIPS

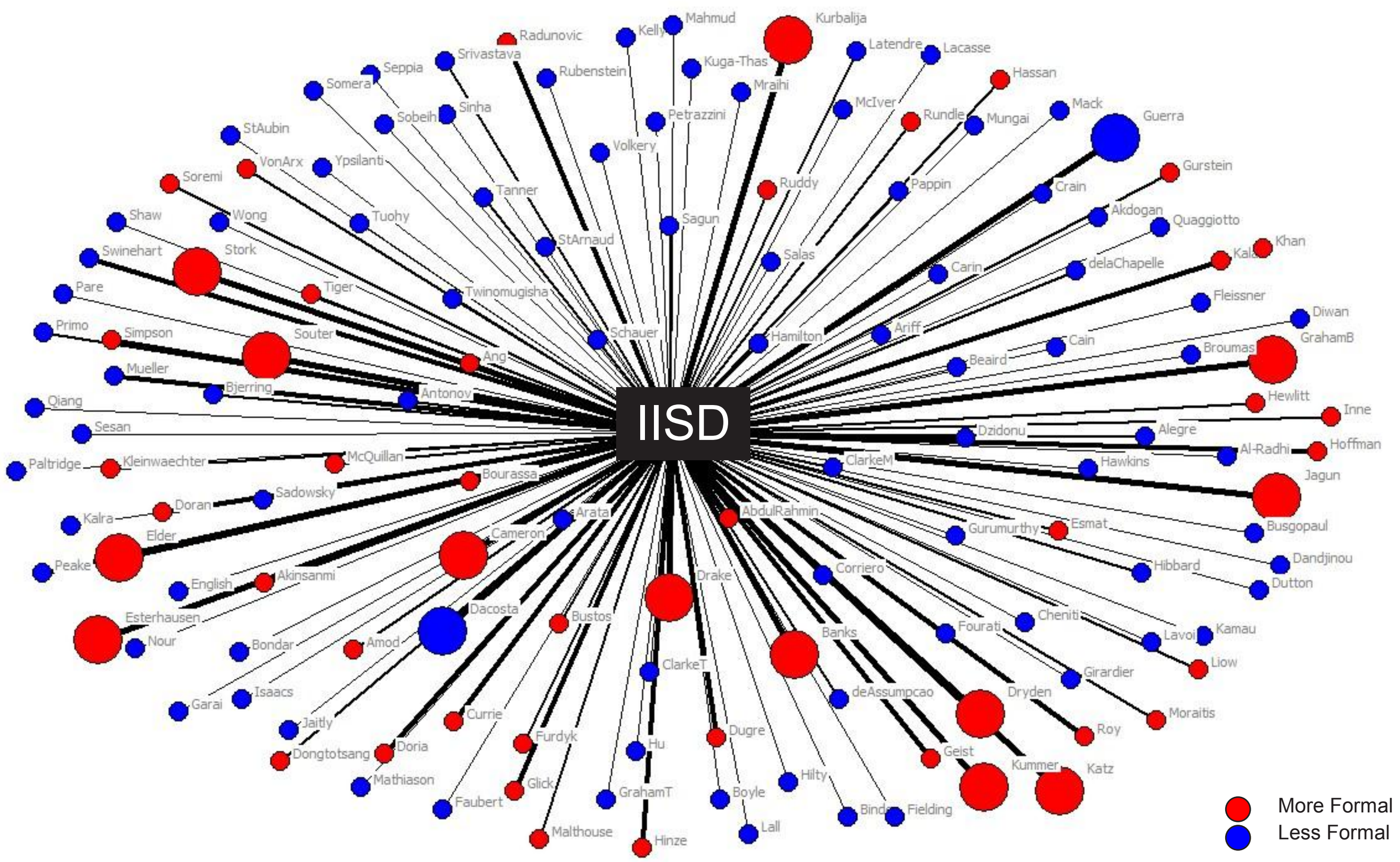
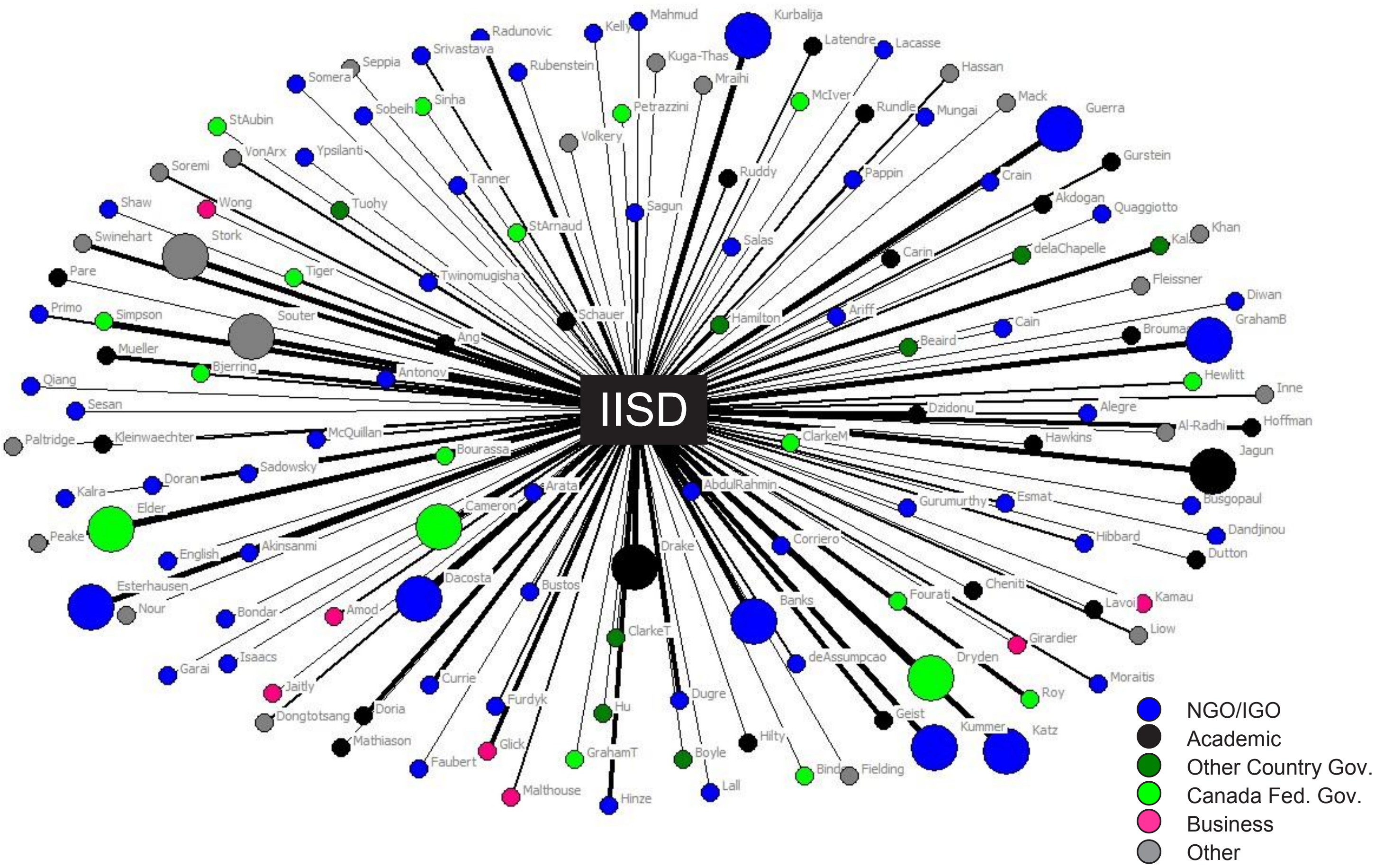


DIAGRAM 3: TYPES OF INSTITUTIONS REPRESENTED BY NETWORK ACTORS



3.2 Perceived Value of Network Actors

In addition to identifying a link and the nature of the link to network actors, key IISD agents were asked to evaluate the value or importance of each actor in the Internet governance context. The results from this exploration were not, perhaps, surprising, with more central network actors being identified as having higher perceived value to IISD agents. More interestingly, there were some actors, deemed as having moderately high value to the network, that were not connected to all IISD agents (and therefore less central). This may be due to one of the IISD agents being new to the team, and therefore less connected at the time of the experiment to those network agents of perceived high value.

3.3 Geographic Scope of the Network of Relationships

An effort was also made to plot the network of relationships geographically. Data points are city locations for each network actors. Each data point may therefore represent multiple actors in that location. The calculations behind the symbols (data point values) indicated on the map are generated by adding the weighted value of the "nature of each link" (formal/less formal) to the weighted value of the "perceived value of each link" (from low to high). Thus, the symbology of each data point aggregates the calculated values for each link. Nodes are colour designated according to the overall aggregated value of the links. Additionally, the number of actual links to individuals by geographic location is incorporated through the size of the nodes depicted on the map. In other words, the larger the node, the more links to that specific location.

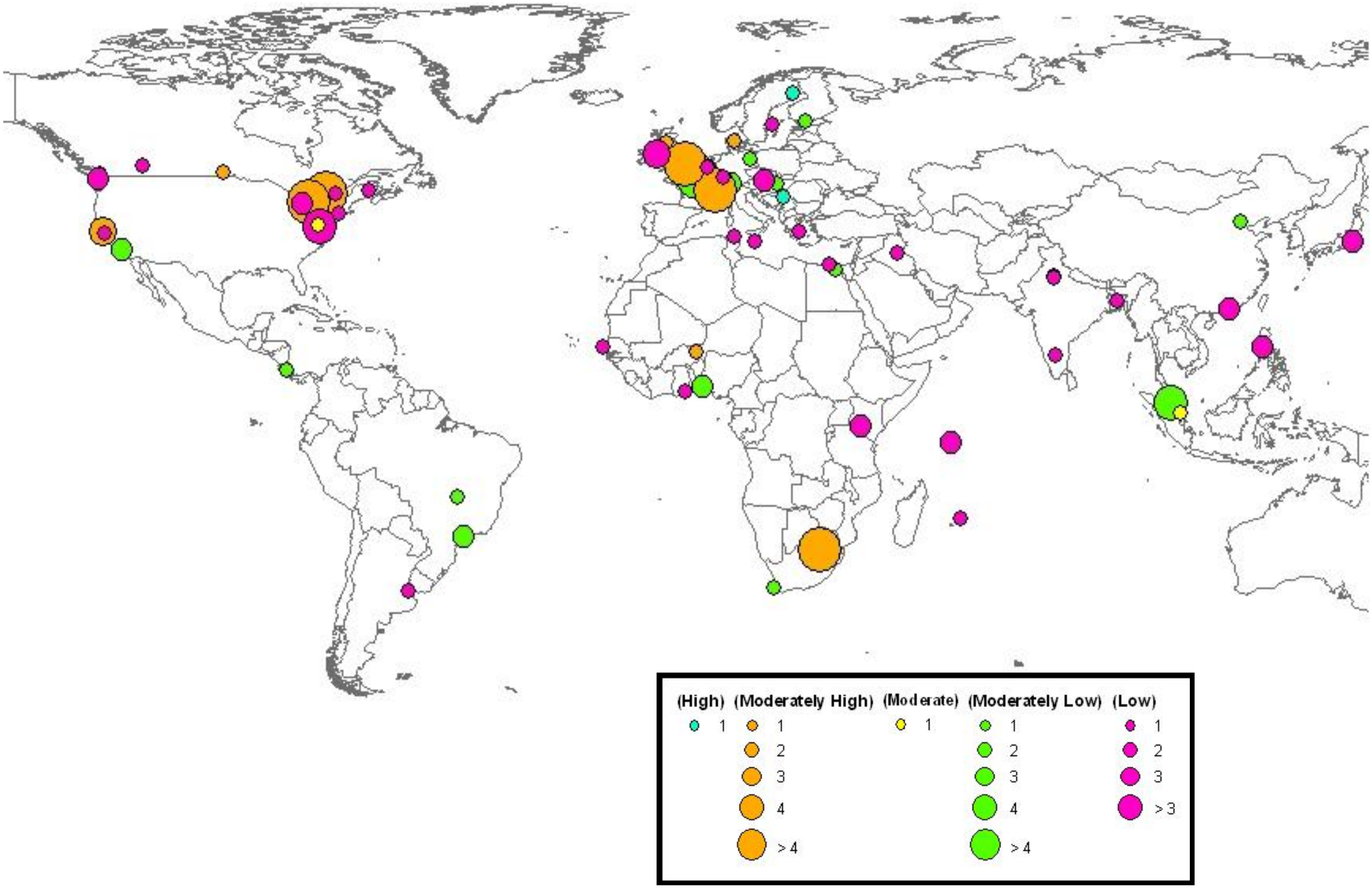
Table 2 provides the indices; Diagram 4 illustrates the geographic distribution of the network. According to the calculated results, IISD connections in the Internet governance domain have been strongest with developed nations (North America and Europe), whereas links with less-developed nations are weaker.

TABLE 2: REGIONAL VALUES

REGION	REGIONAL STATUS	TOTAL # OF LINKS PER REGION	AGGREGATE CALCULATED VALUE[10]	REGIONAL CONNECTION INDICES[11]
North America	Developed	17	37	629
Northern Europe	Developed	8	23	184
Western Europe	Developed	8	14	112
Southern Africa	Developing	4	14	56
South-eastern Asia	Developing	4	8	32
Southern Europe	Developed	3	7	21
Southern Asia	Developing	4	5	20
South America	Developing	3	5	15
Western Africa	Developing	3	4	12
Northern Africa	Developing	3	4	12
Eastern Asia	Developed/Developing	3	4	12
Oceania	Developed/Developing	2	4	8
Eastern Africa	Developing	2	2	4
Central and eastern Europe	Developed/Developing	1	2	2
Central America	Developing	1	2	2
Western Asia	Developing	1	1	1

[10] Aggregate calculated value combines "nature of link" and "perceived value of link" values
[11] The regional connection index is calculated as (total # links per region x aggregate calculated value)

DIAGRAM 4: GEOGRAPHIC DISTRIBUTION OF THE NETWORK OF RELATIONSHIPS



3.4 Summary

A number of key findings can be drawn from this analysis:

1. IISD's network of relationships on Internet governance, as a whole, is relatively dense at 44.8 per cent. As a point of comparison, other network densities calculated in other studies (Procyshyn, 2004; Ryan, 2007; Ryan & Katz, in press) have often produced results well below 20 per cent).
2. NGOs/IGOs appear to play a significant role within the network of relationships.
3. Relationships appear to be more formalized with network actors that are more central to (have higher connectivity with) key actors in IISD.
4. Each of the network actors that are identified as "most valued" within the network are also fully connected (100 per cent) to IISD with the exception of 2 of the 12.
5. At this point, it would appear that IISD connections are strongest with developed nations (North America and Europe) based upon the calculated regional connection indices.

4.0 Conclusions and Implications for IISD's work on Internet Governance

In order for IISD to make strategic decisions about how to position itself and strengthen its influence on the Internet governance debate, IISD needed to better understand its current network of relationships with other actors, stakeholders and decision makers. This study utilized a social network analysis methodology and tools in order to provide a preliminary assessment of scale and scope (geographic and institutional) of these relationships.

It is important to point out the limitations to the SNA approach. In a majority of cases, datasets are incomplete. There are often problems associated with fuzzy boundaries and not knowing, in advance, who to include or not to include. Most importantly, there is lack of recognition for the dynamics of the network phenomenon: networks are not static. They evolve over time. Although SNA appears to be a promising tool for investigating empirically the structure and evolution of inter-organizational interaction and knowledge flows within and across regions, the potential of the application of network methodology to scope out regional influences has not been fully explored. Currently, applications delineate geography as a mere "attribute" in the social network analysis methodology, rather than as an explicit spatial representation, which would be ideal.

This brings us to this study and its limitations. A significant hole in the data lies in the information (or lack thereof) associated with the identified network actors themselves (n=143). Whom do they connect with? How powerful are those connections? What is the nature of those connections? How important are those tangential actors in facilitating action for Internet governance and sustainable development? Leveraging existing network actors and enlisting them to bring others from their respective institutional affiliations would he an important way to increase the scale and scope of the network.

As it currently stands, this study is limited to the IISD point of view on the Internet governance network. An important undertaking, for example, would be to assess the nature of the IISD connection and value within the network of relationships according to other actors (do they, in turn, consider the key agents in IISD to be a valued connection?).

As previously mentioned, density of the network was comparatively high at 44.8 per cent. At this point, this measure says very little about the nature of the network unless it can be compared to other networks and their measures. However, this measure can be viewed as a base measure which could be compared to results in later years, should the study be repeated.

Nevertheless, this experiment provided sufficient insight into IISD's network of relationships that the following decisions were made within a year following the study:

1. Appoint two new Associates to join the IISD team, to strengthen its relationships in two areas:
    a. Developing country connections, in particular with NGOs and with the Internet technical community in Africa; and
    b. Government connections in Europe and in developing countries.
2. Increase connections with the private sector, through participation in the Information Technology Association of Canada's Committee on Information and Communications Technology and the environment and through active engagement with private sector representatives at the Internet Governance Forum.
3. Increase opportunities for the new member of the team to increase his connections.

5.0 Lessons Learned on Social Network Analysis

This study was an experiment to see whether SNA might prove to be a useful tool in understanding the composition, reach and effectiveness of networks of relationships on policy issues. While it provided useful insights into IISD's relationships on Internet governance, the study also has provided both insights and caveats on SNA as a network monitoring and evaluation tool.

In order to refine and improve the evaluative process, the following points should be considered.

1. SNA continues to be a highly specialized field, requiring the commissioning of external expertise and specific software applications. Adding in the geographic component was an additional expense as the geographic lens was not, at the time of writing, a standard consideration within SNA and therefore needed to be custom designed for IISD's experiment. In addition, the process of conducting the analysis can be labour intensive. The resulting costs can be well beyond the reach of research and policy networks, which often function on limited budgets and with in-kind or volunteer support from members. In most cases, although these networks might benefit from the insights that SNA can provide, they have virtually no resources to invest in an SNA exercise.
2. In addition, it is worth questioning whether the insights gained are sufficiently revealing to warrant finding the means to conduct SNA. In IISD's experiment, it was not apparent at the time that the developing country connections were as weak as they were, and so the SNA was helpful in providing the evidence and rationale to address the gap. Other findings were less helpful: knowing that the network of relationships was fairly "dense" did not provide any particular illumination into whether IISD should continue to reinforce those relationships, and whether those relationships were the right ones to leverage IISD's influence on Internet governance and policy.
3. SNA traditionally focuses on networks of individuals. IISD requested an institutional lens as well. This proved to be helpful, and should be included if networks seek to use SNA as an evaluation tool. Particularly with respect to new studies, a preliminary "institutional" analysis of a network may delineate key institutions of interest wherein key individuals may be targeted for further analysis. This may be a strategy to pursue if a network is particularly large or dense in order to better target and analyze key sets of actors.
4. The geographic lens was particularly insightful. SNA practitioners should look at how this can be integrated more seamlessly into SNA software.
5. It would be useful to limit the number of "nodes" or "actors" and, instead, focus more on the quality of the linkages. In other words, with a larger group of "key" in-house actors, delineate a ranked list of links (maximum of 10) and qualify those links in a more detailed manner. Who is important? Why are they important? This would assist in distinguishing key individuals from key institutions and to rank the importance/relevance of institutional affiliations.
6. SNA-based studies are context dependent in many ways. In other words, depending upon the nature/focus of the network (for example, agriculture or climate change adaptation), link characteristics and value of those links will vary. An SNA study requires upfront consultation to determine which actors and associated links to capture, characterize and value in order to evaluate a given network (i.e., to effectively and efficiently define the network boundaries). Links and/or nodes could be characterized through factors such as credibility, reputation or respective roles in the network (funder, partner and so forth). Does manner or level of communication among actors matter? Is it important to identify a clear leader or bottleneck within the network? Does geographic location matter?

Interest continues in the evaluation community on whether SNA can be both an effective and efficient tool. This experiment suggests that SNA can provide some useful insights to help strengthen networks, but the costs and complexity of SNA are significant barriers to its deployment as a management and evaluation tool.

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