

# **A Comparative Analysis of Free and Open Source Software Public Policy in Belgium, Canada, and Germany**

by

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## **Abstract**

The network approach has become an important part of the study of public policy, given the increased involvement of organized interests in policy development and the importance of interactions between public and private actors outside of the institutions of government. The proliferation of theoretical work and case studies of networks in a variety of policy sectors is assisted by a parallel and growing body of formal theory that analyzes networks – their structures and their characteristics and activities of their agents. The theoretical and methodological aspects are combined in an effort to establish generalizable rules about the nature of policy-making across states.

This thesis examines the case of free and open source software policy and tests a set of hypotheses with respect to the formation and structure of networks and their effect on policy formulation and change at the federal level in Canada, Belgium, and Germany. These hypotheses posit the nature of linkages between public and private actors play a role in the presence or absence of policy in these areas, as do the epistemological foundations in which these networks operate. A typology is developed within which network characteristics and structure can be assessed. The importance of network structure, as well as the processes by which actors learn, are considered in explaining policy change in the cases over approximately the last decade. The project reaches the conclusion that behavioral factors, not structural ones, are key determinants of policy changes in the case studies. These findings contradict the position taken by many network analysts.

The findings of this project also demonstrate the existence of policy networks in all three cases, providing environments for the dissemination of knowledge critical to policy development. The relatively insular character of these networks is notable and policy changes are found to be the outcomes of deliberate choices made on the part of a small subset of the network.

**Keywords:** policy networks; free and open source software; Belgium; Canada; Germany; public policy; comparative politics

*To Cynthia, Keldan, and Thera.*

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## List of Acronyms or Glossary

ACF	Advocacy Coalition Framework
BELGIF	Belgian Government Interoperability Framework
BMWi	Bundesministeriums für Wirtschaft und Technologie [Federal Ministry of Economics and Technology, Germany]
BSA	Business Software Alliance
BSD	Berkeley Software Distribution
CAAST	Canadian Alliance Against Software Theft
CIO	Chief Information Officer
CMS	Content Management System
COTS	Commercial Off-the-Shelf Software
CSIS	Center for Strategic and International Studies
DARPA	Defence Advanced Research Projects Agency [US]
DND/CF	Canadian Department of National Defence/Canadian Forces
DRDC	Defence and Research Development Canada
DRM	Digital Rights/Restrictions Management
EU	European Union
FAP	Federated Architecture Program [Canada]
FDP	Frei Demokratische Partei/Free Democratic Party [Germany]
Fedict	FPS Information and Communication Technology [Belgium]
FLOSS	Free and Libré Open Source Software
FOSS	Free and Open Source Software
FRAND	Fair, Reasonable, and Non-Discriminatory
FSF	Free Software Foundation
GoC	Government of Canada
GPL	GNU Public License
GNU	GNU is not Unix

GTIS	Government Telecommunications and Informatics Services [PWGSC]
IP	Intellectual Property
ICT	Information and Communications Technology
IS	Information Systems
IT	Information Technology
LoT	List of Tables
LoF	List of Figures
MoU	Memorandum of Understanding
NOiV	Nederland Open in Verbinding [Netherlands]
NRC	National Research Council
OSI	Open Source Initiative
OSS	Open Source Software
PWGSC	Public Works and Government Services Canada
RFI	Request for Information
SaaS	Software as a Service
SNA	Social Network Analysis
SPD	Sozialdemokratische Partei Deutschlands/German Social Democratic Party [Germany]
ToC	Table of Contents
TRIPS	Trade-Related Aspects of International Property Rights
VM	Virtual machine
WRS	Wirtschaftsförderung Region Stuttgart [Germany]

# 1. The Relevance of Software to Public Policy

## 1.1. Introduction

The study of public policy has benefited from a plurality of theoretical approaches. Marxist and neo-Marxist perspectives emphasize the role of class and the position of the state as subordinate to capitalist interests even in the presence of policy that might, in the short term, run counter to those interests. In pluralism, interest groups are the primary actors and their cooperation and conflict, a source of policy. By comparison, the state provides the framework and acts as a mediator of interests and public policy in corporatist arrangements. Markets and bureaucracies provide a set of rules that make transactions predictable and information more reliable in policy making under institutional or neo-institutional theories. In institutionalism and neo-institutionalism, public policy options are shaped by the institutional environments in which they are pursued. Finally, public choice theories reduce policy to the product of individual choices with regard to utility maximization.

This sampling of political theories suffers from a major deficiency. By virtue of being theories, with purposively limited scopes, they are unable to explain everything and account for exceptions. This is true of any public policy study. The methodological approaches available to students of public policy are similarly diverse. In an effort to explain causal relationships, political scientists have drawn upon the methodologies used by other social sciences, such as sociology, that in turn have been inspired by metaphors from the natural sciences, computing science and mathematics. The complex social reality evident in modern political systems is amenable to explanation using the language and metaphor of networks. In many respects, networks have become the default perspective for describing the structure and form of society (Castells, 2000). According to other theorists, networks still have a way to evolve before becoming the definitive organizational form of Western societies in the 21<sup>st</sup> century but they also argue this process is well underway and will lead to the replacement of centralized and formal

hierarchical organizations by networks eventually (Raab & Kenis, 2009). Networks as a tool of theory and practice have long gone beyond evocative language and descriptive metaphor to find broad application in the social sciences (Freeman, 1978; Granovetter, 1973).<sup>1</sup> Indeed, the utility of network concepts and tools has been so thoroughly proven that these theories and methods have been rapidly adopted by physicists and biologists, in a reversal of the tradition of social science borrowing from the physical sciences (Watts 1999; Freeman, 2008; Borgatti, Mehra, Brass & Labianca, 2009). States are not monolithic entities: nor are policy-making activities limited to a set of clearly defined social, political and economic boundaries within them. States are complex configurations of interests that cooperate and compete with each other. The network metaphor captures the reality and complexity of relationships between state and non-state actors. In an effort to move beyond description, methods from sociology and network theory have been borrowed to test for the existence of network, and, if found analyze them. In combination with theories of policy change we are able to assess if and how structure and agency play roles in in public policy. The policy network approach potentially can explain how policy is created, in that it recognizes the reality of policy formulation and implementation in which public and private actors exchange information and collaborate on an issue, often outside of the formal institutions of government.

Policy network analysis is well-established in political science as a consequence of the work done by scholars in the United States, Britain, Germany and other countries. Original and notable contributions include those by Hecl (1978), Rhodes and Marsh (1992) and Marin and Mayntz (1991), each developing particular aspects of the policy network approach in their respective American, British, and continental European contexts. Canadian theorists have also done important work in this field: for example, Coleman and Skogstad (1990) which was expanded upon by a number of theorists (Howlett, 2000; Montpetit & Coleman, 1999). The policy network approach has been widely applied and appears in a large number of case studies focused in such fields as

<sup>1</sup> Freeman's 1978 and Granovetter's 1973 articles are commonly cited as examples of the seminal application of network centrality and social networks, respectively.

health (Lewis, 2006), energy policy (Toke, 2000), advanced technology and manufacturing programs (Hallacher, 2005), and biotechnology (Montpetit, 2005) among others. This broad range of work suggests comparably complex policy sectors involving constellations or clusters of groups of public and private actors engaged in collaboration and competition, such as information technology (IT) are fertile ground for investigation. Public policy focused on information technology -- specifically with respect to government deliberations of issues of software -- provides the context for this dissertation.

As a topic of public policy, software has attracted little attention from political scientists, despite its critical importance to the maintenance of an industrialized society and the increasing role it plays in mediating social, political and economic systems. Instead, software is generally assessed from an industrial policy perspective and treated either as a single undifferentiated sector or at the micro level of analysis of individual firms. Unfortunately, the former approach is too high-level to uncover the nuanced policy implications that are evident upon closer inspection, and the latter misses recurring patterns that are often characteristic of a policy sector. Furthermore, a firm-level analysis is incapable of distinguishing the structural and systemic variables that potentially play a role in policy. The selection of an appropriate approach is further complicated by the idiosyncrasies of the software development process that themselves may be variables and factor into how the policy under examination appears. Why are multilevel analysis and case-based analysis of policy networks utilized as the methodological underpinnings for this study? Firstly, the policy network approach has the capability to establish causal relationships between the macro, meso, and micro levels of the policy sector. An observable connection between a type of software and its mode of production and the resulting policy is a driver for focusing this investigation on a currently active field with respect to technological development and policy, namely *free or open source software* (FLOSS). Policy dealing with this type of software is examined using the aggregated body of policy network theory and relatively conventional research techniques. FLOSS has become a very fruitful area for analysis by a variety of scholars in the social sciences using a broad range of approaches, for example from the governance and innovation perspectives (von Krogh & von Hippel, 2003; 2006), from the viewpoint of labour market participation (Lerner & Tirole, 2002) and through the lens of social anthropology (Zeitlyn,

2003), among others. In a 2007 article Von Krogh and Spaeth explored the interdisciplinary nature of FLOSS research and concluded that this phenomenon arose out of a set of characteristics (such as the impact of FLOSS, the transparency it embodies, its theoretical proximity to science, etc.) that generated the theoretical and practical conditions for “interdisciplinary dialog”. That said, FLOSS, did not attract significant attention from political scientists until relatively recently (Weber, 2004). Consequently, FLOSS provides a relatively new and unexplored topic for academics interested in its policy implications.

## **1.2. FLOSS as a Focus of Public Policy**

FLOSS is *Free/Libré and Open Source Software* (European Commission, 2002). It refers to software developed and released under licenses that require the source code or the human readable instructions that comprise software before it is “compiled” or “interpreted” by computer into a form that is run, to be distributed freely. A more precise definition of this form of positive freedom is provided by the Free Software Foundation,

The freedom to run the software for any purpose (freedom 0). The freedom to copy, study, and distribute a program, and finally, the freedom to improve a program and release your improvements to the public, so that the whole community benefits (freedom 3). Access to the source code is a precondition for this. (FSF, 2012, para. 4)

FLOSS is made freely available for use, modification, and copying with few restrictions, in comparison to commercial off the shelf (COTS) or proprietary software. As described above, this freedom is synonymous with liberty, and not exclusively cost. FLOSS can be sold for commercial profit. Another notable characteristic of FLOSS is its modes of production and distribution: it is developed, disseminated, and improved iteratively by local and global networks of programmers and end-users. There is a significant component of evangelism to FLOSS as its proponents often engage in efforts to inform the public and commercial users of its capabilities and opportunities. FLOSS has been adopted by a number of large organizations and its development is often supported financially by government: examples include the United States Defence Advanced Research Projects Agency (DARPA) and the German Federal Ministry for

Economics and Technology (BMW); and commercial organizations (IBM and Hewlett-Packard)). This work often builds upon earlier efforts undertaken by universities (for example, the University of Berkeley), foundations (the aforementioned Free Software Foundation), and private individuals. Notable examples of FLOSS include the Apache web server, the Linux operating system kernel, Firefox web browser, and the LibreOffice applications suite.

A concept often associated with FLOSS is that of *open standards*. Open standards are instructions or guides to the implementation of technology. They share some characteristics with FLOSS, but are specifically defined by the documentation or examples of their implementation. They are open for all to examine, are royalty-free, and the organizations that administer these standards provide equality of access to all interested parties and do not discriminate against any (Perens, 2010). Open standards are sometimes conflated with free and open source software. The distinction drawn between the two is the latter are *specifications* and can be implemented using proprietary means. FLOSS is implemented predominantly through the use of open standards. Closed specifications are incompatible with the requirement of FLOSS to share source code, and its reliance upon the liberty to implement and modify. The distinction between FLOSS and open standards is an important one because although they are related, open standards are not a substitute for FLOSS. Open standards present policy-makers with a markedly different set of tools to their problems than FLOSS provides. Open standards are seen as a solution to the problem of systems or data *interoperability* within or between government administrative agencies, other jurisdictions or governments and their citizens. In some settings, open standards are prescribed by public organizations to escape dependency upon a single vendor of critical IT systems or to assist the development of a local market for IT services. In all cases these open standards can be implemented using proprietary technology as there is no requirement to use FLOSS to do so.

Policymakers are interested in FLOSS partly because of the critical importance assumed by software in post-industrial economies and societies over the last forty years. Software technologies not only control most aspects of production, distribution, and consumption in the modern economy but have become important industrial products on their own (Quintas, 1996). The communications protocols that interconnect the systems

of the Internet take the form of software infrastructure, or “code”, as well. The Internet and other software-mediated communications technologies augment or, in some cases displace traditional modes of discourse entirely, which in turn affect our social reality. Consequently, software plays a role as social or cultural agent. However, there are more specific reasons for states turning their attention to this type of software. FLOSS presents states with both challenges and opportunities. FLOSS is seen by policy-makers as a means to an end, and an end in itself. States are grappling with the de facto reality of FLOSS use within their administrative systems and institutions and puzzle over how to accommodate it within well-established technical standards, procurement processes that are oriented towards tangible goods, proprietary software and services, and existing intellectual property frameworks. In these cases, the policy issue concerns the choice of governance mechanism for FLOSS. Additionally, policy-makers see FLOSS as a policy instrument in the pursuit of a broad set of policy goals such as encouraging the development of domestic industry, improving the security of computing and communications infrastructure, protection of culture, and preserving access to public information.

Free or libré open source software presents states with policy opportunities that are not possible with commercial or proprietary software. The liberty aspect of FLOSS permits individuals to modify the source code to meet specific needs and benefit from the free (as in cost) availability of this software. These advantages translate into opportunities for social, functional and technical benefits that policy-makers have now recognized and begun to pursue and implement. The last decade has seen an increasing number of cases of FLOSS being used to pursue a variety of goals. For example, states have sought to use FLOSS to “bootstrap” their technological development (Kshetri, 2004; Lee, 2006), to address the national security concerns inherent in commercial/proprietary software (Greene, 2002; Krempel, 1999), to improve public access to information, and to protect their cultural heritage by localization of

software to minority linguistic areas.<sup>2</sup> Some analysts consider FLOSS to be uniquely positioned to meet states' international commitment to support intellectual property rights (May, 2006).

Efforts to put FLOSS on the policy agenda of states have not gone unchallenged. The normative claim that FLOSS has a role to play in public policy has been hotly contested both within and outside the FLOSS community. Some of the more prominent FLOSS developers and proponents are of a notably libertarian bent, and consequently, are highly critical of any attempts at public policy, favouring the view that the state should not involve itself in public policy in this domain.<sup>3</sup> As FLOSS technologies and organizations have spread beyond the United States, the aversion to public involvement in FLOSS has become less evident. Arguably, FLOSS proponents now stand in opposition to the prevailing orthodoxy of "software manufacturing" which characterizes most commercial proprietary software, such as that produced by Microsoft Corporation, SAP AG, or Oracle Corporation, largely through claims that the restrictive licensing of commercial software prevents the sharing of property and information that informs a moral or enlightened view of social development. This philosophy stressing the critical importance of extending open access to the essentials of a post-modern society, computing capabilities and information, underpins the lobbying efforts of some FLOSS proponents vis-à-vis national governments (Stoltz, 1999). The philosophical position of FLOSS supporters also places them into conflict with the major players in proprietary software. With its focus upon freedom, FLOSS challenges the dominant discourse and economic assumptions underpinning intellectual property upon which the global software

<sup>2</sup> An example is the *Translate.org.za* project. This initiative has an objective to localize FLOSS for eleven of South Africa's languages. See <http://www.translate.org.za/>

<sup>3</sup> This position is somewhat ironic when considered in an historical context. The US Defence Advanced Research Projects Agency (DARPA) played a significant role in nurturing the open standards and technologies for networking, operating systems, etc. used by FLOSS and proprietary software, today.

market is still largely based. The threat posed by the high quality software and grassroots support for FLOSS was initially discounted by major proprietary software players. Eventually, FLOSS came to be seen as a challenge to their business models because, in addition to its freedom and cost advantages, its quality had reached parity with commercial products (Harmon & Markoff, 1998). Over the last decade, proprietary software companies have increasingly applied FLOSS to their own internal development processes or sought revenues from technologies or services utilizing FLOSS. However, in many cases, this support has undertaken only after a belated recognition of market realities, or touted but conditional upon licensing schemes that emphasize the “open” aspect of FLOSS without some of its freedoms. The release of source code under licenses that are “open” but otherwise encumbered is an attempt to gain the advantages of a community development model while protecting core market share and intellectual property assets. FLOSS proponents rail against these licenses, arguing they do not provide the fundamental liberties of FLOSS and generally obfuscate the benefits of open source software.

That FLOSS has attracted the attention of policy-makers is evident by its appearance on the policy agendas of several states. However, the FLOSS community's precise role (if any) in putting the topic of open standards on the agenda is not clear, nor is the role of policy-makers within government in doing so well understood. One of the objectives of this investigation was to answer these questions. Private and public actors have organized themselves to lobby for FLOSS to be put on the public policy agendas of a number of states such as France, Germany, China, Brazil, and Peru. The form and breadth of these policies is significant. The Washington, D.C. Centre for Strategic and International Studies (CSIS) produces a yearly summary of government FLOSS initiatives and the total of 364 open source policy underway in March of 2010 is an indication of the interest in FLOSS on the part of states. FLOSS policies have taken a variety of forms, including direct financial support for software projects (Germany, China), targeted industrial development policies (Brazil), and government procurement favouring FLOSS (Peru) (Lewis, Keiber, Krieger, Rasmussen, & Sladka, 2010). The actors in each state have also sought to challenge the existing epistemological context and reform it to be more supportive of the use of FLOSS within public organizations. They have provided the expertise for policy creation and implementation. The flow of

information between these actors is often informal and decentralized and takes place over networks bound together by ties of shared experience and interest. For example, studies indicate that FLOSS developers are connected to other developers in their home country and worldwide (University of Maastricht, 2002). And a subset of this developer population is involved in the public policy process either directly or via shared membership in other networks through employment in public agencies, participation in interest groups, and involvement in publicly-funded projects. FLOSS advocacy groups are active at the European level and lobby for policies that provide a legal environment supportive of FLOSS. This type of purposive activity was evident in the assembly of a coalition against software patents in which FLOSS interests were prominent and assisted in the ultimate defeat of a software patents directive in the European Parliament in 2005 (Leifeld & Haunss, 2011). Multiple overlapping group membership is evident in networks of FLOSS developers and policymakers in at the European level, helping facilitate the exchange of ideas between public and private organizations. These linkages are characteristic of the policy network approach.

Peter Katzenstein has defined policy networks as links in the policy process binding together political and societal actors (Katzenstein, 1977). Policy networks can be composed exclusively of public actors, private actors, or combinations of the two (Kenis, 1991). At the outset, this definition suggests the difficulty in delineating the boundaries of a policy network, particularly in the context of increasingly complicated sets of state-society relations. Establishing the boundaries of the policy network is accomplished through the isolation of the relevant variables that play a role in policy network formulation and persistence. The state institutions, public and private policy actors, epistemological communities, and norms that drive the creation and operation of policy networks, provide these variables. The breadth of variables also suggests that the traditional consideration of policy networks as a meso-level approach argued by Marsh and Rhodes (1992) is inadequate. Instead an attempt should be made to consider the systemic factors that affect policy network formulation, such as state regulatory styles, institutional autonomy and capacity, and the norms that underpin policy (Atkinson and Coleman, 1996). Insights into the policy process can also be gained from attempting to integrate the approach with a macro and micro level analysis in the fashion recommended by Daugbjerg and Marsh (1998). Their intention was to better explain

policy outcomes partially through the argument that the removal of macro-level variables from the policy network framework would exclude major explanatory variables. Finally, the role of choices made by individuals or institutions acting within policy networks is important and in any such study must be assessed. This investigation drew upon all of these insights to identify the relevant individual and organizational actors and subjected them to analysis at multiple simultaneous levels, taking not only the characteristics of individual units under consideration, but the context of the systems and institutions within which they operated and the norms within they were situated.

The appearance of FLOSS on the policy agenda of the aforementioned states is interesting from a policy network perspective because it provides a set of suitable case studies of the relationship between the structure of policy networks and policy. A related and central issue is whether there is a relationship between the presence of policy networks or their absence and the appearance or non-appearance, respectively, of public policy in this area. More precisely, this investigation posited that private and public networks have organized within and outside governments and have provided the organization and capabilities to develop and implement policy in support of FLOSS solutions and standards. To explore this concept in a systematic manner this investigator developed a number of hypotheses about the form taken by FLOSS on the policy agendas of two states, namely Germany and Belgium, and why it has not appeared in a similarly significant form in Canada. By “not significantly”, we meant the absence of policy or policy that may take the form of a deliberate non-decision, policy that remains in the proposal or research stage or policy that result in a non-supportive position for FLOSS.

Networks provide links between public and private actors and are potential paths through which knowledge, ideas, and values can move.<sup>4</sup> This phenomenon appears as a form of osmosis, permitting the transference of knowledge, ideas, and norms into and out of networks of actors, conceivably affecting the policy process. The importance of

<sup>4</sup> In this dissertation when we refer to actors we mean individuals or organizations that have the capacity for action (agency).

information and knowledge was evident early in this research project. The development of FLOSS is a knowledge-intensive process (from both social and technical standpoints) and its policy aspects require similar competencies from the individuals and organizations that seek to regulate it or capture its benefits. Consequently, the prerequisite knowledge to participate in this policy area, how actors developed or acclimated to norms common to the policy network, and what role the network played in this knowledge acquisition versus that by actors, became topics of inquiry. Most importantly, however, was the question of the learning of this knowledge (and norms, values, etc.) on the part of policy actors occurred and what impact this had on the resulting public policy, how this changed the form of policy over time, and what affect learning had on the network forms in which the actors operated. All of these issues had to be assessed within theoretical frameworks of policy-oriented learning. Fortunately, these theories were already well-established through the works of Sabatier (1988), Heclo (1974, 1978), Hall (1993), Bennett and Howlett (1992), and others.

In this investigation we explored the observation that Belgium and Germany appear to have been more fertile ground for FLOSS public policy than Canada. These observations generated a set of first impressions of policy events and the causal relations between actors, network structure, and policy change in this sector. We ascribed these developments to a number of possible factors:

- That there are more exclusively outside-government networks in high technology fields in North America than in Europe. North American FLOSS supporters are part of these networks and consequently participate less in the policy process than their European counterparts. And European policy networks exhibit a greater level of policy-maker consensus with the FLOSS community from normative and epistemological standpoints.
- Canadian policy-makers generally hold the default position of “software as manufactured good” or a discretely packaged output of an industrial process that has the properties of any other tangible product. This stands in contrast to the idea of software as a form of governance, regulation, or architecture which determines the rules

under which computer mediated systems are experienced (Lessig, 1999). The latter is often espoused by the FLOSS community over the former because of the manner in which FLOSS is created – via a fundamentally social endeavour that does not produce a product in the industrial sense. By comparison, the perspective of software as a manufactured commodity does not dominate in European policy. Proponents of software manufacturing take the position that software is merely another standard, manufactured good and that companies such as Microsoft reflect the dominant method of production. This mindset is the result of the influence of the United States and its major global role in software production but also because of the export orientation of Canadian firms that produce proprietary software.

- Europe has some large software companies (for example SAP in Germany) but government agencies there have generally avoided reliance upon organizations such as the world-wide Business Software Alliance (BSA) for policy-relevant knowledge and have made deliberate steps to free themselves of dependency upon commercial products and standards. In contrast to European actors, Canadian policy-makers appear to be more reliant upon the lobbying efforts of the BSA and the Canadian Alliance Against Software Theft (CAAST).

In order to examine the above assumptions and explore the idea that networks of actors engaging in policy learning that has driven policy change in each case empirically in this investigation a set of hypotheses were developed and assessed against observations of policy events and actors in Belgium, Canada, and Germany. As was previously noted, these hypotheses are juxtaposed against the theoretical frameworks of policy subsystems, policy learning, and policy change. Policy change is defined as:

...substantial rather than semantic difference in either outcomes or outputs of principle guided government action. (Giessen, 2011)

Clearly, it is a major aspect of this project. Over a period of a decade, changes in FLOSS and FLOSS-related policies were observed in each of the three cases. Policy-makers in

the three states publically described the challenges of understanding FLOSS and how to formulate policies that capture its benefits or provide frameworks for its governance. Policies appeared that were supportive and unsupportive of FLOSS, reflecting changes in the social and political context in which policy development occurred. Policy instruments were created, and discarded or superseded by other ones. Given the major theoretical focus of this investigation, a question that arose logically out of the observations of policy change in the last ten years is what role the structure of policy networks and other factors, such as policy-related learning, had in affecting policy change in this area. Policy-related learning assumed the position of a highly visible independent variable relatively early in the project. Policy change was clearly the dependent variable. Independent variables -- which include policy subsystem characteristics - are what cause or affect policy change and were what this investigation was attempting to isolate.

There are a number of theories of change, each providing analysts with a particular perspective, and attempting to explain how policies develop over time and under what circumstances. Two commonly referenced patterns of policy change are the normal and paradigmatic (Howlett & Ramesh, 2003). The former is the type under which most policy can be grouped. It reflects the normal state of policy-making and policy operations and is characterized by continuity of goals and incremental change only. However, when there are major changes to actors, the institutions or the context of ideas in which policy-making occurs, the potential for more significant change exists. This paradigmatic shift manifests itself as discontinuities in policy or major changes in policy goals, and is often associated with changes in the underlying epistemological context of the policy system. Adopting the concept of punctuated equilibrium from biology, social theorists have applied it to describing the conditions of policy change (Baumgartner & Jones, 1993). In Baumgartner and Jones' theory, policy is generally stable and change is predominantly incremental, constrained by institutional settings and the bounded rationality of policy-makers. Significant change occurs when these constraints are challenged or removed by exogenous political or social developments. Hall's (1994) notion of policy change also addresses the normal versus paradigmatic policy change dichotomy. Hall divides policy change into three orders of significance, based upon his interpretation of changes in policy instruments and goals: first-order policy change is

change in the characteristics or nature of policy instruments; second-order changes are changes in the instruments used in the pursuit of policy goals, but the goals themselves remain unchanged; and finally, third-order policy change is a paradigmatic shift in policy, usually manifested as a change in policy goals. Given the duration of the three case studies under investigation we expected to see both patterns of change. Policies should vary between cases over such a long period of time, particularly in an area such as FLOSS, which is subject to significant technical and social change. Once established, policy may be adjusted nominally or incrementally. Alternately, it may undergo major change, driven by developments in society, technology, or the political environment.

Theorists have linked learning with policy evaluation and change. Learning and the development of foundational knowledge are prerequisites for actors to be able to participate in policy-making. Specific types of learning have been associated with the normal and paradigmatic change described by Heclo (1974), Sabatier (1987), Hall (1994), and Baumgartner and Jones (1993), among others. Causal relationships between social learning and lesson drawing and normal and paradigmatic policy change, respectively, have been explored by policy theorists. Building upon these theories, analysts have focused upon various dimensions of learning and policy change, including the role played by exogenous factors in empowering one set of representatives of a paradigm over another (Howlett, 1994) or the development of new ideas by a subset of actors of a policy subsystem (Bandelow, 2005).

A synthesis of these concepts – change, learning and networks - informed the assessment of FLOSS policy in the three case studies. The centerpiece of this project was a quartet of hypotheses that drew upon all of the aforementioned concepts for their theoretical underpinnings. They related policy learning to changes in the behavioral patterns of actors with commensurate changes in network structure and policies. These hypotheses are:

Hypothesis 1: Policy change is less likely to occur when interconnections between actors in a policy network *exceeds* a certain threshold. This hypothesis arises out of the observation that network structures may have a role in determining the presence and nature of policy change. The interconnections referred to are the communications links between actors engaged in shared participation in policy events.

This hypothesis challenged the unqualified notion that establishing links between actors facilitates the flow of ideas and abets policy-related learning and subsequent political change. Instead it suggested a number of possible explanations of how network connections might actively inhibit policy change. From a structural perspective, policy subsystem communications do not scale effectively past a certain point, with the possible attendant effect of inhibiting or retarding the communications between actors. Or policy subsystem actors may hit a limit with respect to their ability to handle communications from many fellow actors and that policy-related learning is ineffective when competing sources of information exist.

This hypothesis is an important one when considered within the context of FLOSS policy in that it assumed a causal relationship between changes in structural attributes of the networks of actors and variations in policy over the interval that this investigation covers. It attempted to account (but not exhaustively) for observations in the three case studies that cover a broad range of potential policy, including instances of increasing support on the part of government for FLOSS, the waxing and waning of FLOSS policy in some instances, and the evolution of FLOSS policy into alternatives that appear to better address policy-makers' problems.

Hypothesis 2: A policy network did not appear in Canada because prospective network participants are members of competing outside-government networks. We asserted at the outset of this project that knowledge and ideas are critical to the development and maintenance of policy networks but did not immediately grasp the major role that policy-related learning played as mechanism for bringing expertise and norms into networks. What became evident as survey data was gathered, policy documents and related artefacts were summarized, and a better picture of the role of agents within networks developed was the need for actors to work within frameworks of policy-relevant information as a prerequisite for network formation and to affect policy change. This hypothesis suggested that insufficient numbers or types of actors or a lack of participant capabilities or resources to establish a policy network and effectively shape policy dealing with FLOSS were factors in the Canadian case. This hypothesis also invited speculation that should outside networks be found they potentially take the form of a FLOSS-supportive set of actors, but without public sector participation in an official capacity (e.g. limited to participants drawn from private organizations such as IT firms

and FLOSS advocacy groups or individuals) or unsupportive of FLOSS policy but composed of private actors that have the capacity or resources to participate in such policy, is playing a role in preventing network formation in Canada. It was conceivable that the latter, should they exist, occupied actors and resources that would otherwise be assisting public sector actors in formulating FLOSS policy, or lack the legitimacy to participate in the policy process, or be actively involved in lobbying or advocating against FLOSS policy. The testing of this hypothesis did not conclusively establish that such competing networks existed, however.

Hypotheses 3 and 4: A fertile epistemological context was a necessary precondition for the emergence of policy networks in the two European cases. And that this context was lacking in the Canadian case. The key role played by knowledge in policy network formation became an important part of the evaluation of these two hypotheses as well. These hypotheses claimed that an *epistemological context*, defined as the shared foundational knowledge required by actors to effectively operate in a policy area, was required before networks could form around a given issue. This context acted like a type of “social adhesive”, for example, in facilitating knowledge transfer in epistemic communities (Haas, 1992). We established early in this project, however, that epistemic communities and epistemic context could not be conflated. We developed the notion of an epistemological context as a new concept specifically for this project, refining it further to include the body of knowledge common to actors in a network and required to understand the policy implications of FLOSS and participate in policy definition, formulation, or execution. Policy-related learning became the major mechanism for the dissemination and reinforcement of this knowledge and the consequential driver for actors to affect policy change regardless of the policy network form in which they operated. It also provides the lingua franca in technical or organizational terms, by which members in communities of practice can communicate with each other. This hypothesis operated under the assumption that variables specific to the European cases positively influenced the development of a basic set of information and knowledge that played a role in network formation. It did not say that network formation was not expected in the Canadian case, but only that this context would be absent or not relevant to formation. These two hypothesis framed perhaps the most important issue of this project, namely what aspect of policy networks was the key determinant of policy change in the three

cases: the structure of the network themselves or the behavior of the network actors. Policy network theory has traditionally ascribed to structural characteristics the driver of policy formulation and change. However, this project found that, at least in the cases of FLOSS policy in Belgium, Canada, and Germany, that the information resources and capabilities of actors played a major role in their behavior and consequent changes in policy. These findings were a major departure from policy network theory that historically has ascribed a greater role to the structural characteristics of networks and the institutions that compose or intersect them than the behavior of actors. How this actor behavior, shaped by an epistemic context, developed and propagated became a major (and not expected) focus of the project. In sum, agency appeared to win out over structure.

This type of comparative analysis using the policy network approach is not new. Indeed many examples exist (Greer, 2002; Montpetit & Coleman, 1999; Montpetit, 2005). However, this study breaks new ground by its topic and approach. The set of case studies presented in this dissertation is of interest to political scientists for a number of reasons: (a) it is an exploration of a new area of policy studies, and from a unique perspective (b) it potentially helps describe the preconditions for the emergency of a policy network. The FLOSS public policy domain is of particular interest because it is a very active area that has not been examined rigorously from a network perspective. While the explanation of policy outcomes has been a major focus of network theory, the prerequisite conditions for policy network formation and the consequential structures have been less explored. The keys to understanding both sets of relationships are found in these prerequisites: first the determination of whether network structure or attributes is a causal factor in the change observed in these cases, or if this change is driven by the behavior of network actors, or if this the result of some combination of the two; and second, establishing a relationship between networks and policy change and the substantiation of policy learning as the agent of this process.

The study also has relevance for policy-makers. While its primary objectives are to use FLOSS as a topic of case studies to critically examine the concept that changes in network structure drive changes in policy and assess the causal factors that play a role in both types of variation, it also holds interest for domain practitioners. Firstly, the case studies themselves are (arguably) of importance to policy-makers and stakeholders

involved directly in FLOSS policy because they communicate how states have used FLOSS to address a wide range of external policy problems and how they have met the challenge of regulating FLOSS usage within their own administrations. Secondly, the specifics of FLOSS policy development and execution, in particular how they can be ranged along different continua such as supportive to unsupportive or strategic versus tactical form, the management of interest groups in a network, and finally the qualitative nature of FLOSS policy instruments, should all be of interest to policy-makers. These topics are covered in the case studies.

### **1.3. Method**

At its most basic level, this investigation used a comparative research method. Case studies were the selected approach and comparisons were drawn between three federal states – Belgium, Canada, and Germany. Analysis was undertaken at several levels simultaneously, specifically at the macrosocial level and at the meso or subsystem level or from within the system (Prezeworski & Teune, 1970; also see Wang, 2010). The comparative method was a suitable choice for this investigation because of the causal complexity evident in the issue area and can be used in order to compensate for the possible complication of collinearity (Ragin, 1989). Small-n case studies force explanation of deviations and idiosyncrasies. The demand to account for these idiosyncrasies is particularly relevant for defining policy network boundaries. The choice of cases was made by the patterns of network structure described above, the need to keep key variables constant in order to facilitate the comparison of similar cases possible, and establish the causal relationships that characterize the independent variables.

Germany and Belgium were selected as cases, because of their macrosocial similarities to Canada, namely comparably high levels of social, economic, industrial and technological development, and common democratic and federal political systems. All three states faced and continue to face similar policy problems in the information and communications technology fields. This selection of states reflects a “most similar” case design, and that choice is a deliberate attempt to hold constant a number of complex factors that may play a role in the absence of, or alternately, in the makeup of the policy

network that has appeared in a particular state. We made this specific selection of similar states in order to prevent the macrosocial elements from obscuring the lower level factors that were the defining attributes of policy network structures.

The aforementioned case studies were supported by a number of overlapping and mutually reinforcing research techniques in an effort to address common methodological problems. These issues include the challenge of establishing the identity of valid network participants, determining network boundaries and testing the significance of network links and the roles of participants. An initial set of prospective policy network actors was constructed through analysis of policy artifacts and of mailing list communications, journal and newspaper articles, information technology trade publications, and self-identification on relevant web sites and blogs. The resulting set of candidates was interviewed and a survey was administered. The survey requested that respondents identify the organizations and individuals with whom they communicate or collaborate with regards to FLOSS. This established an initial set of connections that provided the second set of contacts to which the survey could be sent and, where possible, interviews conducted. "Snowball sampling" techniques were used to expand the network actor sample from "first-order" to second, third, and further orders as far as was feasible (Wasserman & Faust, 1994). However, initial response rates were low and the utility of snowball sampling was less than anticipated at the outset of this project. Some of the challenges faced in mapping so-called "dark networks" were also encountered early on in this project (Raab & Milward, 2003). In order to compensate for a paucity of responses from surveys, the hesitation (in some cases) of survey respondents to identify other individuals in their networks, and the problem of confirming that contacts were indeed key participants in their networks and the policy process mixed methods were used. Network membership and consequently the boundaries of these policies networks were corroborated by analysis of policy documents, journal articles, mailing list correspondence, and by interview notes. These materials not only provided confirmation of network affiliation, but assisted in addressing the deficiencies associated with small samples, arising out of the small populations of these networks, particularly when compared against the significant number of responses garnered by such archetypal studies as Laumann & Knoke's (1987) work. The end effect of these efforts was the production of a set of mutually reinforcing materials that provided the

necessary data to test the hypotheses detailed above. An innovative analytical technique, called the Actor-Process-Event Scheme (APES) pioneered by Swiss political scientists (Serdült & Hirschi, 2003) was utilized to turn this body of quantitative materials into a graphical display of actors, the events in which they participate, their relationships to other actors, and the policy process over time. Ensuring the inclusion of a temporal aspect was extremely important to deriving relevant information about how relationships between actors and events evolved over time (Doreian, 1990). More precisely, the APES used information about FLOSS policy events and their timelines and the groups that participate in them to produce a map that made the relationships between FLOSS network actors and critical policy activities clearer. The APES also was used to generate a set of artefacts associated with social network analysis (SNA); specifically, matrices depicting actor-actor relationships and actor participation in events. With further processing these matrices were turned into summary measures of various aspects of networks such as density and centrality. These quantitative measures were complementary to the empirical and qualitative material that composed the majority of the research. Finally, all of the comparisons were undertaken within an analytical context provided by a policy network typology that provided a set of variables common to all cases. This not only helped establish comparability across cases but also tied the investigation into the literature in a novel way that yielded insights into how the policy network structure versus agency debate is still relevant and applicable to nascent policy areas such as this one.

## **1.4. Dissertation Outline**

This project is composed of ten chapters, grouped roughly into three major sections. The first section includes a chapter that provides FLOSS subject matter background, describing the historical development of this type of software, its salient technical, social, and legal aspects, and discusses the relevance of open source software to policy-makers and political scientists. This is followed by a chapter that outlines the development of the body of policy network theory in the American, British, continental European, and Canadian contexts and briefly describes the major aspects of each approach. A review of the policy network literature is also a precondition for establishing definitions of terminology, the operationalization of relevant concepts and

variables and providing a more detailed explanation of the techniques used to conduct the data gathering and subsequent analysis used in later chapters. This section also briefly touches upon relevant theories of policy change to attempt to explain the variations in policy development between the three cases and account for the importance of the role of learning and knowledge. The second section begins with an identification of the relevant theoretical concepts and then outlines their operationalization. A modified Marsh and Rhodes typology is brought in to assist with the isolation of relevant independent variables. Following the parameters for testing, the hypotheses are described, and a chapter is dedicated to each of the three states under consideration, namely Belgium, Canada, and Germany. Each case is introduced by a description of the policy environment and the state structure including the relevant local, provincial or state, federal, international actors. The nature of the FLOSS policy sector in each country, international linkages, as well as the commercial context in which it operates (for example, who are the major domestic players in terms of software companies) is covered in this section. The policy actors are modelled and the relationships between actors and policy events are described using the APES introduced in the preceding chapters. In line with the observation of changes in policy, a longitudinal analysis is done, arraying policy changes against actor behavior and subsystem structures over time. The key section of the investigation is the third. This encompasses the comparison of the three cases where the pertinent variables are drawn out and contrasted and the specific elements of each hypothesis: namely, network connectivity density, network affiliation, and epistemological context are addressed. Determining the role these variables have in policy network presence (or the lack thereof), network formation and quality of policy (or again, the lack thereof) occupies a majority of this section. Finally, this study concludes with a summary of the research findings, describing their relevance to policy network theory and political science in general. A number of caveats with respect to the study's findings are discussed as well and are followed by some informed speculation with regards to how the policy networks described in the three states will evolve in the future. We attempt to extrapolate new policy directions from these structural adjustments. The conclusion suggests some future avenues for promising research in related policy areas such as biotechnology that may follow a similar epistemological model and organizational structure to the FLOSS domain.

## 2. The Policy Implications of Software

### 2.1. The Importance of Software

The significance of software is undeniable. It is ubiquitous. Every aspect of modern life is governed to some extent by it. An industrial society is sustained by software-controlled systems of waste removal, electricity, fuel, and water distribution, manufacturing and transportation control, and logistics. The economic importance of software is reflected in the value of the global software sector: US\$ 242.4 billion in 2009 which is expected to grow to US\$ 330 billion by 2014 (Data Monitor Group, 2010). Software is also culturally and socially significant, providing entertainment in the form of games and other artificial environments, mediating our social interactions and facilitating collaboration through e-mail, messaging, blogs and on-line communities, and social networking applications (Synder, 2005).

However, outside of the information and communications technology sector under which it is usually subsumed, software rarely attracts the attention of policy-makers. And when it does, it is largely within the context of industrial or trade policy, or intellectual property concerns (Schalden, Schrank, & Kurtz, 2005). More precisely, for most policy-makers, software is predominantly situated within the economic activities that support software manufacturing, or the process of producing and selling software as if it were a tangible good.<sup>5</sup> The focus of such policy has traditionally been upon the

<sup>5</sup> The Canadian Alliance Against Software Theft self-identifies as an “industry alliance of software *manufacturers*” (emphasis added) at this link: <http://www.caast.org/language.html>. Thank you to Russel McOrmand of FLORA Consulting Services who brought this fact to the writer's attention.

proprietary software and software services provided by commercial enterprises. This type of software is referred to as *proprietary* because a proprietor or owner maintains control over the software's use, distribution, or modification. Examples of proprietary software include Microsoft's Windows operating system and its Office productivity suite. Proprietary "software as a service" (SaaS) or "cloud computing" are Internet-delivered applications hosted by commercial organizations, for example, Google, Amazon.com, or Salesforce.com. Proprietary software is often part of a larger bundle of software-related services that include project management or technical consulting for projects. Examples of these include the implementation of large-scale enterprise resource planning applications such as those produced by the German firm SAP, or custom application development for a variety of markets and purposes.

Free and open source software differs significantly from proprietary software in that there are no restrictions on its use or duplication. The source code -- or the instructions written by programmers as an input to the compiler that will produce the final software product -- is made freely available to the user, facilitating the examination and modification of the software technical possible. This freedom does not exist with proprietary software and generally a non-disclosure agreement or similar legal arrangement is a prerequisite for an outside party (for example, someone who does not work for the originating firm) to access the source code or a proprietary license governs the terms of redistribution and modification. However, the most important difference between proprietary and free and open source software is in their respective modes of production. Most proprietary software is produced within conventional corporate environments by individuals or groups of programmers generally relying upon a formalized methodology to guide their development efforts. As described above, the completed software is licensed in a manner so that corporate ownership and control and restrictions upon the use, duplication, and modification of the software are maintained.

By comparison, some of the largest and most successful free and open source software projects, such as the kernel of the GNU/Linux operating system and the Apache web server, have been undertaken by groups of geographically-separated software developers working over the Internet voluntarily and usually in their spare time. Do these seemingly esoteric distinctions in a technical process translate into tangible public policy concerns for the policy practitioners in various national governments and academic analysts? To properly answer this question and others raised in the introduction to this investigation, namely “Why are policy-makers interested in free and open source software?” and “Why then should political scientists study this area?”, a brief discussion on what distinguishes software from tangible goods must first be undertaken along with a more detailed examination of why free and open source software presents a clearly different case from proprietary software in the context of public policy.

**Table 1. Characteristics of Proprietary Software and FLOSS**

	<b>Proprietary</b>	<b>FLOSS</b>
Cost	Sold for profit but can be provided at zero cost.	Provided at zero cost but can be sold.
Access to source code	Generally not available, but in some cases can be made so with a non-disclosure or other license that limits distribution.	Required by FLOSS licenses. E.g. GPL, BSD.
Freedom to modify	No.	Required by FLOSS licenses. E.g. GPL, BSD. GPL requires modifications to be released back to community. Attribution of credit to original creator.
Freedom to copy/share/distribute	No.	Required by FLOSS licenses. E.g. GPL, BSD.
Development Model	Generally hierarchical or centralized.	Community, network-based.

Software possesses a number of attributes that distinguishes it from industrial products. Firstly, software production is a knowledge and labour-intensive process (Quintas, 1996) The first stages of software development usually involve the gathering

and analysis of requirements, namely what functionality the software will provide to its users or business, social, cultural, or economic processes that will be dependent upon it. The requirements-gathering phase is followed by the design of software components, including interfaces to other systems. The actual writing of the software is ideally undertaken once the design process is complete, and the completed software tested before it is considered to be release-worthy. After release, software bugs are often “fixed” or “patched” in the nomenclature, by updates or maintenance releases of the software. And additional functionality is often provided by such updates to software. The process of constantly improving and updating software ensures that it rarely results in completed product in the manner of a tangible good such as an automobile. The series of iterative design activities that constitute the software development process further distinguish software from conventional durable goods that are produced in several distinct phases (design, production engineering, and manufacturing) (Quintas, 1996). The Internet increasingly plays a role in reinforcing the distinction between software and “finished” goods: many programs are hosted on remote systems or dependent upon an on-demand connection to the software developer or vendor for updates and bug fixes, often independently of the software user's preferences.

Economic characteristics also factor into the differentiation of software from tangible goods. Unlike tangible goods, software is non-rival. The use of software by one person does not deprive others of its use because it can be duplicated and distributed with little effort. However, unlike public goods which are non-rival and non-excludable, software can be made excludable in the sense that access to it can be limited via various means and then sold. In this sense, software is a club good. Intellectual property rights and copy protection are two means by which the excludability of software is established.

With some of the broad technical and economic attributes of software described, the question of what then is notable about free and open source software follows. To answer this question the origins of this specific type of software must be probed, particularly with respect to its distinctive technical nature and the social organization of its production. However, even in the absence of these special technical and social attributes FLOSS does have economic importance as a large and rapidly growing market on its own. A recent International Data Company study claimed that open source software is expected to grow 22.4% yearly from 2009, becoming an \$US 8.1 billion dollar

market by 2013 (Little & Stergiades, 2009). As a purely technical phenomenon, free and open source software is not a recent development, nor, when considered within the broader historical context of software and computer science, is it an aberration.<sup>6</sup> Computer users often wrote their own software before commercial software packages production became predominant in the 1980s (von Hippel, 2005). Academic researchers and scientists shared what they developed and the code they wrote could be modified to meet the needs of others, establishing a norm that would nurture the “hacker” community. Then the term hacker did not have the unfortunate pejorative connotation that it does today, and referred to individuals who were part of the programmer subculture of the 1960s and interested “in the details of programmable systems and how to stretch their capabilities”.<sup>7</sup> One centre of this new hacker culture was the Artificial Intelligence lab at MIT. The increasing presence of proprietary software in the late 1970s and early 1980s and its eventual institutionalization as the dominant mode of software production in industry presented the hacker culture with a serious challenge. The prevailing norm of sharing of computer code was under assault by the increasing encroachment of exclusionary and restrictive licensing of software and this presented Richard Stallman, a programmer working at the Artificial Intelligence Lab in the 1970s, with an ethical challenge. Stallman believed that the inability to share software was fundamentally antisocial (Stallman in DiBona, Ockman & Stone, 1999). He rejected the

<sup>6</sup> There exist a number of excellent historical analyses of how open source software developed, from an anthropological standpoint such as Eric Raymond’s 1999 book *The Cathedral and the Bazaar*, or focusing on the social aspects of organized groups of programmers (see Steven Weber’s *The Success of Open Source* (2004)).

<sup>7</sup> This classic definition of a hacker was provided by *The Jargon File*, which describes the etymology of many computer-related terms. See <http://www.catb.org/jargon/oldversions/jarg262.txt>

IP rights convention, the implication that programmers did not have a social responsibility that accompanied their role as producers of software, and that the fruits of their labour were merely commodities to be sold under specific conditions. Stallman's philosophical position led him to found the Free Software Foundation (FSF) and to develop an intellectual and legal framework that would enable sharing of code and protect software freedoms namely, "Copyleft" and the GNU General Public License (GPL). In Stallman's words copyleft was intended to provide "distribution terms that would prevent GNU software from being turned into proprietary software" (Stallman, 1999). The copyleft philosophy laid out the freedoms to use, copy, modify, and distribute software but does not permit others to add their restrictions. It also ensured that successive modifications to software are protected, and if copylefted software is combined with proprietary software or used in producing proprietary software, the derivative work is also free. This requirement has earned copyleft the moniker "viral" because of the infectious nature of the license upon modified or derived software works. Copyleft was implemented by the GNU General Public License which since its inception has undergone a number of major revisions to adapt to changes in technology and meet challenges posed by patent threats, anti-free software provisions in some digital restrictions management (DRM) implementations, among others (Free Software Foundation, 2012). In addition to laying the intellectual foundation for free software in the 1980s, Stallman and the FSF produced a number of important and foundational software tools such as the compiler, programmer's editors, and libraries used in major FLOSS projects initiated in the 1990s such as the GNU/Linux kernel and the Apache web server. However, it was the former that drove much of the growth in open source software the last decade and a half, superseding the FSF's own work on a free operating system, and other projects to build operating systems based upon the Berkeley Software Distribution code (BSD) (Stallman, 2000).<sup>8</sup> By the time Linus Torvalds, a Finnish computer science

<sup>8</sup> In this article Stallman mentions the technical design decision (specifically selecting the Mach microkernel as the basis for Hurd) that played a role in delaying the GNU Hurd operating system. Weber (2004) also discusses the development of the BSD system in his book.

student, had posted version one of Linux for download in 1994 it already contained the work of hundreds of contributors. In the following decade Linux rapidly spread to running many of the servers that underpinned the internet, to personal desktop and portable computers, enterprise back office systems, and devices such as smartphones and routers. The success of Linux drove the general proliferation of open source software -- the Apache web server, the GNOME and KDE desktop environments, MySQL and PostgreSQL databases, and the LibreOffice productivity suite are salient examples.

Free and open source software faced challenges throughout its history. And the international policy environment and information technology markets continue to generate new ones. Examples of the former include the negotiation of intellectual property regimes unfavourable to FLOSS development, such as the Anti-Counterfeiting Trade Agreement (ACTA). ACTA provisions are seen by FLOSS proponents as a significant potential impairment to the distribution of free software and puts it at a disadvantage with respect to use of copy-protected media (FSF, 2008). Secondly, a number of major market players have assembled portfolios of software patents that potentially will be used against FLOSS in the future (Shankland, 2004).

Other challenges to FLOSS have originated from within the community. The GNU GPL represents one approach to open source software rooted in a political concept of freedom as liberty, not cost. This distinction often explained through the aphorism: "Free' as in 'free speech', not as in 'free beer'." (FSF, 2012) The range of liberties ensured by copyleft is broad. However, in the late 1990s a number of luminaries in the free software community were concerned that the GNU GPL inhibited adoption of FLOSS by commercial organizations. Business people were concerned that the use of this software might require them give away control over the proprietary software they developed. This led Bruce Perens, Eric Raymond, Larry Augustin, and others to define the conditions for

open source (the Open Source Definition) and create the Open Source Initiative (Perens, in diBona, Ockman & Stone, 1999). Although largely a subset of the FSF's definition of free software, the Open Source Definition was at the time (and still is today) seen by Stallman to insufficiently emphasize the liberty concept of freedom and that the concept of openness could be interpreted solely in terms of access to source code which simply did not go far enough to protect user freedoms (FSF, 2012b).

The debate over the free versus open aspect has not been settled. A number of licenses have been developed over the years to provide an organization or individual developers with choices under which they can release software, according to their preferences and objectives. The general view of the community has become increasingly pragmatic with respect to licensing. The free versus open debate did little to inhibit the spread of this software and its increasing adoption by commercial enterprises and public organizations. However, the open versus free distinction has also introduced a division exploitable by commercial interests. It provides for the creation of “business friendly” licenses but also the opportunity for commercial organizations to capture benefits associated with FLOSS while protecting their sources of revenue and their intellectual property. Commercial organizations do not necessarily require licenses that maintain as much control as possible over the software they produce. For example, they can capture the benefits of FLOSS by free-riding on the outputs of the community -- particularly in the cases of high-grade software such as the Linux kernel or Apache web server (Vaughan-Nichols, 2010). But the variation in licenses do permit commercial organizations to claim to be supportive of “open source” and argue for this as a lobbying or marketing point, militating against the adoption of products under more restrictive license such as the GPL that would require customers to open any changes they make. The relationship between FLOSS communities and commercial organizations will continue to be strained by arguments over licenses, the freedoms they represent and pressures for their dilution.

## **2.2. Policy Definition**

In order to shift the discussion from the topic of software as a technological or economic issue, to that of policy dealing with software, some terminology must be first clarified. A clear definition of policy permits us to formalize the parameters of this

investigation and establish how we test for its existence. There are a number of definitions of public policy, some broad enough to define it as any activities undertaken by government (Dye, 1972) whereas others are more specific with respect to its focus on problem solving (Anderson, 1979). However, the one this investigation will settle upon is the definition provided by William Jenkins of public policy as a:

...set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them within a specified situation where those decisions should, in principle, be within the power of those actors to achieve. (Jenkins, 1978)

Jenkin's definition is a suitable choice for this investigation because it deliberately identifies public policy as a process and emphasizes the interactivity that drives it. This definition is also *a propos* given the multiple actors and multiple interactions across formal organizational boundaries reflecting the reality of this aspect of policy. It also hints at the existence of a boundary for the policy subsystem by suggesting an intuitive but not always clearly defined link between participation and the capability to make decisions.

### **2.3. The Challenge of FLOSS Public Policy**

The economic importance of FLOSS, political involvement by open source advocates, and the appearance of open source software as a tool in government organizations have, over the last two decades, generated a set of issues that policy-makers could not ignore. The policy activity with respect to free and open source software differs from proprietary software. In the minds of policy-makers, the prevalent economic model for the production of software has been that of software manufacturing, translating into policy oriented towards firms and markets for software and managed in the same manner as other tangible manufactured goods. However, one way that open source software differs from proprietary software is with respect to its mode of production. Furthermore, open source software inherits the non-rivalrous nature of software and extends that characteristic as a public good which further distances it from conventional software production, and by extension, policy in that area. FLOSS is also

considered to be an example of collective invention, a process in which an “interested public” is incited to and involved in learning about a particular service or good, and actively contribute to its development (e.g. von Hippel, 2005). Much has been written about FLOSS within this definition (for example, in the writings of von Krogh & Spaeth, 2007; von Krogh & von Hippel, 2003, 2006) with other theorists qualifying these findings by noting that FLOSS differs from other cases of collective invention because of its lack of a dominant design or a “winner takes all” outcome (Osterloh & Rota, 2007).

The interest open source software now holds for policy-makers is a relatively recent development. Prior to the late 1990s, open source software had not spread far beyond the academic and research environments in which it originated. However private enterprises gradually saw value in open source software in providing a platform upon which products and services could be delivered (Perens in diBona, Ockman & Stone, 1999). The commercial attention given open source provided some of the necessary validation in order for to be considered for use within government (Simon, 2005). This qualification is important as open source software had already been used operationally as government information technology employees brought it in “through the back door” in order to solve technical problems. Open source software was given additional impetus by an increasing number of analyses that argued for government use of open source to promote economic development (Stolz, 1999). By the middle of the last decade, it had been accorded a policy role in a large number of political, economic, and social contexts. Indeed, the diversity of policy approaches at times suggest the metaphor of the Rorschach ink-blot test, where the complex landscape of open source software projects becomes subject to organizational and personal interpretation in terms of what policy goals might be served by this phenomenon. This diversity of approaches has raised questions about how to state can successfully use and promote the use of open source software (Hamel, 2007).

Given the wide-ranging applicability of open source software as an instrument to address various technical and economic issues, it is not surprising that it has been involved in wide range of policies in a large number of jurisdictions. However, FLOSS is not only a policy instrument: it is often seen as a policy problem in its own rights. FLOSS presents organizations with governance challenges because of its status as a disruptive technology and the reframing of intellectual property rights that it represents. In line with

theories linking the selection of policy problems and tools, the choice of instrument is contingent upon the type of policy problem that is being addressed (Peters, 2005). FLOSS policy is no exception and does not take a dichotomous form. These policies can be arrayed along a continuum, ranging from positive statements of the benefits of open source, to implementations of open source technologies and financial and logistical support for open source projects or developers. Policy in this area occupies a broad range, with examples including the promotion of open source software in enhancing the security of their operations, developing native information technology industries and protecting cultural heritage. Firstly, open source software plays a role in security policy. With the source code readily available, open source software is considered more secure than proprietary software. Eric Raymond's often cited aphorism "Given enough eyeballs, all bugs are shallow" reflects a reality that open source projects can harness larger numbers of reviewers and fix problems more quickly than proprietary software, which theoretically leads to better quality software, and in this context, more secure software (Raymond, 2001). The presence of source code also permits public organizations to audit the software they use to ensure it meets their security requirements. Consequently, public organizations concerned with the security of their software will support open source projects. A number of examples of public policy supporting the use of open source software in the area of communications and data security have appeared globally. In the late 1990s the German Federal Ministry for Economics and Technology (BMWi) directly funded the GNU Privacy Guard project to develop encryption software to secure data on systems and in communications (Krempf, 1999). Their goals included assisting the security of communication and improving software security through transparency and reliability. Chinese concerns with the integrity of foreign proprietary software used on their government systems was cited as the initial driver behind that government funding projects such the native Red Flag Linux distribution (Smith, 2000).

A number of jurisdictions promote open source software as a policy instrument to support the development of their own domestic software sectors and to secure freedom from dependency upon foreign suppliers, particularly where local industry is small or under foreign commercial control. A policy paper entitled "L'économie de l'immatériel: La croissance de demain", released in December 2006, described the French intention to make the Paris region a centre for open source software development (Sayer, 2006).

France has a software sector but it lacks a significant global presence comparable to American software companies such as Microsoft. Similar policy measures have been pursued by German officials in Baden-Württemberg and other German federal states taking the form, for example, of programs such as “Open Source Region Stuttgart” that provides financial and logistical support for local firms developing FLOSS solutions (WRS, 2012). Within the developing world, governments such as Brazil see the potential in FLOSS to encourage development of their economies, citing the customizable nature of open source software in permitting localization not possible with market dominant software products (Kingston, 2005). The policy would be to assign this work to local firms. Open source software also is a viable policy option for developing economies to provide critical e-government infrastructure while maintaining their intellectual property rights commitments under international regimes such as TRIPS. However, in countries such as Cambodia, Indonesia, Laos and the Philippines, these efforts are in their nascent stages, and limited to declarations of interest or limited internal deployment of technology, rather than any concerted or tangible policy (Cooke & Horobin, 2006).

Finally, policy-makers in a number of jurisdictions have turned to open source software in pursuit of social or cultural goals. A major concern of smaller cultural or ethnic groups is the dearth of software that supports their local languages or written alphabets. In the case of Iceland in the late 1990s, Microsoft made a business decision to not support the Icelandic language in Windows as the potential market was insufficient to justify the investment. This decision was made despite Icelandic government lobbying and offers to compensate Microsoft for the translation of the Windows operating system. A variety of open source projects undertook the necessary localization efforts and provided support for the Icelandic language in alternate software environments. The (initial) lack of commercial products supporting Norway's second language, Nynorsk, evoked a threat to boycott Microsoft products from parts of the Norwegian school system (Marson, 2005). Microsoft eventually provided this support but only after this significant reaction. The absence of software written for smaller linguistic groups and the reluctance of major commercial software to localize software in the absence of payback or do so presents a set of problems for policy-makers who are engaged in policies to support linguistic minority groups or protect cultures against the harmonizing effects of globalization.

**Table 2. Examples of FLOSS Policy**

State	Policy	Policy Objective
Brazil	Funding of FLOSS technology centre	Promotion of open software/standards in national market
China	Funding of Red Flag Linux	Security
France	Support of French software firms	Development of local software sector
Germany	Support of German software firms	Development of local software sector
United States	2009 Stimulus bill included call for study on open source health IT	Promotion of open software/standards and reduction of costs of software acquisition

Apart from the larger policy goals pursued by government, open source software sees direct application within governments in an operational capacity. Specifically, open source technologies are used by government departments, public corporations, municipalities, and cities to run important electronic infrastructure such as e-mail, file storage, or web servers, content management systems, among others. Often this software is introduced through informal channels, by technologists in public employ, seeking to solve some immediate problem or provide infrastructure under budgetary constraints.<sup>9</sup> However, there are a large number of formal cases studies of open source use within government departments and public organizations (Perry & Margoni, 2010).

A major driver for the use of open source within government is the goal to move away from proprietary systems and data formats. In both cases governments often find themselves tied to specific vendors and at the whim of their product development plans.

<sup>9</sup> The arguments between proponents of commercial and open source software over the arguable cost benefits of FLOSS have been prominent in the IT trade press and will not be dealt with here. The statement about low cost is from the perspective of a technologist and pertains to the capital or up-front costs of software, not the cost of software (including its support) over its life cycle.

These often translate into high costs for organizations which generally have been under cost pressures for the last few decades. Another consequence of the dependency upon commercial technologies is the short lifespan of proprietary data formats. Commercial enterprises have entirely different goals from government. Locking public and private sector customers into their proprietary technologies ensures a constant revenue flow and a rapid product development cycle militates against competitors gaining a foothold in the market. These activities are the antithesis of what government needs: the gradual introduction of technology into government operations and often in an incremental manner. The ephemeral nature of digital formats is a consequence of the constant rate of technological change. Governments require document formats to be predictable and stable – for decades or even centuries – and find themselves at mercy of vendors of proprietary formats. One of the touted aspects of FLOSS is that it generally relies upon publicly-determined, published, and often royalty-free specifications with general use rights, and consequently implements these open standards or open formats (Simon, 2005).

However this does not mean open standards on their own will provide the same freedoms as FLOSS. The benefits of the two are sometimes conflated and incorrectly so. The benefits of FLOSS have already been enumerated earlier in this investigation. Proprietary software products often rely upon open standards in order to be interoperable with other products or systems or to be compliant with customer's business requirements<sup>10</sup>. Open standards are in some cases considered an intermediate step between proprietary and open source software, particularly for public agencies that do not want to dictate choice of software products to their suppliers and internal users but do want to maintain some control over their data and eventually escape their dependency upon one supplier for their software needs. And even the choice of open standards can become controversial. After a 2005 statement by the then-Secretary of Administration and Finance Eric Kriss rejecting private sector's control over public

<sup>10</sup>Open standards: Belgium's federal Council of Ministers approves ODF (Open Document Format) (Belgian Council of Ministers, 2006). In this press release the Belgian government makes explicit the linkage between open standards and document exchange capabilities.

records through proprietary data standards and intellectual property licenses, the commonwealth of Massachusetts began the process to mandate the use of the ODF or Open Document Format – an open standard for word processing and documents and other data types. At the time the policy was considered, the market dominant Microsoft Office package did not support this format and Microsoft was positioning its own format, Office Open XML as an alternative, but its primary open source competitor, OpenOffice.org, did. The state's position drew considerable criticism from Microsoft and Microsoft-funded lobby groups, while a number of Microsoft competitors threw their support behind the proposed standard in an attempt to break the MS monopoly on office document formats. Despite disagreement over whether one branch of the government could impose IT standards upon the other, a number of public hearings and a submission to the state Supreme Court, ODF remained a standard for Massachusetts but was joined on the listed standards by Office Open XML in 2007.

The policy relevance of FLOSS is clear. FLOSS is of interest to policy-makers for its many-faceted policy implications, including security, economic development, linguistic and cultural protection, and freedom of information. What is less clear is the process by which FLOSS appears on the policy agenda of states. There is a significant body of theory with respect to agenda setting (e.g. Kingdon, 2011) but how applicable is it to the case of FLOSS. How does a specialized form of software and its governance come to be seen as a solution to policy problems? And why would policy networks be the best way to study this particular area?

These questions are answerable only after situating them within the appropriate context of theory. Consequently, it is to a review of the policy network and policy change literature that the focus of this investigation turns.

## **3. Literature Review**

### **3.1. Policy Subsystems and Policy Networks**

Without first establishing the suitability of the policy networking approach for the analysis of FLOSS policy, its selection appears rather arbitrary. Why is the policy network approach suitable for the study of FLOSS? Even a cursory examination of FLOSS policy in most jurisdictions reveals the involvement of private and public actors, drawn from local and international organizations. Policy networks include private and public actors - essentially all those parties involved in the formulation and implementation of policy (Mayntz, 1994). Furthermore, FLOSS policy activities are undertaken by multiplicity of actors and their interactions are shaped by the institutions in which the policy is developed. Patterns of interactions between actors are web-like – not top down. Therefore, the policy network approach is a suitable one, given the characteristics of the actors and the interactions that have been observed, and provides a set of theories that could shed light on FLOSS policy from a number of perspectives - for example, governance, interest intermediation, and resource distribution. While state actors have been traditionally accorded the central role in policy networks, some innovative applications of theory are useful to explain why participating private actors behave in their fashion (for example, see Cashore & Vertinsky, 2000). Finally, the approach also has the advantage of an associated “buffet” of methodologies and techniques from which to select and then to test for the presence of networks and, if found, to describe and analyze them.

The policy network approach is a relatively recent development in terms of theories of interest group intermediation, or the relationships between the state and societal groups, pressure groups, and political governance, and what role these play in policy formulation and implementation. It arose out of the debates between pluralists and corporatists in the middle of the last century (Kickert, Klijn, & Koppenjan, 1997). Pluralism is the prevalent model used to explain the role of organized groups in policy-

making and execution in the United States. It is characterized by the presence of interest groups that have overlapping membership and lack a monopoly on representation (Howlett & Ramesh, 2003) but have similar capabilities to operate vis-à-vis each other and the government they attempt to influence. In a pluralist environment, policies are the product of cooperation and competition between these interest groups, with government playing a largely passive role as an arena for these activities. However, the reality of politics belies that assumption, as the state obviously originates policy. In pursuit of their own agendas, states influence (or, in some cases directly manage) interest groups, thereby structuring the institutional arrangements within which interest groups operate. Neopluralism attempted to address the deficiencies of earlier pluralist theory by accepting that the relative capabilities of interests groups vary, particularly within the societal contexts they operate. Pluralism is a concept that was developed largely by American political scientists studying Congress and the relationships interest groups have historically had with that institution.

By comparison, corporatism, or neo-corporatism as defined in the writings of Gerhard Lembruch and Phillippe Schmitter, arose out of the close relationship between the state, business, and labour in continental Europe and is generally associated with the Scandinavian or Germanic nations. Schmitter provides a definition that summarizes the salient points of the concept.

A system of interest intermediation in which the constituent units are organized into a limited number of singular, compulsory, non-competitive, hierarchically ordered and functionally differentiated categories, recognized or licensed (if not created) by the state and granted a deliberate representational monopoly within their respective categories. (Schmitter, 1977).

In comparison to pluralism, interest groups in a corporatist arrangement are not autonomous, and derive their legitimacy solely from their formalized relationships with the state. The primary goal of actors in corporatist systems is to maintain social stability by bargaining for the equitable distribution of economic benefits.

The pluralism – corporatism dichotomy presents political theorists with obvious limitations – and both theories have been criticized for their failure at consistency and their lack of empirical verification (Marsh & Rhodes, 1992). The weaknesses of both are

evident in their inability to describe the political and economic reality of the late 20<sup>th</sup> and early 21<sup>st</sup> centuries. Traditionally corporatist states in western and northern Europe are challenged by the proliferation of interest groups domestically and internationally, by the breakdown of organized labour under the assault of globalization, and the general decline of the legitimacy of peak associations to speak on behalf of their membership. The theoretical inconsistencies have motivated the development of new models and new theories. From the perspective of interest group intermediation, some analysts have argued that corporatist and the more recent-developed network models of government are critiques of the pluralist approach (Rhodes, 1997).

The policy network approach not only informs typologies of interest intermediation but within the continental European context, also underpins a number of models of governance (Marin & Mayntz, 1995). Distinctive approaches to policy networks have evolved over the last three decades in the United States, Britain and continental Europe, and it is to a survey of these theories, their distinguishing features, and how they have been applied by Canadian academics that this investigation now turns.

Analyses of state and interest group relationships in the United States have largely concentrated on sub-governments -- or arrangements characterized by a combination of participants drawn from Congress, private interests and bureaucracies. Prior to Woodrow Wilson's 1887 distinction between the political and the bureaucratic or administrative aspects of government, the dominant institutional approach focused on the roles played by the major actors in politics such as the President, Congress, and the judiciary within the framework established by the constitution. Wilson's description of the political-administrative dichotomy was also an attempt to explain the increasing role of the bureaucracy in the United States federal government as institutionalism on its own could not account for the development of the bureaucratic state. American institutional theory neglected to explain the role of interest groups despite evidence that the early framers of the Constitution identified and cautioned against the influence that outside parties might have on the political process (Hallacher, 2005). The complex reality of policy-making and the involvement of individuals and organizations from within and outside government in the policy process challenges simplified notions of institutionalism.

Consequently, the policy cycle model addresses some of the weaknesses of institutionalism in that it focuses upon a set of stages and permits a greater role for all actors involved in the policy process beyond those identified as being member of formal structures (Howlett & Ramesh, 2003). It also provides a systematic approach to analyzing complex processes and assists in the determination of relationships between stages of the policy process. This model was largely the original work of Harold Lasswell in the 1950s and refined later by Gary Brewer and others. All variants of this model share the concept of separation of the policy process into a set of decomposable discrete stages that can be coarsely grouped into problem identification, solution identification, and solution selection. Lasswell's model is divided into seven stage – intelligence, promotion, prescription, innovation, application, termination and appraisal [Lasswell, 1956], taking public policies through a complete life cycle starting with research, formulation, implementation, and finally termination. Lasswell also made premise for evaluation of the effectiveness of public policy against its original objectives. Successive theorists built upon Lasswell's work, including Brewer (1974) citing the use of cost-benefit analysis and risk assessments within a broader technical and normative evaluation stage. Brewer, in particular, improved upon Lasswell's model by including actors from outside government in the policy process (Brewer, 1974; Howlett, 1995). Further refinements of Lasswell's and Brewer's work have appeared in a variety of forms (Charles Jones, 1984; James Anderson, 1984 Howlett & Ramesh, 2003) and have formalized the policy cycle model as the primary means by which policy process is described. However, the complex reality of policy-making also calls into question the validity of the rational-comprehensive assumptions that underpin decision making in the policy cycle model. Policy is rarely initiated, implemented, or evaluated in a systematic, textbook fashion or within an orderly or predictable environment. A number of analysts have pointed out the messy reality characterized by conflict over ideas between policy actors (Stone, 2002 in Hallacher) and the blurring of the line between policy development and implementation (Palumbo 1994 in Hallacher). Furthermore like the institutionalism and pluralism that preceded it, the policy cycle approach suffers from the flaw that it is essentially incapable of providing causal explanations of policy. It still is limited to descriptive, not predictive capabilities.

The American sub-government literature developed out of other efforts to account for the role of groups or clusters of actors in policy formulation, particularly those composed of participants drawn from the bureaucracy or interest groups and the inability of pluralism, institutionalism, and the policy cycle approach to explain policy formulation (Kickert, Kiln & Koppenjan, 1997). Sub-governments were originally considered to be the congressional committees, interest groups, and executive agencies exclusively active in a policy area. Their routine interactions established patterns of collaboration and closed off the policy domain to outsiders. This set of major participants also underpinned the notion of the “iron triangle” (Peters, 1986). However, like the other theories that preceded it, the sub-government model could not explain the evident exceptions to the tight and relatively stable arrangements that characterized iron triangles. In using the term “policy community”, theorists attempted to explain the existence of broader, less formal groupings that appeared to congregate under shared ideas or common understanding (Hecl & Wildavsky, 1974). Consequently the American sub-government literature expanded to include membership drawn from interest groups under the term issue networks (Hecl, 1978). Issue networks are looser policy arrangements, with flatter structures and broader membership than sub-governments. Decisions are the product of interactions between actors including those previously named in the sub-government literature, but now expanded to include media, lobby groups, academics and private sector organizations. Hallacher describes a number of structural changes in the American political system that have facilitated the growth of issue networks, namely, the increase in number and influence of interest groups, structural weakening of the congressional committee systems and increased oversight of the bureaucracy by the public, judiciary and the White House (Hallacher, 2005). The American concept of subgovernments and its complimentary notion of issue networks largely reflect the idiosyncrasies of the political system. These concepts have limited applicability elsewhere, for example in the UK, where the policy role of the legislature is comparably limited (Rhodes, 1997). Sub-governments and issue networks have been the inspiration for a more systematic policy network approach taken by British theorists but whereas the former focuses more upon describing the relationships between actors in the policy process, the latter generally proceeds from the position that the structure of networks plays a greater and more influential role in the nature of policy than do its agents.

The foundations of British policy network theory are found in two seminal works: Heclo and Wildavsky's *The Private Government of Public Money* (1974) and Richardson and Jordan's *Governing Under Pressure* (1979). These studies applied American concepts of sub-governments to develop an understanding of the role of pressure groups and personal networks in British government, respectively. Heclo and Wildavsky investigated the role played by the personal contacts between bureaucrats in policy creation, focusing on the operations of the Treasury because “the task of allocating money is the most pervasive and informative operation of government. It tells us how politicians and civil servants co-operate, bargain, and fight – both among themselves and between each other.” (xii). In line with the qualitative nature of this case study, Heclo and Wildavsky's work was interview-intensive, integrating information from approximately 200 contacts (xxi), and permitting the mapping of a community within which information could be exchanged, advice sought, and arguments played out as evident in the following quotation:

We have therefore interpreted our subject matter, not in the usual terms of relative power and divisions of responsibility, but in terms of community and policy. Community refers to the personal relationships between major political and administrative actors – sometimes in conflict, often in agreement, but always in touch and operating within a shared framework. Community is the cohesive and orientating bond underlying any particular issue. (xv)

In contrast to the American concept of issue networks, Heclo and Wildavsky emphasized the comparatively smaller community of civil servants involved in policy in their domain and the sharing of cohesive perspective and identity (Heclo & Wildavsky, 1974). Richardson and Jordan also departed from what were, at the time, the prevailing institutional analyses situated within the Westminster model, and examined the role played by networks of policy practitioners acting below the surface of formal institutions, in focusing upon specific interpersonal linkages. Common to both studies was the continuation of the importance of commonality of interest in linking together participants in the sub-government (Dowding, 1995). These two studies provided the foundation for later theoretical works on policy networks in British politics, largely represented by the writings of Marsh and Rhodes and Wilks and Wright in the 1980s and 1990s. Marsh and Rhodes' theory and model is used in this study. We have adopted their concepts of

policy communities and issue networks and their typology of policy networks with its set of structural variables to provide the ability to compare cases through the isolation of the relevant independent variables, to classify these variables, to assist in determining structural versus behavioral aspects of networks, and to assist in determining causal relationships. Their model also helps us in establishing the boundaries of policy subsystems by providing definitional clarity with respect to network characteristics.

Rhodes focused upon the nature of interorganizational relationships making his approach structural rather than an analysis of interpersonal relationships between individuals that characterized Richardson and Jordan's work. In doing so, Rhodes developed a number of typologies over the last three decades starting with one that arose out of his analysis of British central-local governmental relationships. The first one described resource exchange relationships and theories of power dependence (Rhodes, 1981). This typology assumed a corporatist context and framed central-local interactions as a game where the dominant party (or coalition) determined how exchanges of resources would occur within a set of rules and where relative capacity would establish ability of actors to influence the game and meet their goals (Rhodes, 1998; 1999). However, the sectoralization of policy in Britain, as elsewhere, and the continued disaggregation of government called into question the assumption of the validity of a corporatist foundation for any model. Criticized for his failure to explain the linkages between different levels of analysis (the micro, meso, and macro), Rhodes later refined his first typology (Rhodes, 1997). While retaining his earlier focus upon resource dependencies, Rhodes' revised version distinguished between five different types of network, essentially placing them upon a continuum bookended by policy communities and issue networks, with policy communities, professional, intergovernmental, and producer networks occupying the range between the two. In this typology Rhodes emphasizes a number of major sets of characteristics, or variable sets: network membership stability, membership exclusivity, and level of interdependence with respect to resources. These are described in Table 3.

**Table 3. Rhodes Revised Typology: Policy Communities and Policy Networks**

Network Classification	Network Characteristics
Policy community	Restricted membership, vertically interdependent.

<b>Network Classification</b>	<b>Network Characteristics</b>
Professional network	Restricted membership, built around interests of the professionals that compose it.
Intergovernmental network	Limited membership
Producer network	Membership fluctuates, built around interests of producer
Issue Network	Unstable and broad membership

Source: Adapted from Rhodes, 1997, p. 38

Rhodes' later work with Marsh broadened the concept of policy networks to encompass relationships between interest groups and governments. The resulting set of classifications situated policy communities at one end of a continuum and issue networks at the other, ranging them in terms of the closeness of relationships.

**Table 4. Marsh and Rhodes Policy Network Typology**

<b>Network classification</b>	<b>Network characteristics</b>
Policy community	<p>Limited number of participants, high level of integration and interaction. Continuity with respect to membership. Shared values and norms.</p> <p>Routine contacts.</p> <p>Interests are professional/technical/economic.</p> <p>Resource exchange is foundation. Hierarchical resource distribution.</p> <p>Ideally a balance of power between members to ensure stability of network.</p>
Issue network	<p>Large number of participants possible.</p> <p>Low level of integration between interests as entire range of affected interests possible.</p>

Network classification	Network characteristics
	Resource distribution within network and in member organization uneven.  Unequal distribution of power.

Source: Adapted from Marsh & Rhodes, 1992.

Wilks and Wright departed from Rhodes (and Rhodes' later work with Marsh) with respect to their unit of analysis, and the definitions they establish for policy networks. Instead of the policy network concepts identified by Rhodes and Marsh, Wilks and Wright develop the ideas of a policy universe, policy community, and policy networks where the policy universe is the broad set of actors who share an interest in the policy area. The policy community is the set of disparate, heterogeneous (“disaggregated” in Wilks and Wright's terminology) participants in the public and private sectors constituting a “space” in which public-private relationships are effected and can be analyzed. Wilks and Wright situate their analyses of these disaggregated relationships within the context of industrial sub-sectors. Policy networks are instantiated by the exchanges between actors in a policy community or between policy communities.

Similar to Hecló and Wildavsky, Wilks and Wright also pay particular attention to the role of interpersonal relationships in their analyses but use a more formal methodology to describe how personal relationships cross organizational and corporate boundaries knitting together actors into frameworks of shared ideas (Wilks and Wright, 1987).

In a departure from a purely structural analysis of policy networks, other, later work rooted in the British tradition focused upon the interplay between a set of dialectical relationships, namely structure and agency, networks and their context, and network and policy outcomes (Marsh & Smith, 2000; O'Driscoll, 2008) . In this line of thinking, the dialectic is between structure and agency or the characteristics of the network and those that work within it – a bidirectional relationship where the network structure constrains

actors and actors too affect the network structure. A similar dialectic is at work between the subsystem context – typically the political economy -- and networks, as higher-level factors shape the meso-level networks that operate within them. Marsh and Smith's third dialectical relationship posits that policy outcomes are influenced by networks, but may in turn affect the structure and operation of networks by adjusting the capabilities and preferences of agents working within them.

The influence that British policy network theory has had upon research programmes in has drawn criticism from Dowding and others. In particular, Dowding considers the network approach to have little explanatory power because of its use in studies that use it to describe the attributes of individual actors rather than structural characteristics that he argues might have a role in determining the type of policy under investigation (Dowding, 1995). Dowding disagrees with the British theorists' claim that the structure of policy networks constitutes an independent variable and that structure, as described by Rhodes, Marsh and others, will play a role in policy outcomes. Dowding rejects the idea of a causal relationship between the two. In the structure versus agency debate, Dowding comes out firmly in favour of the latter, arguing that the strategic interaction of rational actors is what determines outcomes – not the structure of networks.

European continental – largely represented by the work of German and Dutch scholars – approaches to policy networks distinguish themselves from the American and British theories by their focus on governance (Mayntz, Kenis, & Schneider, 1991). European scholars study the interest intermediation aspect of policy networks and the use of networks as an analytical tool. However, even within the European schools there are two major applications of policy networks: one is focused on the use of policy networks as an analytical concept, characterized by investigations of interaction between organizations and their employment and exchange of resources, including informational ones (Boerzel, 1997,1998). The second application goes beyond models of structural characteristics to an expanded explanatory role for policy networks namely “interorganizational relationships focuses on the structure and processes through which joint policy-making is organized, i.e. on governance” (Boerzel, 1997; 1998). This differs from the structural analysis perspective because it eschews low level unit analysis (usually individual actors) in favour of broader investigation of systems of relationships.

Another element distinguishing the two is the latter perspective that the governance role played by policy networks is largely the consequence of the functional differentiation of modern society and the recognition that policy is the result of bargaining and negotiation between actors who have interests or stakes in the policy area, some of whom might be non-governmental actors. While the state is still primarily responsible for governance, a major element of the European continental theories of policy networks is the observation that private actors control resources that give them the ability to participate in policy formulation and implementation. A purely market-based system of resource coordination is not seen as a viable alternative to the traditional hierarchical governance of the past because a lack of coordination may lead to the possibility of market failure. Instead the alternative -- coordination of activities across networks of public and private actors in a non-hierarchical manner – is for these theorists the hallmark of policy networks. The inclusion of private interests in the policy process, the interdependency and interactions between public and private actors characterize these new forms of governance and support the assertion that policy networks are a reflection of observable change in the structure of political systems (Mayntz, 1991). The governance focus of this policy network approach has been supported empirically by the development of the European Union. A number of analysts have gone beyond policy networks as metaphor to theorize about the causal relationships between policy and the governance processes via network of the EU, in particular emphasizing the role of networks in establishing the EU as a new political system. One theorist describes the EU in Rhodes' terms of the differentiated polity, describing policy variation across the EU by area and functional specialization (Pederson, 2003). Policy-making in the complex and constantly changing environment of the EU is increasingly undertaken as activities coordinated between public actors at multiple levels (local, state, regional, national and supranational) and private actors also acting on multiple levels. Furthermore, the EU and national actors require resources held by this multiplicity of actors and the preponderant manner of collaboration and resource coordination is facilitated by policy networks (Boerzel, 1997). In light of the continued penetration of the nation state by networks the debate continues with respect to the impact this transformation will have on the European nation state with respect to its role and capacity in policy-making and implementation.

The Canadian literature on policy networks draws upon all of the aforementioned approaches, but has developed terminology and concepts particular to the domestic political culture.<sup>11</sup> Like its British counterpart the Canadian approach to policy networks is disposed towards a structural analysis because of its similar lack of emphasis on agency and the general perception that the structure of the network is more important determinant of network actor behavior. Atkinson and Coleman's work is considered foundational for successive theorizing, calling into question the monolithic structural assumptions inherent in corporatist and pluralist concepts of the state (Atkinson and Coleman, 1989). Their policy network typology also showed greater variation in interest intermediation than suggested by any of these previous concepts. Later work by Coleman and Skogstad emphasized the need to focus upon structures at the macro and meso level, arguing that the structure of sectoral-level organizations would influence policy by constraining policy-makers choice and impacting the ideas underpinning the policy process (Coleman and Skogstad, 1990). These particular structures under investigation by them were state autonomy and capacity, the organizational capacity of sectoral interests, and relationships between state and societal actors (Coleman and Skogstad, 1990). Coleman and Skogstad also established set of definitions for policy networks and policy communities. Building upon Wilks and Wright's (1987) definition of the concept, Coleman and Skogstad's policy community includes:

All actors or potential actors with a direct or indirect interest in a policy area or function who share a common 'policy focus' and who, with varying degrees of influence shape policy outcomes over the long run. (p. 25)

Using Paul Pross' distinction, Coleman and Skogstad further divided a policy community into a sub-government and an attentive public. The sub-government is the set of active policy-making actors and would include government agencies, business, and interest groups, in contrast to the attentive public, which might include concerned citizens, sector

<sup>11</sup> Skogstad asserts that Canadian theories with respect to policy networks owe an intellectual debt to British and German scholars for popularizing the concepts to their current international range and status (Skogstad, 2005). Her assertion is supported by the direct references to the work of British political theorists of networks made by her and Coleman

experts, and the media, but do not have direct and routine involvement in the policy-making process (Atkinson and Coleman,1990). Atkinson and Coleman go on to define policy networks as the characteristics of the relationships of actors that organize themselves around issues important to the broader policy community again emphasizing the importance of differences between the structural factors. These factors, such as the relative centralization of state actors, reflect differences that translate into their constructed typology of policy networks. This typology groups networks into three major categories: pluralist, closed, and state-directed. The salient characteristics of each type are described in Table 5.

**Table 5. Atkinson and Coleman Policy Network Typology**

<b>Network Classification</b>	<b>Network Type</b>	<b>Network characteristics</b>
Pluralist	Pressure Pluralism	Dispersed state authority Weak associational system No coordination of group access to state  Groups have advocacy role while state agencies remain autonomous.
	Clientele Pluralism	Dispersed state authority Weak associational system  State unable to differentiate from interests and are dependent upon them for resources (information and expertise).  Interest involvement in policy process exchanged for resources.
	Parentela Pluralism	Interests have dominant position within governing party.  Direct influence through positioning in bureaucracy.

<b>Network Classification</b>	<b>Network Type</b>	<b>Network characteristics</b>
Closed	Corporatist	State authority and decision-making centralized Strong associational system  Two conflicting interest groupings are managed by the state. State delegates capacity to impose compromise within their respective associational systems.
	Concertation	State authority and decision-making centralized Strong associational system  Single peak association (single sector). Hierarchical system of management in combination with strong state coordination.
State-Directed	Highly autonomous. Strongly coordinated state agencies and sectoral interests. Weak associational system.  State interests dominate policy process. Organized interests do not.	

Sources: Coleman & Skogstad (1990), p. 27-28; Howlett & Ramesh (2003).

Coleman and Skogstad emphasize that there is not a one-to-one relationship between policy communities and policy networks. Indeed, multiple policy networks of different types are possible within each policy community (p. 29). However, despite its refinement by other Canadian theorists the Atkinson/Coleman/Skogstad typology has not seen widespread application outside of Canadian policy studies (Skogstad, 2005).

Canadian academics have undertaken a number of methodological and theoretical refinements of the American, British, and Continental European policy

network concepts described in the preceding sections. They have examined a number of related issues, including whether policy networks affect policy making outcomes and policy change and the role of ideas in policy change. One such investigation by Howlett models different policy subsystems configurations, the actors that comprise them and how they interact. The evidence gathered supports the idea that persistent sets of core actors, combined with "durable" actor interests and set within stable epistemic environment facilitates non-paradigmatic (more accurately, incremental) change and its complement, that paradigmatic policy change occurs when new ideas and interests penetrate the subsystem (Howlett, 2002). He concludes that the policy subsystem structure influences the rate and manner of change in the four sectors of Canadian public policy under investigation, specifying the level of exclusion of non-interest actors as an inhibitor of policy change and the extent of overlap between policy communities and policy networks as a facilitator of it. Howlett's analysis is notable because of its parsimonious taxonomy of policy change, juxtaposing paradigmatic and non-paradigmatic modes change against rates of change and its support of an operationalization of policy change and subsystem configuration. Other Canadian analysts have undertaken further investigation of the agency versus structure debate in policy networks, and included taking into account actor strategies in policy communities, bringing nuance to discussions of policy change that a structural approach alone cannot provide.<sup>12</sup>

Given that policy development occurs between public and private actors, the question of how these activities are managed by actors should be raised specifically. Building on top of the "classic" policy network theories, in particular, the governance focus of the continental European network management literature has burgeoned. The

<sup>12</sup> For an example of actor behavior affecting policy subsystems see Montpetit's comparison of the role of policy communities in the development of Ontario and Quebec's agro-environmental policy (Montpetit, 1999).

policy network literature proceeds from the assumption that networks constitute a new form of policy-making, distinct from the hierarchical and bureaucratic structures of the past. In the network management sub-field the governance of these structures has become a primary focus. In Koppenjan, Kickert and Klijn (1997) network management is synonymous with public management. However, governance is distinguished from public management in that the latter is defined by purposive efforts to “influence societal processes (of policy processes)”, whereas the former is a broader category of influence of social processes that goes beyond public actors and their deliberate steering efforts. The network approach to governance and policy making is considered an alternative to the rational control rule model that assumes a central actor (governance) driving policy formulation and implementation in a systematic, scientific manner. In this model, governance is achieved through improved coordination, increased autonomy and control over other actors in the system (Koppenjan, Kickert & Klijn, 1997). The Central Rule model breaks down somewhat when exposed to the complexity of policy making, particularly with respect to the limits of information available to government and increasing levels of bureaucratization of policy. The multi-actor perspective is a critique of the Central Rule model and that it favours greater local autonomy for actors. In this approach, effective governance is a function of subsidiarity. By comparison, for some analysts, the network perspective of governance ties successful management of networks to a somewhat ephemeral improvement of the levels of interaction between actors and the consequential amendment of the structural characteristics of network (Koppenjan, Kickert & Klijn, 1997).

More recent analysis raises a number of important questions with respect to the management of public networks and its various forms of structure and process, specifically how networks are managed and what role government has in this, what factors affect their cohesion and durability, the role of power in networks, and how accountable networks are to the public agencies in and around which they operate (Klijn & Koppenjan, 2000; Agranoff & McGuire, 2001; Agranoff & McGuire, 2007). The importance of networks and the role of government in managing them is seen as the result of number of the factors described in previous sections, including reflecting a change of policy instruments used by governments in the 1990s and early 2000s (Agranoff & McGuire, 2001).

Theorists of public network management go deeper than the policy network with respect to the relationships between structure and agency, network characteristics and classification, and effectiveness to discuss the management of interactions of actors around policy problems and over resources and their allocation. Policy networks provide the context for the discussion of the management of these activities.

In Canadian theories, policy networks are situated at the meso-level. However, macro-level contexts are clearly relevant given the influence political culture, the international system, and economy, have upon network structures and relationships at lower levels. In the previous paragraphs we have drawn distinctions between policy network concepts based upon their national origins and extracted relevant theoretical threads highlighting the utility of concepts. As part of this survey of perspectives we have undertaken a relatively high-level review of the archetypal Canadian policy network typology and theory and established its applicability to this case of FLOSS policy in three governments, Belgium, Canada, and Germany. The relationship between the macro and micro level, in Coleman and Skogstad's view, constitutes a variable (Coleman & Skogstad, 1990). The choice of three federal states is an attempt to keep some of these variables constant between the cases. It is conceivable that subsectoral policy is affected by macro-level characteristics. Consequently, the existence and impact of variables that differ between the cases must be described and an attempt to account for their affect upon the network will be examined. Related to this is the perspective taken by the project. In this study, FLOSS provides a lens through which networks and policy change can be studied. The hypotheses described in chapter one are predominantly focused upon exploring the relationships between network structure and attributes, actors, and policy development within the context of FLOSS policy. However, we anticipate reciprocity of analysis and expect to see some light shed upon FLOSS policy from the perspective of networks as well.

### **3.2. Policy Change and Policy Networks**

The discussion of policy network literature has been, so far, generally focused upon categorizing theories by their national origins. Theories investigating the linkage between policy networks and policy change have been left unexplored. However, without

delving deeper into how policy subsystems affect substantive changes in policy, there will be insufficient background to operationalize concepts necessary to measure policy change in the cases studies. There is a large corpus of theory around policy change, dating back several decades, attempting to come to grips with the difficulty of isolating causal factors in the developments of complex policy systems and the inability of state-centric theories to account for the increasing involvement of non-state actors in driving change. Heclo (1974b) was one of the early theorists of policy change arising out of his research of social networks in the UK and Sweden. His central thesis was that change cannot be entirely accounted for by exogenous or macro influences on the policy environment and that the interactions between policy actors for power and influence were as important. In Heclo's view actors operated within policy communities and undertook these strategic exchanges with an eye to gaining the informational resources or knowledge in order to respond to changes in the environment and the nature of the policy problem.

Building upon Heclo's work, Sabatier and his collaborators developed the Advocacy Coalition Framework (ACF) The salient characteristics of Sabatier's ACF included the concept that analysis should encompass timeframes of a decade or longer in order to capture policy change, particularly resulting from implementation cycles; policy subsystems or domain are the primary unit of analysis, expanding the scope of participation beyond actors described in Heclo's "iron triangle" to other levels of government and private organizational and individuals; that policy subsystems participants are drawn from all levels of government; and finally that policies reflect the interests and beliefs and knowledge brought to the system by actors (Sabatier 1988, Jenkins-Smith & Sabatier, 1994). The inclusion of belief structures distinguished the ACF from previous theories. Sabatier argued that advocacy coalition were subsets of the overall policy subsystem and composed of individuals with shared causal and normative beliefs. These beliefs are organized into a hierarchical structure where the "deep core" of "basic ontological and normative beliefs such as the perceived nature of humans or the relative valuation of individual freedom or social equality which operate across virtually all policy domains." (Sabatier & Jenkins-Smith, 1994) At lower levels the policy core and secondary or peripheral aspects contain the "basic normative commitments and causal perceptions" and the comparably broader set of beliefs knowledge about the nature of

the policy problem, instrument and institutional suitability, etc. Sabatier (and his later work in collaboration with Hank Jenkins-Smith) emphasized the role of knowledge and learning in policy change, but did not assign the role of primary driver to them. The “deep core” beliefs by advocacy networks are characterized by persistence. Only major exogenous changes that alter the dynamic and change the distribution of power and influence among advocacy coalitions in the policy subsystems are seen as significant enough to challenge the fundamental norms held by actors and initiate the a search for new knowledge, instruments, institutions, etc. that result in policy change.

The role of policy-oriented learning as a factor in policy change certainly gained greater visibility through Sabatier’s work. In succession a number of other theorists addressed that that aspect of Sabatier and Jenkin-Smith’s investigations, for example by including their concept of learning in a survey of the policy learning literature to date, distinguishing between a number of prevailing notions such as government learning, lesson drawing (Rose, 1991), and social learning (Hall, 1993) (Bennett & Howlett, 1992). These distinctions have, in turn, been worked into a variety of analyses of the role of policy learning in driving policy change in a broad range of studies (Lee & van de Meene, 2012; Weible, 2008; Weible 2005, Benz & Fuerst, 2012). In their article, Bennett and Howlett further refined the learning concept by isolating the processes that were subsumed in the concept of policy learning used in the policy literature, namely learning about organizations, programs, and policies. They argue that the disaggregation of the concept was at the root of the lack of operationalization of policy learning in over the previous decades. However, a key piece of work linking learning to policy change did not appear until 1993 in the form of Peter Hall’s survey of economic policy-making in Great Britain. Hall also built on Hecló’s insight into the importance of learning to policy, specifically expressed in the concept of “policymaking as social learning” (Hall, 1993). In developing his model of policy change, Hall brings to bear the Kuhnian notion of the paradigm within which policy-makers operate, or the

...framework of ideas and standard that specifies not only the goals of policy and the kinds of instruments that can be used to attain them, but also the very nature of the problems they are meant to be addressing. (p. 279)

Hall's policy change model integrates the insight that policy changes must be disaggregated in order to understand the role of social learning and the paradigmatic contexts in which this change occurs. Hall's model is summarized in Table 6. He groups policy change into first, second, and third-order changes. First and second-order changes are essentially normal policy-making with only policy instruments undergoing changes. Hall reasons that a number of factors will drive paradigmatic change: a set of sociological processes that include political decisions versus objective analysis of options; the distribution of resource capabilities of actors within institutions and exogenous influences that impart greater "pull" to actors or their arguments. It should also be noted that Hall's model does not neglect the role of power and influence. He notes that a new paradigm is formalized when its proponents gain the necessary authority over the policy process and possess the capabilities to institutionalize it.

**Table 6. Hall's Policy Change Model**

Policy Change Subtype	Characteristics
First-order	"Normal" policy process – incremental, routine, satisficing.
Second-order	New policy instruments developed. Response to experience Program change Objectives do not change
Third-order	Recasting of policy discourse. Discontinuous policy/disruption Paradigm shift

From his empirical findings Hall induces that social learning is a factor in first to second-order policy change as policy-makers in the British context learned from their experiences and pursued innovative policy. However, the third-order change (specifically the abandonment of Keynesian economic policies in favour of those based upon monetarism) was characterized by challenges to the dominant discourse, debate and the influence of external actors such as politicians and the media.

Hall's work focuses on the role of social learning in policy change. In parallel other analysts have focused their inquiries upon expanding the understanding of the relationship between subsystem structure and policy changes. Howlett's (2002) assessment of four different Canadian federal policy sectors reveals that low turnover in subsystem actors, their accumulation of experience and knowledge in resolving policy problems, combined with continuity in actor interests, generally yields incremental changes in policy. In Howlett's findings, paradigmatic change appears to be a product of the entry of new ideas and interests into subsystems. Howlett compares change in subsystem characteristics (insulation or persistence of network actor membership and symmetry or the relative growth or contraction of actor membership over the period under investigation) to changes in the subsystem type and predicts changes in policy (instruments, goals, program specifications). Although not a primary focus of Howlett's analysis, "learning" (arguably unqualified and not discussed to the extent in Bennett and Howlett's 1992 work) also features prominently as an independent variable, facilitating changes in the subsystem composition.

Hall's threefold order of policy change model is used in this investigation to order the case studies and assess the changes in policies observed over intervals of time in each case. First-order changes correspond to changes in instrument settings. Second-order changes are associated with changes in instrument form – also defined as program change. And finally, third-order changes are changes in policy goals. Howlett notes that Hall's model distinguishes between policy-making means and ends and the concrete versus abstract aspects of policy outputs (Howlett, 2002).

Given the prominence in the literature of learning in affecting policy change, there is obvious benefit in attempting to associate concepts of policy learning with changes in policy. Policy learning is not a singular concept. Bennett and Howlett in their 1992 article survey the policy learning literature, differentiating between three types of learning: social learning, governmental learning, and lesson drawing. Based upon Bennett and Howlett's decomposition of Etheredge's, Rose's, and Hall's concepts of policy learning into a subject-object ("who learns what to what effect") relationship, one can return to Hall's original policy change model and further qualify the nature of the intervening variables that are likely to play a role in policy change at the "lower" levels of his model.

**Table 7. Policy Change and Learning**

Policy Change Subtype	What Changes Specifically?	Related Learning
First-order	Instrument “settings” – incremental changes or refinement of an instrument	Governmental/Lesson Drawing
Second-order	Instruments change (the form they take or category from which they are drawn)	Government/Lesson Drawing
Third-order	Change in goals of policy.	Social Learning

We would assert that certain concepts of learning will be associated more frequently with the specific types of policy change depicted in Hall’s model. Specifically, that governmental learning and lesson drawing are more likely to be associated with first-order and second-order change. More precisely, government learning takes the form of state actors (individuals or organizations) increasing their knowledge to the benefit of their policy-making abilities (Etheredge, 1981). In Bennett and Howlett’s summary of Etheredge’s concept, government learning is primarily about bureaucrats learning about how to deal with administrative/institutional challenges in policy development and implementation. This type of learning, when successful, is seen to lead to organizational change. By comparison, Rose’s concept of policy learning deals with program change, and Hall’s with paradigmatic change. The fundamental social context changes that drive paradigmatic change have no relation to either lesson drawing or governmental learning. Hall’s concept of social learning can be directly mapped to third-order policy change as described in his 1993 article. Conceivably, policy networks are capable of playing a role facilitating all three types of learning, for example as Haasian epistemic communities, as a medium of transmission of learning from actors/institutions external to the policy network, and as a community of practice for lesson drawing. While their structural characteristics suggest they are more likely to assist the transfer of knowledge in a lesson drawing manner, policy networks can also assist their members in undertaking governmental learning. Bureaucrats are actors in many policy networks and may use them as learning instruments to draw upon the experiences of bureaucrats in other jurisdictions with policy-making in the same policy areas. The application of these lessons learned can lead to program changes (lesson drawing) or new organizational

arrangements to more effectively deal with problems, for example the creation of new administrative structures or processes.

A major methodological challenge faced in conceptualizing learning as an intervening variable between an agent (policy network in this case) and policy change is establishing the empirical substantiation of a causal relationship. In the absence of direct evidence linking learning on the part of an agent to policy change, it is difficult to determine if the presence of change was caused or affected in any way by learning. To address this gap, in this project we rely upon the explicit statements on the part of survey respondents or evidence provided by policy documents confirming that learning activities were undertaken.

The role of learning in policy-making has been emphasized in the review of the policy change literature because it will be integrated into the policy analysis found in later chapters. At core, we would claim that learning by actors leads to the latter making adjustments to network structures, policy instruments, and policy objectives. More precisely, policy-related learning is undertaken by actors in the policy networks in our three case studies. And it is conceivable that this learning plays a major role in changing actor attributes and network structures, leading to changes in policy. We envision several possible scenarios as new information becomes available to policy-makers/actors in networks via various learning processes. First, information transfer via learning can assist in the formation of policy networks by establishing common sets of ideas, values, or norms between network participants or by assisting the definition of and consensus around policy objectives. Secondly, we envision the new ideas brought into the network by learning, in the form of information about policy instruments, for example through the lessons learned in other jurisdictions. And thirdly, we see policy-related learning being a channel for bringing major ideological or normative changes from the macrosocial level into the policy network. All of these scenarios have implications for actor behavior and the structural characteristics of the network.

### 3.3. Theories and Their Applicability

This survey of policy network, policy learning, and policy change theories presages their application in later chapters. In advance of their operationalization, there are a number of points that should be made about their use. The Marsh and Rhodes model is a synthesis of earlier work and peaked in the mid-1990s with respect to its acceptance by other theorists. While innovative, it suffered from a number of deficiencies common to policy network theories: Dowding (1995) and Blom-Hansen (1997) both pointed out the lack of consideration of actors' roles in accounting for policy differences between sectors. Marin and Mayntz (1991) have noted the limitations of the Marsh and Rhodes typology specifically. In later work, Marsh and Smith (2001) also recognized the limitations of the earlier Marsh and Rhodes approach and others based primarily on structural analysis and brought agency into their model in an attempt to remedy its structural determinism. Their effort at remediation was met with some criticism for its lack of definitional clarity (e.g. Raab, 2001). That said, structural analysis has not been superseded by other approaches: for example, it plays a role in assessing network structure and performance (Sandström & Carlsson, 2008). While accepting the validity of these arguments, we still believe Marsh and Rhodes' model retains relevance today and utility in providing a useable typology of policy network variables and a model for the categorization of network types. Their model is a starting point for this investigation but requires some fundamental revisions in order for it to be capable of addressing the criticisms of its detractors and the issues associated with policy network theory in general.

Consequently, we address the deficiencies identified by Dowding, Blom-Hansen, and others by integrating Marsh and Rhodes' model with theories of policy learning and policy change. A core issue of this analysis is how to challenge the structural focus taken by British policy network theories of this period (as we have noted above). Although we believe Marsh and Rhodes approach still possesses explanatory value, we depart from their predominantly structural view in favour of a more nuanced perspective that brings the behavioral aspects of network actors into the analysis. However, Marsh and Rhodes' typology contains a large number of variables. And given the small number of cases in this investigation, the use of this model may present difficulties without it first being

reduced to a subset of its original form. In the next chapter we intend to simplify the model somewhat, by reducing its variation, in order for it to be applicable to this set of case studies.

In recognizing this investigation's primary focus upon policy subsystems, the expansion of subsystem participation to include non-governmental actors, the prominent roles accorded to policy-oriented learning and policy change, and the importance of coordination and cooperation among and between actors and groups of actors, Sabatier and Jenkin-Smith's Advocacy Coalition Framework (ACF) would seem to be a natural fit to this study. Instead we have elected to use Marsh and Rhodes model – albeit somewhat modified. Why was the latter selected over the ACF? The first reason is found in this project's rumination upon the structure of networks versus behavior of actors as an explanatory factor in network and policy change. We believe that we are able to shed light upon actor behavior and policy-oriented learning as the factors that drive policy change by using the Marsh and Rhodes' model through which variables can be identified, then isolated and used to examine contrasts and differences in ways not possible with the ACF. By virtue of its structural perspective, the Marsh and Rhodes model provides a foil against which instances of actor behavior are more obvious. Secondly, a major assumption of Sabatier and Jenkin-Smith's ACF is that subsystems are composed of sets of actors aggregated into coalitions (Sabatier, 1988 ) and in particularly contested policy areas at least two or more coalitions would form (Weible and Sabatier, 2005). It became evident early in the data gathering around the cases in this study, that these were instances policy subsystems that were often composed of individual actors or fragmented sufficiently to make identifying coalitions difficult. Consequently we settled upon a theoretical framework that would be more appropriate to a structured research program than the ACF. Finally research efforts informed by ACF by and large focus on single policy events (Weible, Sabatier, Jenkins-Smith, Nohrstedt, Henry, and deLeon, 2011; Weible and Sabatier, 2005; Ingold, 2011) in a single subsystem and generally do not integrate multiple policy events or cross national comparison of networks into their studies - although there are some exceptions (e.g. Montpetit, 2011). In sum, we selected a theoretical approach and matched it to a set of research methodologies and data analysis techniques that we believe was better suited to comparing a set of variables across three cases in different states. However, the

reasons given for the choice of Marsh and Rhodes over the ACF do raise the question whether the suitability of their model is a reflection of the policy subsystems that were investigated. More precisely, as policy subsystems mature and become institutionalized or routinized would their structures and actors become amenable to analysis using the ACF? Would not fragmentation of membership observed in this investigation suggest immature or underdeveloped policy networks that might over time settle into more clearly delineated coalitions of interests? These questions will be briefly revisited in the conclusion of this project.

The first three hypotheses initially mentioned in chapter one can be revisited in light of the theories presented in this chapter. The fourth is specific to a case study that has not yet been undertaken. The first hypothesis links the characteristics of the network to policy change, stating that policy change is less likely to occur when interconnections between actors in a policy network *exceeds* a certain threshold. The Marsh and Rhodes' model is enough to provide the variables to assess the structural aspects of this hypothesis, but unable to explain the possible role for actors in determining the number and type of the connection between themselves. The test for behavioral factors in proving or disproving this hypothesis is possible upon deeper examination of the activities and characteristics of actors at lower levels than the model is able to address.

The second hypothesis states a policy network has not appeared in one of the cases because prospective network participants are members of competing outside-government networks. This is almost entirely addressable using the Marsh and Rhodes model once the initial methodological challenges of network boundary identification and actor affiliation are resolved.

Hypothesis three can be rephrased more generically as proposing that a specifically supportive epistemological context is a necessary pre-condition for the emergence of policy networks. This hypothesis introduces a variable that is not found in the original Marsh and Rhodes mode, and requires some qualification. Given the relationship between knowledge and learning, this hypothesis requires the establishment of linkages between policy network and learning. Related theories of policy learning (Hall, 1993; Bennett & Howlett, 1992) are necessary to provide this connection.

It is to a more focused discussion of the parameters of this investigation and to the operationalization of network and policy learning and policy change concepts to which the next section of this document turns. The following chapters begin with a description of the methods used analyze the Canadian, German, and Belgian policy networks and assess network and policy changes through the FLOSS case studies.

## **4. Theory and Operationalization of Concepts: Deriving a Testable Model of Network Behaviors**

The previous chapter briefly surveyed the major strands of thought in policy network theories in Europe, the United States, and Canada, in addition to salient and related concepts of policy learning and change literature, and highlighted the aspects of each that are relevant to this investigation. Having identified those that are important, the task now turns to the clarification of definitions, the operationalization of policy network, policy-oriented learning and policy change concepts and to the subsequent provision of a model that can be used to describe the observed policies and a set of tools against which the FLOSS policy hypotheses can be tested.

The cases investigated in this dissertation were selected on the basis of positive evidence of activity in the area of FLOSS policy. However, this selection does not guarantee the presence of policy or the continuation of policy in this sector over the life of the analysis. A clear definition of what constitutes the presence of policy is required. More specifically, is policy present in the cases under investigation and if not why? Does the existence or non-existence of a policy network explain the presence or non-presence of policy? Are there any other determining factors? All of these questions are dependent upon a number of conditions, including first, the clear establishment of a litmus test for the presence of public policy. Building upon Jenkin's definition of policy, any evidence of activities of policy-makers in the policy deliberation and policy formulation process, and the production or amendment of policy instruments would be evidence of policy. In cases where these conditions exist, there may be an absence of certain policy outputs or policy is produced that may take the form of a deliberate non-decision. This is still valid evidence of policy activities. Furthermore, activities that produce a policy artefact suggesting the process is in a proto-formulation stage, for example, a proposal document, is still evidence of policy for the purposes of this investigation.

FLOSS policy in this area can be conceived of in terms of generic forms such as sets of inputs, processes, and outputs in order to solve problems facing states. Chapter one cited some examples of FLOSS policies found globally. These policies take a number of forms, including ones that propose or mandate technical standards or the preferential procurement of FLOSS technologies and services; funding of FLOSS research and development or FLOSS projects directly; and government standardization upon FLOSS technologies, either directly or by prescribing IT architectures that rely upon FLOSS. When considering these FLOSS policies their development generally can be conceived of in terms of a policy cycle, with examples being drawn from some of the stages described by Howlett and Ramesh (2003), namely policy agenda-setting, formulation and development of policy instruments, and policy implementation. Policies in this area, unsurprisingly, involve a broad section of public and private actors and interest groups. Finally, FLOSS policies are classifiable by policy types, as mandatory, advisory, preference or direct.

**Table 8. FLOSS Policy Typology**

<b>Policy Examples</b>	Standardization of procurement Preferential procurement Funding of R&D Direct Funding of Development Standardization of technology
<b>Policy Cycle Stages</b>	Agenda-setting Formulation Implementation
<b>Parties Involved</b>	Legislature Executive Bureaucracy Interest group Business Standards body

	Academics
<b>Policy Type</b>	Mandatory Advisory Government Preference Undertake directly or support R&D

More relevant to this investigation and its cases are the policies that involve deliberations about FLOSS but do not directly lead to the formulation of policy directly dealing with it. There are scenarios where FLOSS may be considered by policy-makers as one of several potential solutions to a problem but be set aside in favour of a different instrument. For example, the role played by open standards in government and policies related to their use, discussed earlier in this investigation, requires exploration. While the use of open standards need not be synonymous with the presence of FLOSS, a decision to reject the adoption of FLOSS, for example, in favour of open information technology standards is valid policy. A policy direction initially favourable to FLOSS which then later is amended to support open standards is another valid policy choice. However, we require some connection to FLOSS as a prerequisite for policy to be FLOSS-relevant. At a minimum, FLOSS must be some part of the policy cycle: for example, part of deliberations or analysis in the agenda-setting phase or an instrument used in policy implementation. This set of conditions disqualifies open standards policy on its own from consideration. Policy supportive of open standards might assist the eventual adoption of FLOSS in public organization but is not, by itself, a sufficient condition for the creation of FLOSS policy.

#### **4.1. Policy Networks, Variables, and Characteristics**

We move from a general review of policy and what form it is expected to take in the FLOSS arena to describing and then operationalizing the specific variables that are drawn from the Marsh Rhodes model, how these relate to the hypothesis and what amendments are required for them to have validity and explanatory capability across the cases. In this section we develop a version of their typology that maintains the major

features of their model with the addition of a category specifically used to test for the epistemological context that one would expect to see within a policy network focused upon FLOSS. The network variables are grouped into the primary categories of membership, integration, resources, power and the aforementioned, epistemological context.

Our first hypothesis is: *Policy change is less likely to occur when interconnections between actors in a policy network exceed a certain threshold.*

In order to test this hypothesis the operationalization of a number of concepts introduced in previous chapters is required. These include the related concepts of policy learning and policy change and the Marsh and Rhodes' typology network variables. The Marsh and Rhodes model has a set of primary variables, namely membership, integration, resources, power, and epistemological context. Within each set of primary variables are subsets of variables. In line with the small number of cases we have reduced the quantity of these secondary variables from how they are presented by Marsh and Rhodes in their original form. Additionally, we have simplified some of the qualitative distinctions between policy communities and issue networks as represented by the values assigned to variables.

#### **4.1.1. Membership**

An attempt has been made to set parameters around membership in policy communities and issue networks, attempting to book-end the size of these policy networks. Given the area of focus, the survey sample size, and the scope of supporting materials from which network composition will be derived, the resulting networks are small in terms of absolute numbers of group and individuals. We derived an estimate of policy community and issue network size using initial survey responses and by assessing the number of actors described in policy artefacts and related documentation. This combination of a nominalist approach with a more formal, quantitative, or realist à la Laumann and Knoke's (1987) approach to estimating the size of a subsystem was a pragmatic way to qualify variables early in the research process (Howlett and Maragna, 2006). The selection of research methodology discussed later in this section reflects the subsystem size. Therefore we will rely upon a measure of the relative difference

between the two policy subsystem archetypes. We consider a policy community to have a low number of participants and have established a standard of ten or below for it to be that type of network. Given that issue networks are larger with more participants we have selected the number 20 or above to indicate an issue network. Policy networks that fall into this interval will be marked as “indeterminate”.

In Marsh and Rhodes' model, policy communities can consciously exclude some groups. For the purposes of this investigation, we would argue that membership can be limited across both policy communities and issue networks, either deliberately through the invocation of professional or producer community membership, exclusion of others by formal certification, or as a side effect of FLOSS in the public sphere, given the technical nature of the subject matter and the perceived narrow band of interest in the policy problems. Consequently this membership restriction has been removed in the proposed typology to ensure comparable variables between networks. We do not expect to find homogenous networks in all cases, however. Although there may be a preponderance of actors with similar resource capabilities and interests mirroring membership in epistemic communities (Haas, 1992) or professional networks (Burley & Mattli, 1993) identifiable variations across network actors should exist.

In the FLOSS policy sector, membership composition is expected to be a primary differentiator between policy communities and issue networks. Given that policy communities are more integrated groups, generally composed of professional or business interests, whereas issue networks will be looser arrangements of broader interests often drawn from different organizations, we expect that membership stability will reflect the composition and cohesion of these interests. More specifically, policy communities are expected to have more stable membership – defined as a low entry and exit of participants from the network – whereas issue networks will have more “turnover” or change in membership.

#### **4.1.2. *Integration***

Integration is a set of characteristics that describe the interactions between network participants and the values and norms context within which those interactions operate. These interactions can be formal, such as working groups, parliamentary or

departmental committee meetings, and standards body discussions, or less formal interactions, that take the form of e-mail or telephone communications, meetings at user groups, trade shows, demonstrations, etc. Frequency of interaction is used to differentiate between policy communities and issue networks, where the former should be characterized by frequent and focused interactions and the latter, less frequent interactions.

The continuity of integration is largely based upon outcomes of activities undertaken by the policy networks. Policy communities should -- because of their exclusive and integrated membership -- have more stable outcomes in their process and outputs. We again depart from Marsh and Rhodes' typology with regards to their preferred location for stability of membership and move it out of the integration category to under the membership category.

Consensus is one of the ties that arguably bind together participants in a policy network. In the Marsh and Rhodes typology policy community participants share values. By comparison, conflict over values and intended outcomes is present in issue networks. Our revised typology adopts this distinction as well and simplifies it somewhat. Consensus differs from epistemological context (see below) in that it focuses on values and the measure of agreement over outcomes, whereas the epistemological context deals with shared knowledge. We expect to find cases of correlation between consensus and the presence of shared knowledge about a policy area but this is not necessarily true in all instances. Conceivably a set of actors could possess the same knowledge about a policy area but disagree over the positioning of values or policy goals. The latter would reflect a low level of consensus and we would look to other variables to explain the existence and level of persistence of the policy network.

### **4.1.3. Resources**

Resource distributions between participants in networks and within organizations that play a role in these subsystems are another dimension along which networks are arrayed. In this investigation, the Marsh and Rhodes characteristics of policy communities and issue networks have been preserved and are suitable given the

expected composition of these structures in terms of membership and integration. In policy communities, participants should have their own resources – in this context primarily informational/professional -- and engage in information exchange with their peers. Resources within organizations participating in policy communities are subject to hierarchical distribution or, at the very least, are initially set up by a hierarchy. For example, we might expect to see a mandate given to representatives of a public agency in a policy community to engage in information sharing with representatives of other organizations but that information may be generated locally or at the level of the representatives – not by their political or business masters.

Our adoption of resources associated with issue networks and policy communities is a simplified form of that found Marsh and Rhodes' original typology. We have discarded assessing resource distributions within organizations and focused on the resource differential between organizations. We consider actors in policy communities to possess resources (that take the form of information possessed, specialized knowledge, and capabilities arising out of professional and technical experience/expertise/skills) and capable of entering into resource exchanges with other actors. Given the increased likelihood of more diverse interest composition, and the more fluid nature of membership in issue networks, the resource capabilities are likely to be uneven or limited and support consultative relationships versus more tangible “policy-making”.

#### **4.1.4. Power**

There are many definitions of power in the policy sciences literature. One major aspect of power is related to resource capabilities. The possession of resources by actors is known as dispositional power. Giddens defines power in terms of actors' abilities to achieve their objectives - this notion is referred to as relational power (Giddens, 1984). There is also power that arises out of organizational capabilities, characteristics, or the ability to harness them. The variety of perspectives and definitions of power make the isolation and operationalization of relevant factors difficult. That said, a process of elimination of those concepts that definitely do not apply to a policy network-based analysis can reduce the applicable ones to a manageable number.

Our interpretation of the concept of power in issue networks departs from Marsh and Rhodes typology with respect to their view that it manifests itself as a zero-sum game. This concept of power is often referred to as “transitive” power because of its assertion that one actor’s gain is at the expense of another. Issue networks in this policy area are likely to have an uneven distribution of power as a result of the resource and access differential of network participants. However, these concepts of power are challenged by the observation that actors in issue networks in FLOSS policy often make a specific decision to contribute information, time, advocacy, etc. despite not gaining any political or economic advantage. Furthermore, power can also take the form of persuasion or argument, specifically exercised by agents to gain compliance from others, often without a commensurate loss of prestige, influences, or resources on the part of the recipient. Consequently, the zero sum attribute of power has been rejected in our modified typology. In their article, Arts and Tatenhove (2004) have developed a modified definition of power based upon their view that it is a multi-level, multi-faceted concept, situated within the context of institutions and discourse,

Power is the organisational and discursive capacity of agencies, either in competition with one another or jointly, to achieve outcomes in social practices, a capacity which is however co-determined by the structural power of those social institutions in which these agencies are embedded.  
(p. 347)

Given the multiplicity of definitions and concepts of power and the expectation that policy networks will mirror that diversity in how power is used by and against actors, we shall approach the concept of power with an awareness that it takes different forms and will attempt to associate empirical observations with respect to the exercise or manifestation of power with the above definition. More precisely we will highlight the use of resources on the part of agents to achieve policy outcomes within the policy network frameworks in which they operate.

#### **4.1.5. *Epistemological Context***

Marsh and Rhodes’ typology provides a useful framework for identifying and organizing policy network variables and characteristics but does not provide a full range of dimensions to capture the complexity of networks that operate within the FLOSS

policy space and the variations of dimensions that now play a role in policy-making. One such omission is that of the knowledge or ideas context. The importance of knowledge in policy networks has been noted but not operationalized.

To address this lacuna we have defined a new dimension specific to this investigation and in addition to those presented in our modified typology. As was initially noted in the introduction, the term “epistemological context” refers to the foundational knowledge possessed by participants in the policy process. The epistemological context differs from the values mentioned in the consensus dimension in that it deals with the technical or instrumental knowledge and language or terminology required for an actor to be literate and effective in a policy area, versus the consensus dimension’s concept of shared values or agreement on approach. It specifically refers to the common body of knowledge required to understand the policy implications of FLOSS and participate in policy definition, formulation, or execution. In highly technical policy areas this knowledge could be understood of as the credentials to gain credibility as an actor in a policy network.

The epistemological context arises out of a variety of factors, of which none on its own is sufficient for its formation. A number of these factors combine to produce the informational environment within and with which actors conduct their policy-related activities. First, actors can bring their expert knowledge to the process, particular those that are part of epistemic communities (Haas, 1992). This expertise may be possessed by individuals or organizations that have mandates to direct the policy process. Other experts may act as proxies for more influential actors or those that must stay at arms’ length from the policy process. Expertise may be possessed by network actors that play a role as advisors or consultants but not do any direct policy-making. Institutions and organizations also have embedded knowledge and processes to acquire/retrain knowledge. Finally, actors can learn from other actors, draw upon experiences in other policy jurisdictions and institutions, or from social or political changes exogenous to the policy subsystem. The accumulation of, or change in the level knowledge on the part of actors is related to the concept of policy learning which will be further explored below.

An epistemological context is a factor in both issue networks and policy communities. Shared knowledge among network actors is likely a factor in both network

formation and persistence for the two network types. That said it is unlikely that a specific set of characteristics can be directly ascribed to this particular dimension of policy networks. One might posit that certain forms of foundational knowledge might be more likely in certain policy network forms. For example, the broad range of interests, uneven distribution of resources, and presence of conflict over values or approaches to a policy problem characteristic of issue networks may suggest that knowledge possession among actors is heterogeneous, that its diffusion is not effective, that key players do not have sufficient knowledge or lack the ability to gain leverage from it, or institutions have not incorporated the necessary learning into their processes. Conversely one would expect that the tighter coupling associated with policy communities, combined with the greater likelihood their membership is composed of professional or expert interests, more frequent interactions, and a more homogenous distribution of resources that issue networks would be indicative of a higher level of expert knowledge possession by participants, agreement around the basic instrumental or technical parameters of the policy issue, and a more effective mechanism for spreading new knowledge to existing members and socializing new entrants into the network. The assignment of some characteristics to each network type may be a straw man, but at least provides something against which comparison can be undertaken. Consequently, for an issue network we associate a knowledge context noted by uneven distribution reflected in a general support for core FLOSS concepts or knowledge, but no comprehensive set of foundational concepts. For policy communities, epistemic context should be noted by a more homogenous distribution of knowledge with a resulting broad support for core FLOSS concepts and a vision for its use in the form of developed policy architecture.

Establishing causation for this dimension will be a challenge. Does the epistemological context cause/support the development of a certain network type or is it merely an outgrowth of actor capabilities or their interactions? Are there any generalizable relationships between network type and knowledge acquisition, possession, or diffusion? These questions will be tackled empirically in the hopes that, at a minimum, at least some correlation between network types and the appearance of “knowledge” can be established and that the role of foundational knowledge can be

better described, particularly in relation to the other variables and characteristics selected for each network type.

**Table 8. Policy Network Variables/Characteristics and Their Operationalization**

<b>Network Variable</b>	<b>Policy Community</b>	<b>Issue Network</b>
<i>Membership</i>		
Participant Numbers	Low – under 10	High – above 20
Composition of interest	Economic (private sector), professional (software engineering, legal, or other technical) are predominant	Broad range of interests
Stability	Stable	Unstable – actors enter and exit issue network with higher frequency than policy community
<i>Integration</i>		
Frequency of Interaction	Frequent interactions between individuals or groups specifically focused upon the policy issue of concern	Infrequent interactions
Continuity	Interactions and outcomes stable	Interactions and outcomes unstable
Consensus	Share basic values	General agreement but conflict present
<i>Resources</i>		
Distribution of Resources	All participants possess resources and have exchange relationships	Uneven resource distribution and relationships are primarily consultative
<i>Power</i>	Balanced power or positive sum game	Unequal power distribution

<i>Epistemological Context</i>	Support for core FLOSS concepts and a vision for use (aka policy architecture)	General support for core FLOSS concepts but no comprehensive set of foundational concepts.
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Source: modified from original - Marsh and Rhodes, 1992, p. 251

## 4.2. Research Methods: Operationalizing the Hypotheses

What is the meaning and relevance of interconnections in hypotheses one? The term “interconnections” is used to describe the linkages between participants – either individuals or organizations – in policy networks. The notion of interconnections also provides a litmus test for the presence of a network. In this investigation we borrow from Provan and Lemaire’s (2012) work on public organizational networks, specifically their idea that identifying networks:

...means examining not only bilateral dyadic ties, but also the multilateral relations that define a whole network and that are essential for achieving a collective outcome. (p. 639)

Empirical evidence of interconnections between policy actors must be examined through the lens of dyadic ties between them but also confirming their position vis-à-vis the other actors in the network, the referential nature of their interactions, and the policy-relevance of their activities – be that communication, collaboration or competition. The importance of this test is to help establish whether policy change occurs in instances where an issue network might be the dominant form of organization and whether this form of policy network is less able to support activities that result in policy change in the FLOSS arena. Specifically, this hypothesis provides a test that reflects a broader set of communications found in an issue network. This portion of the hypothesis will be tested using sociometry and other network mapping techniques described in the methods section of this chapter. The information gleaned can be used in a comparison of the number of linkages between policy network participants in combination with situating the policy network type within our modified Marsh and Rhodes model.

The APES becomes is the first stage in assessing a set of network characteristics. In addition to graphical displays of policy actor and event relationships, it

permits the generation of matrices that, with further processing, provide useful information on network composition, such as density and degree centrality. The latter are measurements of the interconnections referred to in hypothesis one. The characteristics used to describe composition of networks are self-explanatory but concepts such as network density and degree centrality require some clarification before they are used.

Network density measures the scale of relationships between actors. It is calculated simply by taking the total number of ties between actors in the network and dividing it by the total number of possible ties (Borgatti, Everett, & Freeman, 2002). A highly interconnected set of actors will have a high network density score.

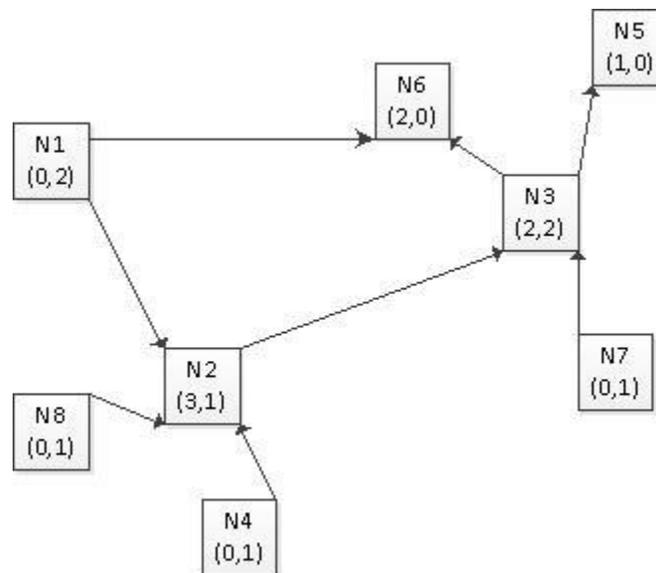
Degree centrality is a measure of the position or importance of actors in a network. Degrees in networks are simply the number of ties that an actor has to other actors in that network. For example, if an actor had three different connections to other actors his degree score would be three. Degree centrality measures the level of concentration in a network that actors possess: this can also be interpreted as the number of connections they have to other actors. In theory, major actors should have the largest number of connections to other actors, which is a reflection of their level of activity or importance (Wasserman & Faust, 1994). At its most extreme, a network with a single actor connected to all other actors will look like a star when graphed. In this investigation, the relationships between actors are generated by turning the APES data into matrices, which in turn, are used to calculate simple measures of centrality.

An initial analysis of survey responses did yield some information on the direction of relations. However there was not enough data to determine the direction of relations for all of the actors and the events in which they participated. More precisely, the orientation of relationships or ties between network actors was not determinable for all of the relationships and thus determined to be out of scope for the investigation as partial relationships would be non-comparable across cases. Examples of directional relationships in the FLOSS policy networks are communications between actors that might go from one in a position of authority to a subordinate (if this relationship was verifiable it would appear as a outdegree for the “authority node” and an indegree for the “subordinate node”) or a case of mutual exchange or collaboration between representatives of two organizations (which would appear as a pair of indegree and

outdegree relations between the two participants). Additionally, because of the inability to determine directional relations consistently, we were unable to build directed graphs and establish related measurements for prestige such as outdegree and indegree. Directed graphs appear as sets of arrows between the graph vertices or nodes that denote actors. An outdegree appears as an arrow pointing outward from a vertex and an indegree the reverse, representing the direction of relations. A high-prestige actor is correlated with a high number of indegree relations. Figure one is an example of a directed graph or a network with a set of indegree and outdegree relations. Each node describes its relations in the form X, Y where X is the indegree and Y is the outdegree.

The policy network graphs derived from the APES for each of the three cases appear to have indegrees and outdegrees on the same relation between vertices. This is indicative of an absence of directional relations between actors in the network. As a consequence of our inability to provide measures based on prestige are unable determine the prominence of network actors from our graphs (Wasserman & Faust, 1994). A lack of directed graphs essentially indicates that the networks under examination have to be described simpler than they might be in reality but even in this minimalized form, will not prevent us from asking important questions about their structure and characteristics (Watts, 1999).

**Figure 1. Directed Network Example**



The network density score provides a metric for operationalizing the threshold referred to in hypothesis one. The selection of a metric that would provide that threshold is largely dependent upon the type of network. Relating this score to the Marsh and Rhodes model we would expect lower density scores to be reflective of issue networks and a higher density score to be associated with policy communities. Working from this assumption the threshold for the first hypothesis has been set at 50%. With a 50% network density score, half of the network's participants will have interactions with each other.

Hypothesis two takes this form: *If policy networks are absent in the observed cases it is because prospective network participants are members of competing outside-government networks.*

Using a modified Marsh and Rhodes policy network typology and the model described the conditions for network delineation and classification is possible. Network membership is mapped using social network analysis techniques to facilitate evaluation of this hypothesis. The membership of networks is compared within and between cases to test for the presence of overlapping, parallel or possibly competing networks. Multiple policy networks can exist in the same policy arena. And the lack of exclusivity between network types suggests that within networks there is the possibility of a core and a periphery (Marsh & Rhodes, 1992). This hypothesis may be rendered inconclusive, however, by a lack of evidence that a competing network exists, or disproved by the existence of a competing network but no compelling evidence that this network played any role in the absence of FLOSS policy in a given case.

Hypotheses three and four deal with the necessity for a supportive epistemological context. *A fertile epistemological context is a necessary precondition for the emergence of policy networks in a given case. And the lack of this epistemological context is evident in at least one of the cases under consideration.*

The study survey and document review should help establish the presence or lack of a supporting epistemological context in each of the cases under investigation. But determining the existence of this context does nothing to assist in understanding any causal relationship between it and policy network formation and change, and the

relationship between this context and learning on the part of network actors. The operationalization of a set of related concepts, turning previously described theoretical definitions of policy learning and policy change into operational definitions is necessary. The relationship between policy-oriented learning and policy change has been described in chapter four. Our operationalization of this relationship draws its inspiration from how Lee and van de Meene (2012) have formalized it. Their study's concept of policy learning is relational and they claim it appears in the interactions between actors in the network. We agree with this assertion and believe that it is substantiated by the empirical record around each case study. Lee and van de Meene have developed a three stage process model of policy change. Their first stage is composed of information seeking on the part of network actors, based in their relationship with other actors. Lee and van de Meene point out that the information gained takes both tacit and explicit forms and citing Hall (1993), point out this information is a prerequisite for learning. In our cases we try to identify where this knowledge originates – developed by actors (endogenously), brought into the network by new actors (a function of Marsh and Rhodes' stability variable), or transmitted via institutional links.

**Table 9. Operationalize Policy Learning**

Evidence	Policy-oriented learning
Explicit statements about societal, political developments related to policy. Technological innovation, social models in society.	Social learning
Explicit statements about lessons borrowed from other organizations, jurisdictions. Policy documents that refer to similar policy problems, instruments in other organizations, jurisdictions. Actor participation in events where lessons learned are discussed. Entry of actors from other organizations, jurisdictions where policy instruments, similar policy problems used/encountered.	Lesson drawing
Direct statements of organizational/institutional reorganization to address policy problem; restructure to develop new policy instruments or policy delivery mechanisms.	Organizational learning

Lee and van de Meene's second stage is adoption of knowledge, its processing, aggregation, and codifying. We would also add the concept of adaptation of knowledge to this stage, or the structuring of it by actors to suit the specific social and technical context within which the policy network operates. Finally, there is the resulting policy change Lee and van de Meene have generally adopted a Hallsian perspective on policy change, citing changes in policy instruments and goals and the importance played by external stakeholders in driving policy change. From our study's perspective, the concept of learning in Lee and van de Meene's policy change process can take any of the forms summarized by Bennett and Howlett (2002) and identified in chapter 4, namely social learning, lesson drawing, and governmental/organizational learning. We identify specific types of learning through empirical evidence and inferences made with respect to each case study.

In this study we assume that learning is one way of bringing the expert-based information that constitutes a significant part of the epistemological context, into a policy network, but do not refine how the policy process and subsystem structure might determine its use in the way other theorists do (Weible, 2008; Afonso, 2007). We do rely upon empirical evidence linking learning and change in order to substantiate the connection between the adoption and adaptation of information in a learning process (be it social, lesson drawing, or governmental) and subsequent policy change. Consequently we look for statements that establish causal relationships between learning and change (e.g. policy makers making explicit linkages between the two); policy documents that describe lesson drawing and social learning (for example the influence of external political or societal actors); policy-makers taking about using lessons from other jurisdictions. In some instances we assume policy change is the result of casual relationships between instances of policy-related learning and subsequent network and policy changes after attempting to competing explanations or testing for the existence of other variables that might play a role in policy change.

**Figure 2. Relationship between Policy Learning and Change**



*Adapted from Lee and van de Meene (2012).*

## 5. Choice of Case Study Method and Case Selection

The comparative method, combined with the case study approach, is clearly the most suitable method for this project, given that the experimental and statistical approaches are simply not applicable to investigating the empirical phenomena observed. This project undertakes comparisons based upon a most similar systems design (also known as Mill's Method of Difference) and the use of case studies and case study theory. A primary aspect of case studies is their "thickness" and the opportunity for description or interpretation provided by them. Rihoux and Ragin (2009) express caution against researchers relying exclusively upon description, not exploring "explicit connections" and not attempting to explain causal relationships (p. 12). We would agree that generalization is a primary goal of social science research, but qualify that statement by suggesting that when case studies are "thick", they also provide interesting opportunities for analysis and in Yin's (2003) words "multiple sources of evidence, with data needing to converge in a triangulating fashion" (p. 14).

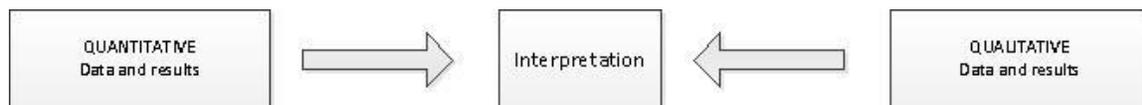
The Belgian, Canadian, and German cases utilize a broad set of sources of evidence in the process of triangulation, that according to Hammersley (2008), "referred to checking the validity of an interpretation based on a single source of data by recourse to at least one further source that is of a strategically different type" (23). In the context of mixed-methods research, into which this investigation falls, triangulation has traditionally been defined as an attempt to draw upon sources of data from both qualitative and quantitative sources in the same study. Figure 3 depicts the interpretation of results from these two types of sources. This concept is also known as methodological triangulation or more precisely "across methods triangulation" (Tashakkori & Teddlie, 1998). Hammersley points out the limitations of this definition and argues that triangulation can accommodate the sourcing data from different methods (structured or unstructured data gathering, for example) within the same investigation or the use of techniques to improve the validity of inferences, such as integrating data from contrasting survey respondents.

However, Hammersley considers the overall concept of triangulation to be imprecisely understood by social researchers and reasons through the view that there are a number of alternative interpretations that have their roots in philosophical, ontological, or epistemological distinctions. Hammersley describes four definitions - the use of triangulation to improve validity; a more constructivist notion of validity where multiple sources of data are sought not with the intention of getting closer to valid observations but understanding how those observations are generated; one that attempts to understand the epistemological and ontological limitations of methods and finally, as a way to illuminate different aspects of social interactions:

The use of different methods to investigate a certain domain of social reality can be compared with the examination of a physical object from two different viewpoints or angles. Both viewpoints provide different pictures of this object that might not be useful to validate each other but that might yield a fuller and more complete picture of the phenomenon concerned if brought together. (Erzberger & Kelle, 2003 in Hammersley).

In this investigation we elect to utilize triangulation in a pragmatic fashion, borrowing perspectives rooted in both post-positivism and constructivism, and recognizing that bringing in potentially complimentary observations of the same phenomenon and different sources of data can also improve validity. Truth, insofar as it can be determined with limitations on perspectives, information, and time, is better unearthed by the convergence of observations and mutually -supportive perspectives. One can further distinguish between methodological triangulation and data triangulation, or the use of information from different sources (Denzin, 1978). This investigation utilizes both types of triangulation.

**Figure 3. Triangulation**



**Adapted from Creswell (2008).**

There are a number of other reasons the mixed method approach is taken. In a 1989 article Green and her collaborators reviewed a sample of studies and identified a common set of purposes for conducting mixed method work. This set included the

aforementioned triangulation and the concepts of complementarity, initiation and development (Green, Caracelli & Graham., 1989). Complementarity in a mixed methods study refers to the use of qualitative and quantitative methods to assess different but overlapping dimensions of a phenomenon. Greene et al. summarize the rationale behind complementarity in the following fashion:

To increase the interpretability, meaningfulness, and validity of constructs and inquiry results by both capitalizing on inherent method strengths and counteracting inherent biases in methods and other sources. (p. 259)

A variation on this concept, according to Greene and her coauthors, is the study of different levels of a phenomenon using different methods, analogous to “peeling the layers off an onion”. Like triangulation, complementarity was actively pursued in this investigation. For example, the policy network typology was used to classify and categorize subsystem characteristics into issue networks or policy communities, focusing on information acquired through empirical means – this was largely a policy subsystem-level analysis. By comparison, the data derived from the survey results, the inputs and results of the APES and the follow-on social network analysis was at a lower level and focused on micro-level interactions between actors.

Initiation refers to the use of a combination of methods to flush out paradoxes and contradictions from research results. Results generated by one method are critically assessed by another with the expectation that a different perspective will assist asking a set of new questions and provide answers. The outputs in this case should be new insights that would otherwise be left uncovered. The goal of initiation is laudable. However, there are likely few opportunities to find paradoxes in this project’s results. The combination of methods used in the FLOSS study was applied mechanically, and at no particular stage did we expect to observe any significant contradictions or paradoxes. Finally, development is the use of results from one method as inputs into another. In theory, development is used to improve study validity by having each method play to its strengths and through the aggregation of results. It differs from complementarity in that development focuses on the technical aspects of improving results validity versus the elaboration or illumination of results to which the former is applied. This was the rationale behind this project’s use of multiple methods to convert qualitative data into quantitative

data. The latter can be further reworked into a format that could be assessed for specific network characteristics. We expect this project will benefit significantly from using each method as a specialized set of techniques suited to sample, measure, and validate specific types of data. The implementation of this chain of methods can be correctly classified under Greene and her collaborator's interpretation of the concept of development.

We would argue that a comparative study in a highly demarcated policy area, such as this one, and with a small number of cases is feasible, as long as the quantity and quality of policy artefact data available is sufficient in providing the multiple sources that can be used for triangulation, complementarity, and development according to our qualifications. The validity of these materials -- specifically that they accurately reflect the reality of policy interactions, including who was involved when, and what they did -- is critical. A broad range of policy artefacts and related inputs including survey materials must be used. In this case there will be a large amount of information garnered from the Internet such as published policy documents, third party analyses, contact data and web sites. The validity of that information as inputs into the case studies relies in part upon the assumption that for all three cases the policy-making interactions discovered on the World Wide Web take the form of so-called "virtual policy networks" and that they are a valid representation of the "real world" policy activities of states (McNutt, 2006).

In this section, key concepts have been operationalized. However, additional effort must be expended upon a discussion of how network participants will be determined and from that how network boundaries are to be mapped. Network participants must be clearly identified actors who are directly involved in policy formulation and implementation. This identification is a relatively mechanical process and involves a review of policy artefacts and an analysis of the survey results. Unfortunately, methodological short-cuts that could be used to gain leverage into networks found other policy areas, such as focusing on public inquiries such as Royal Commissions and task forces in British Parliamentary systems cannot be utilized here (Howlett & Maragna, 2006). FLOSS is often cast as a purely technical or administrative matter and a much of the public-facing structures and the policy artefacts generated in this sector is not readily available to scholars. Consequently, some of the analysis

necessary to establish structural relationships and their characteristics must be done on information derived from secondary sources.

The research methodology and the specific methods and techniques that were used are complimentary. As stated earlier in this investigation, the primary research method is comparative, and it uses a similar cases research design. It proceeds at a number of different levels concurrently, namely at the macrosocial level (state), the meso or sectoral level, and finally, the micro or organizational and individual level. When considered together, these levels of analysis mutually reinforce each other.

Understanding the complexity of social phenomenon, including that of the topic of this dissertation, is a challenge, partially due to different combinations of causally - relevant variables resulting in different outcomes, what Ragin refers to as multiple conjunctural causation. In the absence of an experimental design, comparison of cases may be considered a valid alternative and standard method by which social scientific research is undertaken. Specifically, researchers attempt to determine these causal relationships by understanding the intersection of relevant variables (Ragin, 1989). As mentioned in chapter one, this study falls into the category of method referred to as non-experimental, non-statistical, small-n comparison, particularly given that the number of cases here is three. Several methodological issues arise out of the use of comparison of cases in small-n studies, including the increased weight and significance of negative findings (Lijphart, 1971). Lijphart proposes increasing the number of cases to permit, potentially using the statistical method to analyze them. However, this is impracticable for this investigation because of a lack of suitable cases and constraints of time and resources. Following Lijphart's (1971, 1975) advice we attempt to mitigate some of the problems apparent in small-n and many variables investigations, by bringing in cases where they are comparable, by focusing on the key variables that we have operationalized in the previous section and, in the absence of increasing the number of cases, we expand the historical coverage of the analysis to include as many events and actors for assessment.

In order to reduce the causal complexity of the comparisons we attempt to decrease the number of variables by selecting cases that are comparable in as many of their attributes as possible. Common variables across the cases in this investigation are

at the macro-level, namely a high level of economic development, democratic, federal political systems, similar levels of social development, and participation in international standards and technical organizations.

## **5.1. The APES Model**

This is a mixed method and mixed model study, incorporating both “qualitative and quantitative approaches within different phases of the research process” (Tashakkori & Teddlie, 1998). A major challenge with respect to testing policy networks is how to generate valid data about them for analysis. This is further complicated when attempting to compare them consistently across cases. To address these issues, Serdült and Hirschi's (2003) innovative Actor-Process-Event Scheme (APES) was adapted for use by this investigation to generate policy process, actor, and event data and transform it into structure data from which network relationships can be determined. First, qualitative data, including the survey of prospective policy actors, reviews of policy or technical documentation, and artefacts that described policy-relevant events, such as meetings, conferences, records of policy decisions, etc. was collected. Taken together this body of data provided a set of related process information, specifically policy events, the actors involved, and the linkages between these actors. A transformation of the event and process matrix data into structural data followed. More precisely, first structure data was subjected to quantitative and qualitative analyses using a two-pronged approach (1) the initial sources of qualitative data was transformed into a graphical display of the policy process including events and actors using the APES and (2) survey data was used to correct, reinforce, and fill in the APES. Further qualitative analysis was used to confirm or disprove the findings by alternately providing additional sources of information that supported the events and relationships depicted in the APES or allowed a more critical interpretation of its schema. More precisely, data was collected in several phases. First a review of existing policy documentation, journal articles, newspaper and IT industry publications, web sites to establish an initial set of contacts was done. These contacts were then solicited for their willingness to answer survey questions. This survey (found in the appendix) was published on the web, administered over the telephone and face-to-face. An initial question asked a survey respondent to qualify their involvement in FLOSS policy and if not an appropriate party, to forward the survey to other individuals

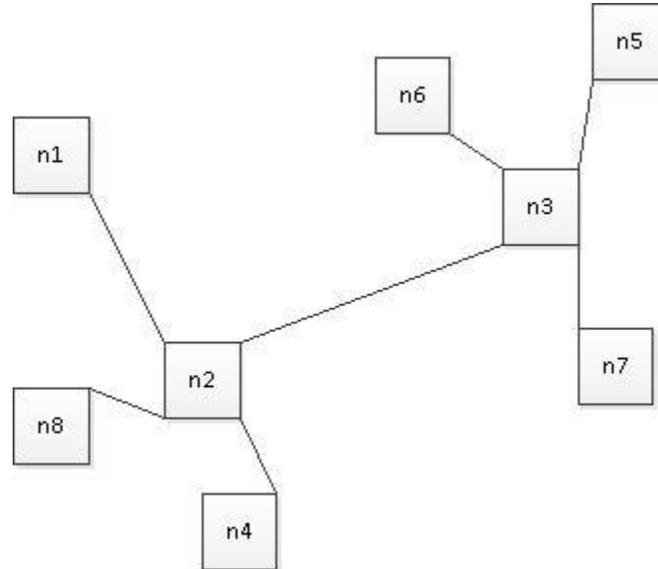
or organizations that might be better prospects. Another line of inquiry identified other actors with whom a respondent interacted and asked to forward the survey to them or contact this researcher. These two types of questions drove snowball sampling (Tashakkori & Teddlie, 1998; Wasserman and Faust, 1994) to be utilized to generate additional leads for successive sets of interviews. The survey was offered to potential respondents initially in English and if requested, could be provided in German and French. Approximately 30 individuals from Belgium, Germany, and Canada were contacted and asked to complete the survey. The survey completion number was 13 – either responses directly to the survey or assisted by the researcher. A further seven individuals were interviewed in a more in-depth manner using the questions from the survey. The latter self-identified or were identified by colleagues as being key actors in the policy process and the interviews, while using the common set of survey questions, often developed into freer form conversations about their involvement in FLOSS process, their cooperation with others, and the characteristics of the institutions and legal arrangements under which they worked.

The data was processed and analyzed in a series of steps that included its organization and presentation in the form of sociograms, sociomatrices, and network graphs. The former have been used extensively in American research into social networks. This research has standardized the use of sociometric techniques and related quantitative methods for the measurement of social and by extension political relationships, building upon Moreno's pioneering (1951) work in creating tools that could describe the organization of groups and the relative positions of individuals within them. Data collection and analysis was done using spreadsheet functionality provided by Libreoffice's Calc program. The network relationships are mapped using Serdült and Hirschi's APES tool, and matrix transformation operations and graphical displays are done with Ucinet 6 (Borgatti, Everett, & Freeman, 2002) and Netdraw, respectively.

Figure 4 is an example of a type of network graph that is used in this project to describe relationships between actors. The nodes (n1 ... n8) represent the actors in the network and the lines between them the ties or relationships between actors. In this simple example network, nodes n2 and n3 are to be the most connected and have relationships with each other and three other nodes. The number of connections to other nodes a node possesses is referred to as its degree. For example, in figure 4, n2 and n3

each have degrees of 3. In the real world, individuals or organizations differ greatly in their interactions or connectivity with others. One would expect that this asymmetry in relationships appears in graphs of networks in which these individuals or organizations participate, specifically that some will be highly connected while others will not. This reflects the differences of formal organizational importance (e.g. the more connected one is the more important you are in an organization), power, influence, resource possession, or social skill. This theory has been confirmed in analysis of real world networks, namely, that they are composed of a large number of nodes with relatively few connections (low degree) and a few number of nodes with a many connections (high degree). This characteristic has been observed in a number of complex networks, such as the internet, electricity transmission systems, and neurons in the brain, garnering these networks the term “scale free” (Barabasi, 2003).

**Figure 4. Network Graph Example**



While useful for mapping the relationships or interactions between actors and network graphs, matrices and sociograms on their own are unable to shed light on *why* network actors interact (Tashakkori & Teddlie, 1998). They are largely a descriptive tool.

Consequently, this investigation relied upon the complimentary interview, policy artefact, and other supporting data to provide crucial information necessary to testing of the relevant hypotheses. These techniques were applied consistently across all cases under investigation and to all of the gathered data in order to achieve reliability and comparability of results. This investigation also used overlapping and, in some cases, mutually reinforcing sources of empirical data, such as the aforementioned interviews, policy documents, newspaper and journal articles to review the findings at the end for quality and validity.

Serdült and Hirschi's Actor-Process-Event Schema (APES) played a prominent role in this project. The data gathered in the course of researching the Belgian, Canadian, and German cases furnished the necessary structural, event and time series data that were used as inputs for analysis by the APES. The APES for each case were used to generate a set of matrices (actor-actor and actor by event) which in turn were processed by social network analysis (SNA) tools to produce network graphs of each policy subsystem. The APES was developed to address a limitation of qualitative case study analyses in the policy studies field, namely their ability to provide sufficient data for a network-level analysis. Its early incarnation was as a descriptive aid to provide graphical representations of policy processes; only later did it evolve into an analytical tool (Hirschi, et. Al, 2005). As a technique the APES is dependent upon a number of assumptions that require some qualification: APES only works with clearly identified actors and the events in which they participate. Because it is based upon a concept of policy cycles (Howlett & Ramesh, 2003) it requires that a clear idea of what stages of the policy cycle the APES analyzes (if not the entire cycle).

In this case, acquiring the data for the APES required a significant amount of work to establish events and actor participation in them. FLOSS policy is arguably more opaque than the field of policy used by Serdült and Hirschi as their case studies. More precisely, the Swiss legislative and executive records used by Hirschi, Serdült et al (2005) in their examination of UN Framework Convention on Climate Change were, by their own admission, readily accessible and certainly more so than the author found comparable FLOSS-related event information in the Belgian, Canadian, and German cases in this study. Again, a multi-leveled approach utilizing triangulation was applied in order to first establish initial sets of actor-event relationships and then corroborate them:

at least one additional observation or validation was sought before a relationship between an actor and an event was coded.

The APES provided a remedy - at least in part – to the problem of how to represent the dynamic temporal nature of policy networks. The survey data, sociograms, and interviews generally captured snapshots of a policy network state. The SNA data and network characteristics such as centrality or density derived from the APES similarly summarized networks or aggregates of network states, respectively. The APES graphical summaries helped depict the changes in participant compositions and events over time but even then did not paint a completely accurate picture of how networks evolved over the 10-year interval that this project focused upon. Furthermore, on its own the APES is a very capable tool for describing interactions but does not tell analysts anything about the content of these interactions. APES was utilized for its strengths and its deficiencies were addressed by complimenting it with a body of thick case study materials that were able to provide a more comprehensive view of the changes that the policy subsystems went through over time.

Finally, in this project APES also acted as a compliment to the actual case studies by providing an effective graphical representation of the actor-policy-event interactions that would reinforce the descriptive aspects of the case studies. The broader challenge of representing network data in a readable manner has been examined before, for example by Brandes, Raab, Wagner (2001), and the APES addressed this issue as a practicable solution to the problem of network visualization. The use of APES and case studies in this case is a good example of mixed methods being used as per the concept of complementarity discussed earlier in this section..

The inputs to the APES were the background materials for the case studies in chapters six to eight and include the following:

- Events and actors described in policy artefacts such as briefings, discussion papers, conference or meeting minutes.
- events and actors mentioned in relevant source newspaper or journal articles
- Actors who self-identified in the survey or were identified by surveyed party and confirmed by further application of the survey.

Once collected and organized, the data provided useful summarized information about the networks such as number of actors; number of events; what percentage is public actors, etc. The application of APES linked together actor, event and process data which was then run through social networking analysis to generate a number of useful measures of network characteristics and create further graphical representations of the policy networks.

The first step in this process was the generation of a table enumerating all of the actors, individuals or organizations, who have been involved or self-reported involvement in activities in this policy area. We used the participation categories provided by the APES tool, specifically active, passive, and leading, code each with an integer value, and define them according the following criteria:

**Table 10. APES Participant Categories and Definitions**

Integer Value	Participant Category	Definition
1	Passive	Actor is a participant in the event, but has limited involvement for example, as an observer or is, at most, a consulted party.
2	Active	Actor is actively involved in the event and a contributor. Actor may have initiated event but does not lead it.
3	Leading	Actor is de-facto or formally recognized leader in event.

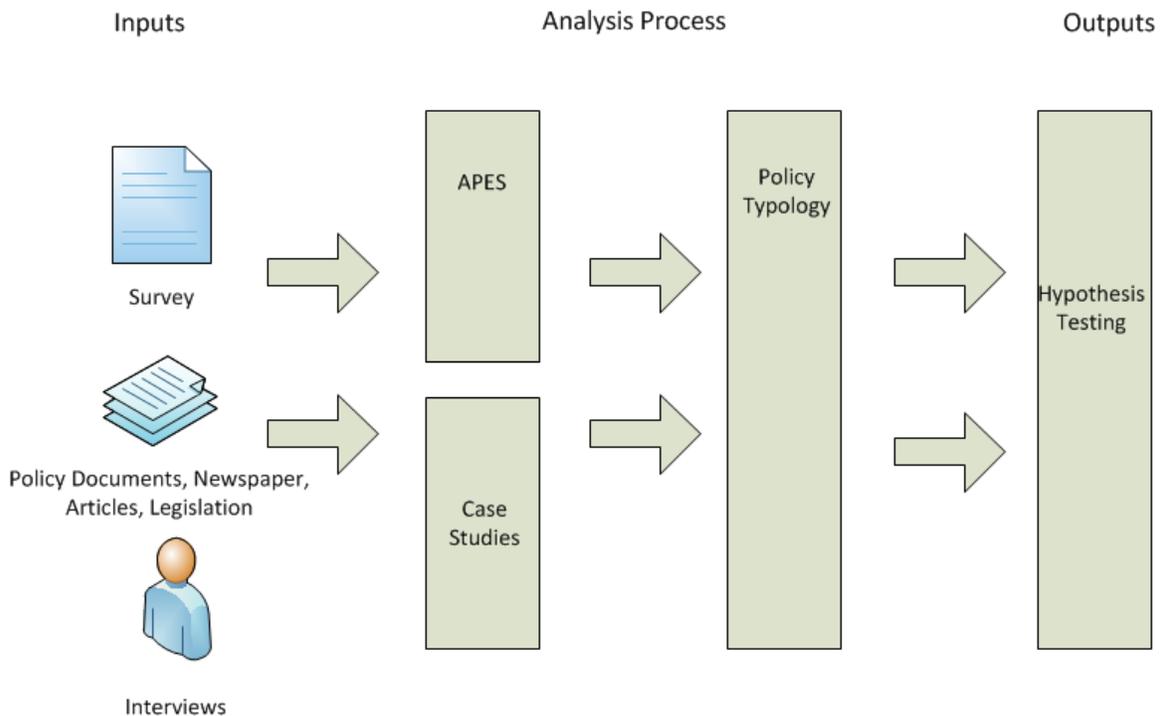
This analysis proceeded under the assumption that there is some equivalence between corporate actors and individuals, given that in some activities individual actors represent themselves and yet others operate within the policy environment on an equivalent footing with corporate actors.

Actor participation is in events. Events fall into the following categories:

- Deliberations or consultations.
- A forum where information critical to informing policy actors is disseminated or exchanged.
- Policy decisions made by federal government actors, including ministries, departments, executive, legislature, judiciary.

The APES helps organize the events and actors into phases according to a policy cycle model (Serdult & Hirschi, 2004). In this investigation, policy events were arranged chronologically by year and not in a single policy cycle. The events reflected the reality of policy formulation – it often operates in an incremental or non-progressive manner or in some cases with reversals or repeats of processes. The use of a chronology established a common basis for comparison across all cases.

**Figure 5. Research Methods and Process**



## 5.2. Study Validity and Reliability

There have been a number of references to validity in this section. The study attempted to address issues of data collection and measurement validity and reliability and data analysis repeatability that are the primary objectives of a research endeavour (King, Keohane, & Verba, 1994). Definitional clarity is merely one step of several

towards high quality empirical research. We were explicit about defining concepts and variables. Research validity or extent to which a study measures what it intends to measure is a primary consideration for researchers in their designs and how it they are undertaken (methods). The overall validity of a study can be further divided into construct, internal, and external validity (Yin, 2003). Construct validity is achievable when suitable and sufficiently operationalized measures are developed in an investigation. Yin describes two major prerequisites for meeting the test of construct validity – the relation of the changes to be studied to the original objectives of the study and the demonstration that the measurements used are applicable to the changes that are selected (Yin, 2003). Internal validity deals with the need for a study to establish causal relationships for it to successfully claim to have any explanatory capabilities. Finally, external validity is whether a study's results are generalizable within a broader theoretical context. Yin stresses the purpose of case study research is to make analytical generalizations, not statistical ones.

Study validity and reliability are achievable through a solid research design. An attempt at constructing one systematically begins by first turning to the original hypotheses for the study to establish the foundational concepts. Using Popper's principle of falsifiability we also explore what might prove these hypotheses incorrect (King, Keohane & Verba, 1994).

With the operationalization of policy network, learning, and change concepts established, and the selection of methods used in this investigation described, the task turns to the exposition of the development of FLOSS policy in each of the three cases. The next three sections are “thick” description of the actors, events, and processes in the Belgian, Canadian, and German cases. It is to the first case study, namely that of Belgium, that the focus of this investigation now turns.

## 6. The Belgian Case

### 6.1. Introduction

Belgium is the first of three cases in this investigation. Belgian policy in this area has developed relatively recently when compared against the other cases, but even in this short period of time a gradual shift to policy focused upon *open standards* away from free and open source software can be observed. Open standards are defined by the Belgian IT administration as a nested combination of a number of factors, but primarily they are free specifications that are defined by independent standards bodies such as the ISO or IETF. These free specifications are in turn, composed of specifications of a technology unhindered by licensing fees, freely published, and sufficient to construct a reference implementation for use elsewhere (Strickx & Jochmans, 2005). However, FLOSS has been a deliberate consideration in Belgian policy and policy-makers (listed in Table 12) have been explicit about the possible role of open standards as an intermediary step towards FLOSS in the future. The discussion of the Belgian case is structured in the following manner. We first undertake an historical description of the evolution of FLOSS public policy with necessary departures to explain the specific policies pursued by actors, a time series analysis of relevant events and policies, and a sociogram describing the policy network. Hall's model of policy change is brought into play, along with theories of policy learning, to understand the changes in policy focus over the last 10 years. We also link the policy network as a possible intervening variable in affecting policy change in the Belgian case. The comparative analysis of this case with the others in this study, and tests of the hypotheses are left to a later chapter.

### 6.2. The Belgian Policy Shift

Prior to 2003, there were few concerted policy efforts at the federal level to establish a role for FLOSS in Belgium. As observed in the cases of other governments,

FLOSS technologies had entered “through the back door” and were being widely used in various capacities. However, the policy implications of FLOSS’ social, legal, and technical freedoms had not been recognized broadly and tackled systematically. At the same time, Belgian governments at all levels were facing challenges of how to share and maintain public data in three languages (French, Dutch, and German) between various levels of the federation and between Belgian and other European governments – including with supranational organizations such as the EU. A 2001 European Commission study on the use of FLOSS by the European public sector compared the experiences of France, German, Belgium, and Spain with FLOSS. In describing the Belgian experience the study assessed the overall importance of the strategic ICT direction set by the federal government and how the latter had laid the groundwork for an expanded role of government in developing IT for the benefit of the citizenry and the economy. Aside from a brief treatment of FLOSS by the National Joint Committee on Barriers to the Information Society in 2001 followed by another study, no major or systematic policy with respect to FLOSS developed (Schmitz, 2001). A number of regional-level efforts and initiatives did undertake FLOSS implementation in the form of technical projects or formalize policy supportive of FLOSS. An example of the former (described in the aforementioned EC study) was the use of FLOSS by the Brussels region as part of its technical infrastructure and its recognition in procurement (Schmitz, 2001). However, these technical deployments were, by and large solutions to specific and individual problems and were not part of broader set of policy deliberations or frameworks within which federal policy around FLOSS could be identified.

A proposal on the use of FLOSS came before the General Assembly of the French-speaking community of Brussels (COCOF) in 2003 but was not voted upon after the Council of State determined it would run counter to procurement legislation (ePractice, 2003). A number of other unsuccessful efforts at legislating FLOSS adoption in the public administration appeared in late 2003, taking the form of a proposal presented in the House of Representatives (0244/01) and one presented to the Senate.

Policy of significance with respect to a formal role for FLOSS in Belgium at the federal level has been developed with the primary involvement of Fedict -- le Service public fédéral Technologie de l’Information et de la Communication or Federale Overheidsdienst voor Informatie- en Communicatietechnologie. Fedict was created by a

royal decree in May of 2001 and a number of roles defined within a “virtual matrix”: specifically to “develop and promote common e-government strategy”, provide support to other parts of government in implementing this strategy, IT architecture and standards development, and “Manage the relationships with other governments with respect to IT and e-government.” (Strickx, 2008)

The virtual matrix concept is notable and requires more explanation. Bureaucratic organizations take a number of forms such as the line-staff model which is structured by functional staff units and where each employee only has a single functional manager; functional, where employees potentially are accountable to their own business unit and that of a functional unit; and more recently the project organization, which is structured around the delivery of projects and their limited, specific goals (Raadschelders, 2008). Matrix organizations are a variant of the project organization and are characterized by the use of resources (informational, staff, financial) drawn from across organizational boundaries, while remaining accountable and responsible to their home organizations and coordinated at the level of the project or initiative (PMI, 2008). Its use as an organizational principle indicates that Fedict does not have the capability to make and implement policy directly or on behalf of other departments. The “virtual” element of the organization describes how this matrix extends beyond the formal organizational boundaries of Fedict to include resources drawn from other public agencies.

In 2004 Fedict was involved in the development of a framework, known as Belgif or the Belgian Government Interoperability Framework, to facilitate connectivity between governmental IT systems and with the ultimate goal of improving information flows within government and between the government, the citizenry and business. This framework was conceived with the assistance of IT managers from Foreign Affairs and Economic Affairs departments (Strickx & Jochmans, 2005). A major pillar of Belgif is open standards, because they are necessary for the technical interoperability of systems and the interchange of documents within and between organizations (Strickx, 2007). It was within the context of the promotion of open standards that Fedict's future policy deliberations with respect to FLOSS were conducted.

This was part of a deliberate decision to not make explicit policies dealing with FLOSS, and instead focus upon open standards for information exchange between

departments and agencies within the federal government. These deliberations culminated in the decision by the Council of Ministers to approve the Open Document Format (ODF) in 2006 (Strickx, 2008). The adoption of this format was to be phased in over a period of time, allowing for a transition from existing document standards, and non-exclusive: other standards would be permitted assuming they were ISO-approved, were not implemented by a single vendor, and compatible with ODF (Strickx, 2007). As part of this initiative the Belgian government funded projects to test a variety of conversion software for major office suites to support the ODF.<sup>13</sup>

**Table 11. Belgian Policy and Goals**

Policy	Objectives
Study on OSS	Evaluate and compare FLOSS use.
Study on the use of OSS in the public sector	Evaluate and compare FLOSS use.
FLOSS Proposal	Mandate use of FLOSS within administration and reduction of costs of software acquisition
BELGIF	Interoperability between government departments and agencies. Reduce vendor dependencies.
Approval of ODF	Interoperability between government departments and agencies.
Memorandum of understanding (MoU) with the Netherlands	Interoperability between governments. Share knowledge about policy and technical experiences

There are a number of notable aspects to the Belgian ODF standard policy decision. The first is the process by which this policy was developed and implemented. The initiators

<sup>13</sup> The technical comparison between various office suites done by the Belgians was described at a high level in this presentation by a Fedict representative: ODF plug-ins and other solutions to implement the Belgian open standards directive. Peter Vandenabeele, Fedict, Barcelona, September 20, 2007.

were a group of federal IT managers and directors who comprised the membership of the Permanent IT Steering Group (PICTS) (Strickx, 2007). Fedict played a consensus-building role and according to Peter Strickx, the decision-making process was “bottom-up” driven, from PICTS through its chair and to the Council of Ministers.

Another noteworthy aspect is the very specific form this policy took. It was a “loose” directive, not compulsory, and largely contingent in terms of its effectiveness upon the buy-in and active participation by federal agencies. Open standards were mandated but the choice is left up to each federal administration whether they took the form (were implemented as part) of FLOSS or a commercial solution. The IT landscape in the Belgian federal government is similar to other groupings of large public organizations in terms of the heterogeneity of the systems involved. In addition to the commonly found set of Microsoft-based operating systems and applications, there are implementations of FLOSS localized in certain federal entities -- for example, the Justice department use of the GNU/Linux operating system -- but these implementations have little bearing upon the open standards policy direction and do not constitute evidence of a broader federal policy supporting FLOSS.

**Table 12. Belgian Policy Actors**

<b>Actor</b>	<b>Type</b>
National Joint Committee on Barriers to the Information Society	Public
Unisys Belgium	Private
European Commission	Public
General Assembly of the French-speaking community of Brussels (COCOF)	Public
Free Software Foundation Belgium	Private
Fedict	Public
Foreign Affairs	Public
Economic Affairs	Public

Actor	Type
Council of Ministers	Public
PICT	Public
Council of State	Public
Senate	Public
House of Representatives	Public

**Table 14. Belgian Actor-Event Matrix**

Policy Actors	Policy Events					
	Study on OSS	Study into the Use of OSS in the Public Sector	FOSS Proposal	BELGIF	Approval of ODF	MoU with the Netherlands
FEDICT	0	0	0	2	2	0
Foreign Affairs, Foreign Trade, and International Cooperation	0	0	0	2	0	0
Economy	0	0	0	2	0	3
Permanent ICT Steering Group	0	0	0	0	3	0
Unisys Belgium	0	2	0	0	0	0
Free Software Foundation Europe	0	0	0	0	0	0
IDABC	0	3	0	0	0	0
Council of Ministers	0	0	0	0	2	0
National Joint Committee on Barriers to the Information Society	3	0	0	0	0	0
Council of State	0	0	3	0	0	0
COCOF	0	0	3	0	0	0

**Table 13. Belgian Policy Events**

Event	Date
Study on OSS	2000
Study on the use of OSS in the public sector	2001
FLOSS Proposal	2003
BELGIF	2004
Approval of ODF	2006

Event	Date
Memorandum of understanding (MoU) with the Netherlands	2009

There were few new or significant policy developments at the federal level in Belgium after the approval of ODF. The most recent case of policy activity was a Memorandum of Understanding (MoU) signed in April 2009 between the Belgian minister for Economy and Reform and the Dutch minister of Economic Affairs (Hillenius, 2009). This MoU was an agreement by the two states to coordinate their policies with respect to open standards *and* open source, specifically to “promote open standards and open source internationally”. This built largely upon the existing work that Fedict and its stakeholders had done with respect to ODF. Indeed, the Dutch disclosed that their open standard and open source program organization, Nederland Open in Verbinding (NOiV) had been collaborating with its Belgian counterpart on an ODF implementation.

Federal policy that deals explicitly with FLOSS, for example in mandating its use in public administration, has not successfully passed the development stage. And the adoption of ODF and open standards policies prevent the Belgian government from “positively discriminating” in favour of FLOSS (Strickx, 2008). That said, FLOSS considerations are part of the Belgian federal IT policy process, however, the resulting policies are preponderantly oriented around open standards. The relationship between policies, actors, and events for the Belgian case are summarized in Figure 6. The actor-actor and actor-event matrices and policy network graph reveal a relatively low density network with participants (generally) not in repeating interactions with others, clustered around a small set of policy events.

However, despite the decade-long evolution towards policy focus on open standards, there are still some opinions held by network actors that the benefits of FLOSS will be realizable by Belgium in the long term. In a discussion with Fedict staff, a number of policy objectives were expressed: open standards are seen as a way for the Belgian government to break its dependency upon single vendors for IT systems (Fedict, 2008 interview). Open standards, in theory, should allow a selection from a broader

range of systems, spurring price and feature competition between vendors, and provide for the opening and sharing of data, etc. The fostering of Belgian IT firms was also mentioned as a possible benefit of open standards. More precisely, small Belgian companies could now provide important software to the “operational” side of government and would be on an even footing with that of large multinational companies, because of the opening of specifications for technology, and the consequent lowering of barriers to development and sale. Finally, and perhaps most interestingly, open standards *were cited as a possible route to FLOSS*. Unfortunately, the interviewee didn’t provide more detail on this point and the policy artefacts and documentation that were inputs into the Belgian case did not provide any clarification of this observation.

### **6.3. The Belgian APES and Policy Network Graph**

A body of qualitative data in the form of Belgian policy documents, newspaper and journal articles, blog postings, email communications, complemented with information from surveys and interviews provided the source materials for the Belgian Actor-Process-Event Scheme and the policy network graph that was derived from it. Public reports and presentations by a number of Fedict staff were a fruitful source of data, for example. We culled a list of policy network actors and the events in which they participated. These were initially listed in tables of actors, actor types, and events, and years of occurrence that have been reproduced in this chapter. The information was used in the comparative analyses done in later chapters as well.

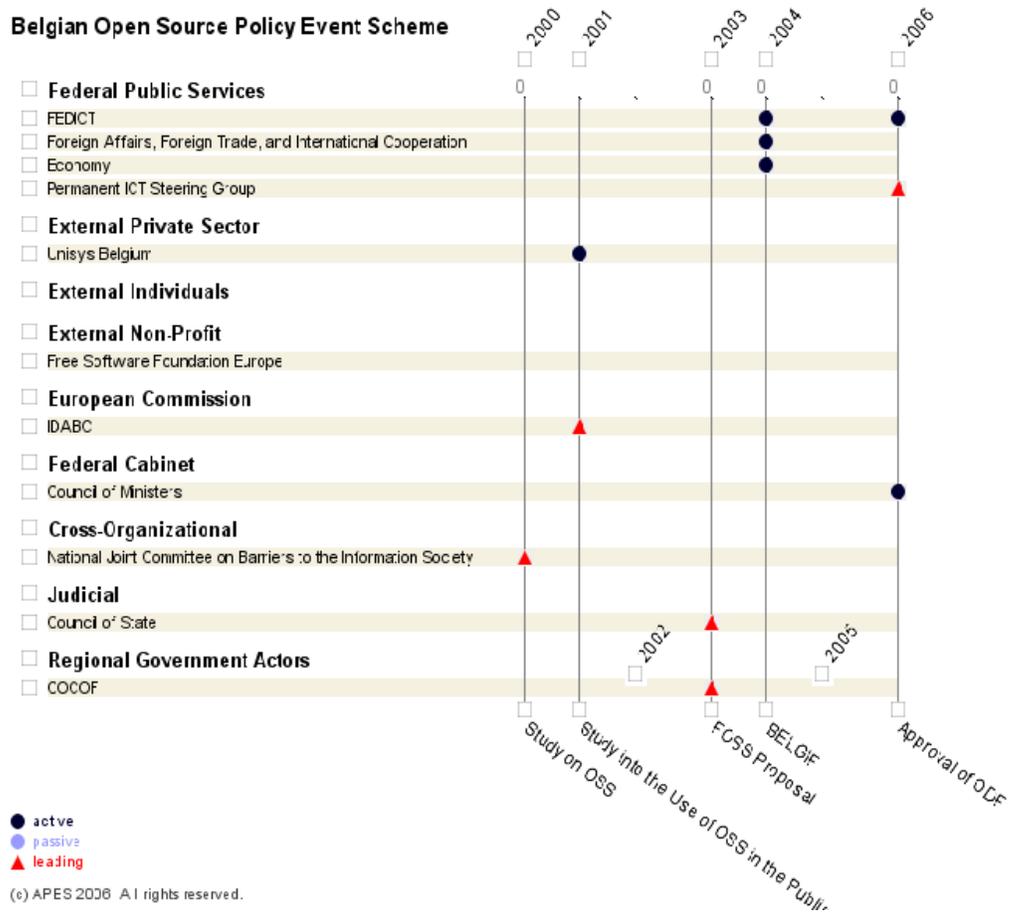
Thereafter, each actor was assigned an integer value based upon an assessment of their participation in a policy event: a one, two, or three, corresponding to a passive, active or leading role. The rationale behind this classification was described in section five. For ease of analysis and presentation, these actors were grouped into higher level categories, including federal public services, the private sector, individuals representing themselves, non-profit, etc. All of this data – event, actor, and actor role assignments were processed using Serdült and Vögeli’s APES tool software to produce the graphical APES for the Belgian case. The APES tool also generated a pair of matrices relating actors to other actors, and actors to events. The former took the form of a standard social networking matrix, arraying actors against other actors and in cases

where actors participated in the same event, scoring them as a one (or “true”) to represent a relationship. The latter produced a matrix of all events by actors and their participation roles. These matrices were, in turn, fed through a standard social networking tool Ucinet to produce a set of inputs to a graphing utility (Netdraw) to produce the policy network graph. This depicted the set of actor relationships in the Belgian policy network, illustrating actors with of low degrees of connectivity, for example the European Free Software Foundation versus those highly connected to other actors and central to the policy network and its process, such as Fedict.

The Belgian network graph reveals a number of interesting aspects of that particular subsystem. First, this is clearly a small network, particularly when compared to the number of participants in other networks dependent upon technical/scientific expertise (e.g. the C40 climate network in Lee and van de Meene, 2012; information/advice networks in marine protection policy in Weible and Sabatier, 2005). There clearly are three major clusters of actors associated with multiple events and a set of individual actors that each participated in one event. The former were the IDBAC-Unisys duo, the Council of State-COCOF duo, and the cluster of actors (various ministries, Council of Minister, PICT) around Fedict. The latter are composed of the National Joint Committee on Barriers to the Information Society and the Free Software Foundation Europe. The actor relationships are evident from the network’s graphical display and can also be determined through inspection of the policy events summary for the Belgian case. From the network graph we can see that the densest cluster has Fedict as its centre and the majority of the connections are through that organization. Other actors in that cluster appear to communicate with each other through that node.

This is significant: it reveals that in the Belgian case Fedict is that policy network’s most central and important actor. It draws influence by virtue of being connected to the largest number of actors and participating in the majority of policy events.

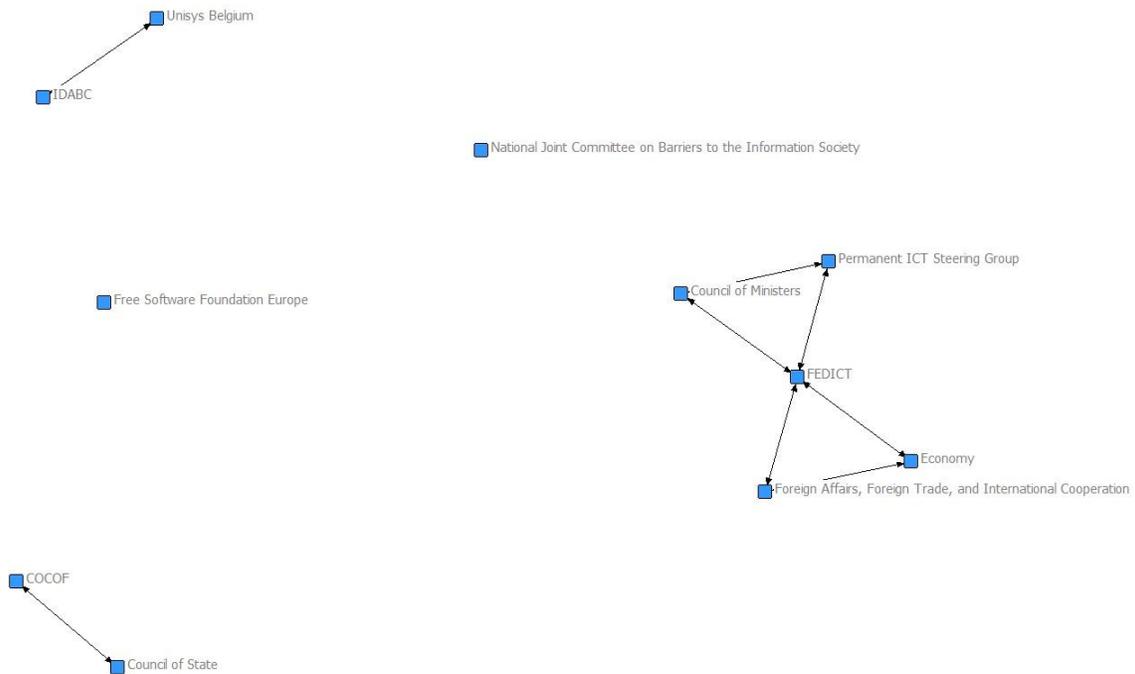
**Figure 6. Belgian Actor-Process Event Scheme**



**Table 15. Belgian Actor-Actor Matrix**

	Policy Actor Relationships										
	FEDICT	Foreign Affairs, Foreign Trade, and International Cooperation	Economy	Permanent ICT Steering Group	Unisys Belgium	Free Software Foundation Europe	IDABC	Council of Ministers	National Joint Committee on Barriers to the Information Society	Council of State	COCOF
FEDICT	0	1	1	1	0	0	0	1	0	0	0
Foreign Affairs, Foreign Trade, and International Cooperation	1	0	1	0	0	0	0	0	0	0	0
Economy	1	1	0	0	0	0	0	0	0	0	0
Permanent ICT Steering Group	1	0	0	0	0	0	0	1	0	0	0
Unisys Belgium	0	0	0	0	0	0	1	0	0	0	0
Free Software Foundation Europe	0	0	0	0	0	0	0	0	0	0	0
IDABC	0	0	0	0	1	0	0	0	0	0	0
Council of Ministers	1	0	0	1	0	0	0	0	0	0	0
National Joint Committee on Barriers to the Information Society	0	0	0	0	0	0	0	0	0	0	0
Council of State	0	0	0	0	0	0	0	0	0	0	1
COCOF	0	0	0	0	0	0	0	0	0	1	0

**Figure 7. Belgian Policy Network Graph**



When FLOSS policy over the last decade is examined through the lens of Hall's policy change model an interesting picture with respect to its progression appears. Belgian FLOSS policies and their commensurate objectives or goals are summarized in Table 11. From a review of that summary, a clear progression from policy activities exploring FLOSS to that oriented primarily upon open standards becomes evident. The Belgian government's public statements about their policy objectives over the ten year interval reveal policy changes, moving from tentative, explorative declarations about the application of FLOSS in the public service to that supportive of open standards. How did this policy focus develop? And what was the role, if any, of the policy network in this shift of policy?

In order to answer these questions in the case of Belgian policy we draw upon Hall's concepts of policy change. The key variables in his model are the objectives that underpin policy, the instruments used to achieve those goals, and the settings in which these instruments are used (Hall, 1993). We should recall that first-order change is where the settings in which the policy instruments operate change and in second-order change the form or type they take changes. Both of the aforementioned are found in instances of "normal policymaking" in Hall's parlance. Finally, in Hall's concept of third-order policy change, the change is in the goals or objectives of policy, and reflects a change in policy paradigm.

Assessing the Belgian policy content, instruments, and objectives through Hall's lens reveals a number of changes over the ten-year interval. Table 16 summarizes these policies, and matches each to the type of policy change observed. Intervals starting from  $T_0$ , corresponding to the first observed FLOSS policy in this case mark off the policy events. The first two policy events  $T_0$  and  $T_1$  were evidence of the initial establishment of federal government interest in FLOSS. Belgian governmental organizations, associated private sector interests, and individuals that would be involved in later policy, participated in a pair of studies that were effectively exploratory or research-oriented policy activities. Their objectives were to assess and learn about the state of FLOSS use by Belgian organizations and European government, respectively. No policy change can be attributed to either because together they were the first manifestation of policy for Belgium and did not result in any formally administrative, legislative, or institutional arrangements. Indeed the second study was not even undertaken officially by a Belgian

agency but had participation by actors who would appear in later policy events. However, by virtue of actor participation and their role in later policy, the two studies were evidence of recognition of the importance of FLOSS and its possible role as a set of solutions to problems faced by the Belgian federal government and an epistemological “kernel” around which policy network actors could begin to undertake their research, lobbying, and coalition-building activities. The COCOF, House of Representatives, and Senate proposals represented by  $T_2$  were the culmination of policy developed to mandate or through legislation formalize the use of FLOSS within the federal administration with the objectives of reduction of costs of software acquisition and support of domestic software firms. This event would appear to be the first example of policy formation reflecting a change in direction from previous policy events – albeit one unsuccessful in achieving its intended policy goals. The policy proposals in  $T_2$  would have implemented a set of compulsory policy instruments for FLOSS selection, procurement and use for the federal administration and reflected a set of tactical and strategic objectives on the part of its proponents in the policy network. From an analysis of their content it becomes evident that the proponents of these proposals had drawn upon a common base of understanding about the use of FLOSS as a disruptive technology, with benefits outside those provided by proprietary software, with a development and distribution model that would have specific benefits for Belgium. The lessons learned by administrations in other jurisdictions were also cited. What this suggests is that  $T_2$  represents a culmination of previous instances of policy learning on the part of its proponents.  $T_0$  and  $T_1$  were examples of both social learning and lesson drawing as proposed by Heclo and Richard Rose, and summarized by Bennett and Howlett (1992) however, without attendant policy changes.  $T_2$  can be interpreted as an attempt at a Hallsian first-order policy change, within the social learning context established by previous research and analysis efforts on the part of network-connected or associated members.

The creation of the Belgian Government Interoperability Framework in 2004 was a paradigmatic shift versus earlier policy work. The previous focus on FLOSS was largely abandoned in favour of a more nuanced set of objectives based around system and data interoperability.

**Table 16. Belgian Policy Change**

Time	Policy	Nature of Change
T <sub>0</sub>	Study on OSS	N/A
T <sub>1</sub>	Study on the use of OSS in the public sector	N/A
T <sub>2</sub>	FLOSS Proposal	First-order
T <sub>3</sub>	BELGIF	Third-order
T <sub>4</sub>	Approval of ODF	First-order
T <sub>5</sub>	Memorandum of understanding (MoU) with the Netherlands	Second-order

**Table 17. Belgian Policy Learning**

Time	Policy	Evidence of Learning?
T <sub>0</sub>	Study on OSS	Social Learning and Lesson Drawing
T <sub>1</sub>	Study on the use of OSS in the public sector	Social Learning and Lesson Drawing
T <sub>2</sub>	FLOSS Proposal	Lesson Drawing
T <sub>3</sub>	BELGIF	Social Learning
T <sub>4</sub>	Approval of ODF	Lesson Drawing
T <sub>5</sub>	Memorandum of understanding (MoU) with the Netherlands	Lesson Drawing and Government Learning

As described above, Belgif (T<sub>3</sub>) was a collaborative effort between Fedict, and the ministries of Foreign Affairs and Economy. The policy problem of system and data inoperability in the complex IT environment faced by the Belgian government, and general view that open standards – not FLOSS – would be a more suitable technical solution to this problem and one better suited to the technical and managerial/organizational heterogeneity of government, became the predominant factor in policy. Notable is the appearance (see Figure 6) of this new constellation of

individuals and organizations involved in the policy process at time  $T_3$ , consistent with Hall's statement that a new paradigm is only "institutionalized" once the proponents of the new paradigm gain control over policy-making and can restructure the policy process to support that paradigm.

The gelling of knowledge around open standards on the part of influential decision-makers in Fedict and Foreign Affairs and Economy, was evident in the creation of Belgif. The approval of ODF in 2006 ( $T_4$ ) by Cabinet reinforced this consensus and validated the influence of this set of actors in the network. The voluntary nature of the policy instrument (an open standard for document formats) did not detract from the importance of this policy as indicative of a sea-change in Belgium. The approval of ODF was a case of first-order policy change, given its incremental nature and the fact that the change in instruments was minor. It progressed from a framework to a prescribed standard, but the overall policy objectives remained consistent with the initial goals set out by Belgif. Finally, the most recent policy event in the decade under review,  $T_5$ , a memorandum of understanding (MOU) with the Netherlands, again demonstrated the institutionalization of the new paradigm, but interestingly enough, suggests that in addition to reflecting lesson learning there is an element of government learning there too. Indeed, the actors involved in the policy specifically mentioned the drawing upon and trading in experiences in open standards between policy-makers and administrative/technical staff in the two jurisdictions. It also referred to an explicit harmonization of process, reflected in cooperation over policy objectives, and potentially instruments, between the two governments with respect to open standards *and* open source (Hillenius, 2009).  $T_5$  was a case of second-order policy change as the context and form of policy instruments changed marginally, but the policy objectives established in Belgif and confirmed by the ODF standard were not challenged, nor was there any evidence of the discovery of information exogenous to the policy network that contradicted or brought into question the existing paradigm. There was also no effective opposition or set of organized interests situated outside the network that could challenge the epistemological foundations that were in place.

## 6.4. Conclusion

The Belgian case furnishes the investigation with its first significant set of evidence of the importance of policy networks in facilitating policy change. The Belgian policy network was initially composed of activities focused upon research and studies into the feasibility of FLOSS use by the federal administration, culminating in an unsuccessful submission to COCOF. Thereafter the policy network's focus turned to open standards with a shift to Fedict as the central actor in this network. While this was a change in policy objectives, the network's previous experience provided a base of knowledge which it could leverage into this new policy area.

Admittedly, there were some discontinuities in the Belgian network membership, evident in the intervals between policy events. Between the changes in policy objectives, there appeared to be a shift in the number and types of actors in the network, representative of the movement of actors in and out of the subsystem, and the ascendance of certain interest groups within the network. That said, there is some measure of filiation with respect to individuals involved in FLOSS policy work and, from the survey and discussions it was evident that a number of actors played roles in early policy events and also were involved in the later policy events that dealt exclusively with open standards. In addition to the movement of actors between organizations there were also cases of knowledge transfer between network actors in the form of reuse of policy artefacts and documents generated by earlier policy activities (Fedict Interview, 2007; Free Software Foundation Interview, 2007). These movements of actors and ideas between organizations over the interval are not evident in the Belgian policy network graph.

The policy network did appear to be a significant factor in facilitating policy learning in its three variants – social learning, lesson drawing, and to a lesser extent, government learning. It provided a forum for the analysis of FLOSS and open standards and an arena for interests to express and evolving a dominant discourse that eventually became institutionalized in a set of policies significantly more supportive of open standards than open source software. The precise role of the policy network and the relationship between its structure and the resulting policy will be assessed more systemically in later chapters. But the empirical evidence from the Belgian case

suggests that the policy network was a key variable in influencing a paradigm change – change that determined the ultimate form of policy in that state. It is to Canada – the next case in this investigation -- that the focus turns to see if a similar outcome was observable there.

## **7. The Canadian Case**

### **7.1. Introduction**

Over the last two decades, FLOSS has made its way into most governmental organizations, often through a “back door” in the form of technical solutions to specific operational problems or as a way of implementing technology at lower cost within the budgetary constraints being faced by most public organizations. The Canadian federal government is no exception and recent analysis has confirmed that FLOSS is used there by a variety of departments (Perry & Margoni, 2010). However, while FLOSS has found fertile ground in federal government IT operations – generally taking the form of flexible and comparably less expensive solutions to technical problems than proprietary software -- it has not appeared on the policy agenda in Canada until relatively recently. The Canadian case is structured identically to the Belgian that preceded it: the first section is composed of a description of the evolution of FLOSS public policy, accompanied by explanation of the specific policies observed and a time series analysis of relevant events and policies. The policy network is describes through the Canadian APES, related actor-event and actor-actor matrices, and a sociogram. Hall’s model of policy change is combined with theories of policy learning, in an attempt to understand the changes in Canadian policy over approximately the last decade.

### **7.2. Canadian Policy**

The reality of the increasing use of FLOSS in the federal government and the visibility of it on the agendas of other states were major motivators for one of the first public examples of deliberations about the role of this software in Canada. The “Open Source Software Solutions Showcase” (see Table 18), sponsored by Public Works and Government Services Canada (PWGSC) and held in May 2002, encompassed a broad agenda including discussions around the IT architectural implications of open standards

and open source, FLOSS business models, and software procurement challenges, in addition to hosting seminars on specific FLOSS technologies. Also of note was that the agenda included a keynote address given by the Belgian architect of the 2001 European Commission-funded *Study into the use of Open Source Software in the Public Sector*, Patrice-Emmanuel Schmitz (PWGSC, 2002).<sup>14</sup>

FLOSS appeared in a more significant manner on the policy agenda of the federal government later in 2002 when it issued a call for proposals to study its business opportunities. This solicitation for analysis work was driven by Industry Canada who claimed primary ownership of the results in order to assess the competitiveness of Canadian IT firms, with Treasury Board Secretariat also interested in them from the perspective of open source business models and the implications for enterprise IT architecture (Dal Molin, 2003).

**Table 18. Canadian Policy and Goals**

<b>Policy</b>	<b>Objectives</b>
Open source solutions showcase	Evaluate and compare FLOSS use.
FLOSS Business Capabilities RFP	Evaluate and compare FLOSS use.
E-Cology Study	Evaluate and compare FLOSS use.
GOC Proposed Position on OSS and Next Steps	Evaluate and compare FLOSS use
FLOSS Overview and Guidelines	Provide an assessment of FLOSS capabilities. Establish conditions for further FLOSS investigation.
FLOSS Position	Interoperability between government departments and agencies.

<sup>14</sup> The conference agenda was a source of data on event participants and the topics of their presentations.

Policy	Objectives
Request for Information (RFI)	Solicit information on no-charge software capabilities for government use.

The result of the process was an external study conducted by e-Cology Corporation and published in 2003. The study was a portion of a broader investigation into open source business opportunities co-sponsored by Industry Canada, PWGSC and the Treasury Board Secretariat, from which each department or agency, respectively, would have been interested in FLOSS from its particularly perspective. This study included a survey of FLOSS usage in Canada – in the private and public sector – and queried both private and public technical and business professionals' view of the future of FLOSS in Canada (Dal Molin, 2003) in a workshop. The e-Cology work revealed a number of interesting findings. Focusing on those relevant to the development of public policy at the federal level, it characterized the existing policy environment as lacking (Dal Molin, 2003). There were a number of examples of FLOSS implementations at the federal level but the absence of comprehensive policy to manage them was seen as a major impediment to the benefits of FLOSS being realized across government.

The e-Cology study was only one of a set of analyses. Scientists at Defence Research and Development Canada (DRDC) had been evaluating FLOSS in parallel – first within the department and then broadening their analysis to other federal government organizations – making a significant contribution to the accumulation of work at the federal level (DRDC, 2006 – interview) The public output of this process was an overview report and a set of preliminary guidelines for FLOSS published in 2004. The overview was, despite what the name suggests, a comprehensive survey of technologies, licenses, development methodologies, and a comparison of FLOSS polices in other national governments (DRDC, 2004). DRDC described a number of general guiding principles and this report made a pair of specific recommendations to the Canadian government, the most salient of which was a progressive or incremental FLOSS adoption strategy – primarily focused on its use and development. The second recommendation was for the federal government to consider FLOSS in addition to proprietary software products, arguing that there were no substantive barriers to adoption presented by any of the departments or agencies actively involved in FLOSS

policy (Industry Canada, PWGSC, Treasury Board Secretariat and DRDC) (DRDC, 2004).

The DRDC report and recommendations were published after the Chief Information Officer (CIO) Branch of the Treasury Board Secretariat released its position on FLOSS in 2004, citing one of the policy implications of that position (DRDC, 2004). A number of the initiatives undertaken previously by federal bodies were inputs to the Treasury Board Secretariat's policy on FLOSS. The current state of FLOSS policy at the federal level in Canada is largely centralized in the Treasury Board Secretariat and the "owner" of the most significant elements of policy in this area. This mandate is derived from the financial controls that the comptroller has over IT expenditures in the federal government and the responsibility held by the CIO Branch for the Federated Architecture Program (FAP). FLOSS, like the proprietary software used by the federal government, must be compliant with the FAP. Specifically,

Acquisition and usage decisions must align with the GOC Federated Architecture, while respecting federal legislation, agreements, guidelines and maximizing the GOC IT investments and opportunities. (Treasury Board Secretariat, 2003)

FAP encompasses a set of organizing principles that govern the design, deployment, and maintenance of IT systems, including their integration across application and organizational boundaries. The leading role played by the Treasury Board Secretariat as a consequence of this mandate is depicted in Figure 8.

The FAP does not differentiate among the diverse business models for software development and any software component developed or obtained for use within the government of Canada must engage viable and appropriate standards-based technologies. (Treasury Board Secretariat, 2003)

Consequently, the federal government's major policy with respect to FLOSS is to deliberately not assign it any preferential role. Current policy clarifies that FLOSS be governed by the same IT architectural and financial process accorded proprietary software. Government departments and agencies are free to acquire and utilize FLOSS software to solve their own business problems as long as its use conforms to FAP and the standards and process it prescribes (Treasury Board Secretariat, 2004).

Furthermore, the major consideration of that policy is for FLOSS to reduce costs of IT acquisition and implementation.

**Table 19. Canadian Policy Actors**

Actor	Type
Public Works and Government Services Canada (PWGSC)	Public
Industry Canada	Public
E-Cology	Private
Patrice-Emmanuel Schmitz	Private
Treasury Board Secretariat	Public
GOSLING	Private
CGI	Private
Defence Research and Development Canada (DRDC)	Public

**Table 20. Canadian Policy Events**

Event	Date
Open source solutions showcase	2002
FLOSS Business Capabilities RFP	2002
E-Cology Study	2003
GOC Proposed Position on OSS and Next Steps	2004
FLOSS Overview and Guidelines	2004
FLOSS Position	2004
Request for Information (RFI)	2009

The final Canadian policy event observed in the period under review was the PWGSC's release of a request for information (RFI) on "No Charge Licensed Software" in January 2009 which also was the first time, to date, that the federal government had requested specific information about such software (Chung, 2009). In the overview to the RFI the request was described in the following manner:

Canada has a Request for Information (RFI) related to No-Charge Licensed Software (typically referred to as Free and Open Source Software or FOSS and also applicable to freeware). No Charge Licensed Software means Licensed Software that is available at no charge for the Licensed Software and is typically made available as a free download from the Internet. (PWGSC, 2009)

While specifically citing FLOSS as an area of interest, the RFI language lacked definitional clarity. No-charge licensed software can be commercial or proprietary software available at zero cost from the internet. Examples of no-charge licensed software that falls under this category include Oracle's Java virtual machine (VM) which is broadly used in IT and in various computing and communications devices, Microsoft Internet Explorer and extension software or "plugins" that permit viewing of specific content on the web such as Adobe Flash. The absence of distinction between FLOSS and free proprietary software in the PWGSC definition of no-charge licensed software was noted and a number of observers communicated their concern that the benefits of FLOSS would be unrealized or further obfuscated in responses to the RFI made by organizations proposing commercial solutions (Chung, 2009; Gifford, 2009).

Since 2009 there has not been any other significant federal government policy that specifically addresses FLOSS issues. This software continues to be implemented within the federal government, taking the form of capable and cost-effective point solutions. One example of this kind of project is the PWGSC's procurement portal *BuyandSell.gc.ca*, built upon the FLOSS content management system (CMS) Drupal, and implemented with the assistance of an Ottawa-area firm.. However, it appears that these projects are not situated within a framework of understanding of the specific benefits offered FLOSS, nor are they informed by broader policy guidance specifically relevant to this type of software. A survey administered by Perry and Margoni in 2010 asked questions about FLOSS use by a number of IT groups in federal departments and

concluded that guidance around how to evaluate the benefits of FLOSS and make decisions not solely based upon cost considerations was lacking (Perry & Margoni, 2010). This lack of shared knowledge with respect to the suitability of FLOSS may be a causal factor in the paucity of constructive and progressive FLOSS policy in Canada.

Canadian survey respondents cited a number of related reasons for the lack of FLOSS policy. One set of replies opined that the benefits and disadvantages of FLOSS are not objectively presented to decision-makers (DRDC interview, 2006). One key contact in the Treasury Board Secretariat emphasized the necessity of collaboration between to key (e.g. the relevant) decision-makers as a prerequisite for policy change, stating, "Just because technicians get together doesn't mean policy types do." (Treasury Board Secretariat interview, 2007)

Another set of survey respondents, from two different organizations within the federal government, suggested that the tight integration of the Canadian IT sector with that of the United States market made Canadian policy-makers less interested in the economic or domestic industrial support benefits of FLOSS pursued by other countries such as Brazil (DRDC survey response, 2006; Treasury Board Secretariat survey, 2007).

Finally, a number of practical challenges with respect to integrating FLOSS into the Canadian government were noted: specifically the reluctance of procurement organizations to have to acquire and secure support for software products for which there might not be a vendor. Procurement departments want a vendor with whom to work, centralized organizations with responsibility for FLOSS who will indemnify the software and protect the government against the financial and operational risks that could result from IP claims brought against the technologies they use. A significant perception of legal, procurement, or implementation risk associated with FLOSS exists within the minds of decision-makers, creating further barriers to FLOSS acceptance.

In combination, these observations support the idea that, at least in the Canadian case, that the development of a sufficiently large body of knowledge reinforced by a set of incentives that might lead to -- in one survey respondent's words -- a "tipping point

event” that would establish a broadly-shared policy consensus around a role for FLOSS did not occur.

### **7.3. The Canadian APES and Policy Network Graph**

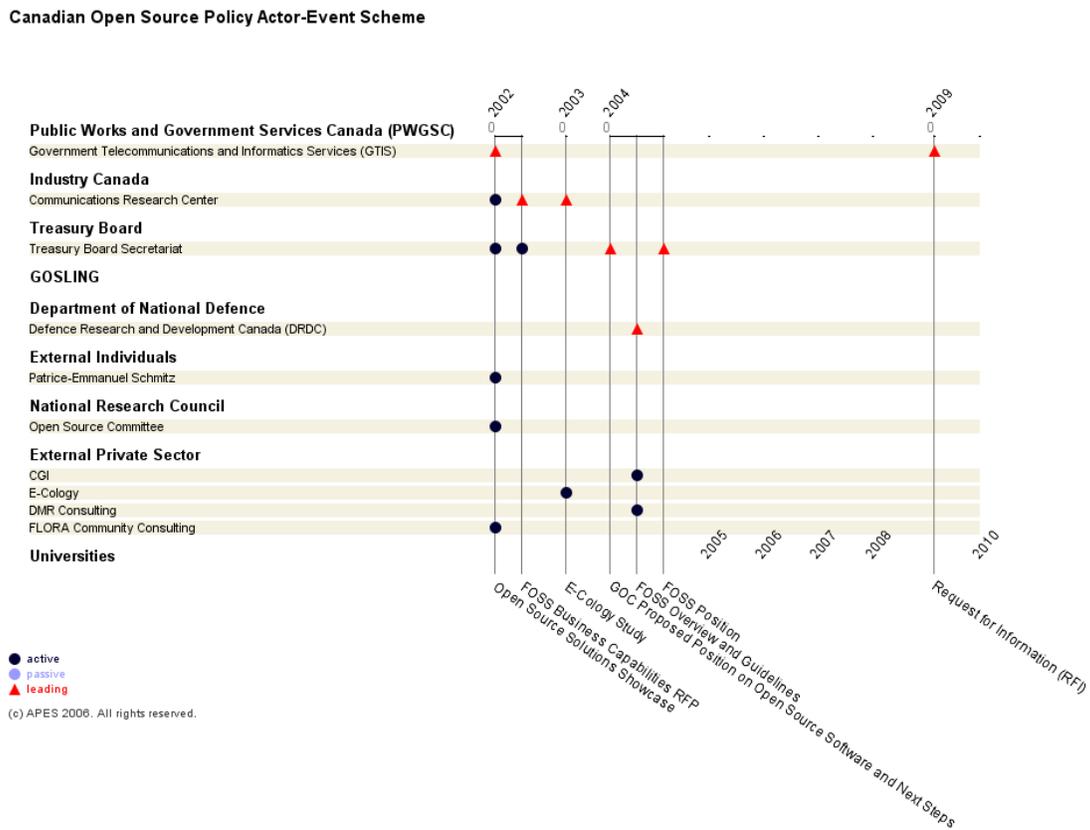
The Canadian APES and policy graph was derived in an identical fashion to its Belgian counterpart. Policy documents, newspaper and journal articles, blog postings, email communications, complemented with information from surveys and interviews provided the source materials for the Canadian Actor-Process-Event Scheme. Canadian policy artefacts were an excellent source of network actors because participation in events was well documented. From this body of data we established a list of policy network actors and the events in which they participated. Again, these were presented in the form of tables of actors, actor types, and events, and years of occurrence. These were reproduced in this chapter and were reused in the comparative analysis sections of this project.

The Canadian actors were also assigned integer values based upon an assessment of their participation in a policy event: a one, two, or three, corresponding to a passive, active or leading role. The combined set of data was processed using the APES tool software to produce the graphical APES and the two actor-actor and actor-event networking tool Ucinet to produce a set of inputs to a graphing utility (Netdraw) to produce the policy network graph. The relatively dense nature of the Canadian network, particularly when compared to the Belgian case, became evident upon the production of the former’s graph.

The high density of the Canadian policy network is largely the result of a single well-interconnected group of actors participating together in a number of events. There is also a smaller group of actors that was involved in earlier policy work. At its highest level, the network is characterized by two clusters of actors: the first (smaller) is DMR Consulting, the DRDC, and contract staffing from CGI; the second is the larger group composed of the Treasury Board Secretariat, Industry Canada, PWGSC and some private consulting firms (e.g. eCology). From the network graph we can see that the densest cluster has a number of relatively well-connected actors, namely the federal

departments. However, in comparison to the Belgian case of Fedict, there does not appear to be a major, central actor. Instead in larger cluster, we see network participation and interconnection relatively evenly distributed between actors. The Canadian policy network graph effectively communicates the relative positions of actors vis-à-vis each other, but what it does not reveal is the key role played by the Treasury Board. We cannot infer Treasury Board's importance to the development of Canadian FLOSS policy from the latter's centrality and position in the network graph alone. In later section we will see that this distinction is to be qualitatively from an analysis of some of the policy documents that describe this department's activities.

**Figure 8. Canadian Actor-Process-Event Scheme**



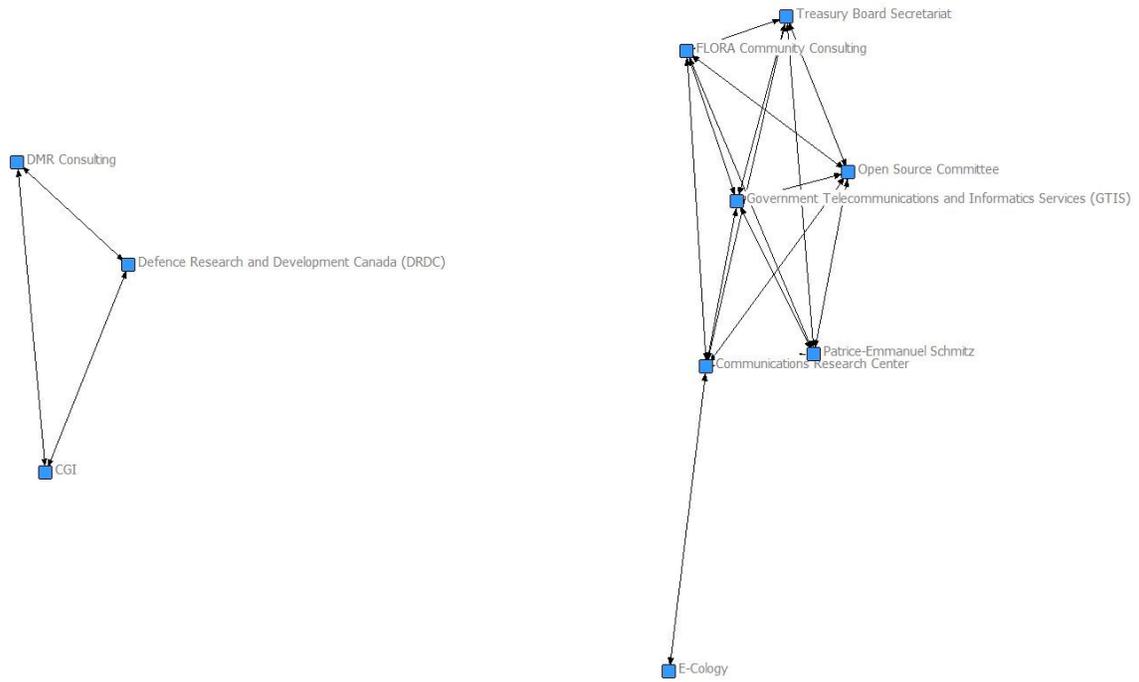
**Table 21. Canadian Actor-Event Matrix**

Policy Actors	Policy Events						
	Open Source Solutions Showcase	FOSS Business Capabilities RFP	E-Cology Study	GOC Proposed Position on Open Source Software and Next Steps	FOSS Overview and Guidelines	FOSS Position	Request for Information (RFI)
Government Telecommunications and Informatics Services (GTIS)	3	0	0	0	0	0	3
Communications Research Center	2	3	3	0	0	0	0
Treasury Board Secretariat	2	2	0	3	0	3	0
Defence Research and Development Canada (DRDC)	0	0	0	0	3	0	0
Patrice-Emmanuel Schmitz	2	0	0	0	0	0	0
Open Source Committee	2	0	0	0	0	0	0
CGI	0	0	0	0	2	0	0
E-Cology	0	0	2	0	0	0	0
DMR Consulting	0	0	0	0	2	0	0
FLORA Community Consulting	2	0	0	0	0	0	0

**Table 22. Canadian Actor-Actor Matrix**

Government Telecommunications and Informatics Services (GTIS)	Policy Actor Relationships									
	Communications Research Center	Treasury Board Secretariat	Defence Research and Development Canada (DRDC)	Patrice-Emmanuel Schmitz	Open Source Committee	CGI	E-Cology	DMR Consulting	FLORA Community Consulting	
Government Telecommunications and Informatics Services (GTIS)	0	1	1	0	1	1	0	0	0	1
Communications Research Center	1	0	2	0	1	1	0	1	0	1
Treasury Board Secretariat	1	2	0	0	1	1	0	0	0	1
Defence Research and Development Canada (DRDC)	0	0	0	0	0	0	1	0	1	0
Patrice-Emmanuel Schmitz	1	1	1	0	0	1	0	0	0	1
Open Source Committee	1	1	1	0	1	0	0	0	0	1
CGI	0	0	0	1	0	0	0	0	1	0
E-Cology	0	1	0	0	0	0	0	0	0	0
DMR Consulting	0	0	0	1	0	0	1	0	0	0
FLORA Community Consulting	1	1	1	0	1	1	0	0	0	0

**Figure 9. Canadian Policy Network Graph**



When viewed together the Canadian actor-actor and actor-event matrices and policy network graph reveal a relatively dense set of network participants grouped around an initial cluster and a subsequently clustered set of policy events.

## 7.4. Policy Change in Canada

In a manner identical to its application in the Belgian case, the lens of Hall's policy change model can be used to examine the evolution of Canadian policy. Tables 23 and 24 summarize the observed instances and types of policy change and policy learning respectively, arraying them against the policy intervals. The first tangible evidence of Canadian policy efforts appeared in the form of the 2002 Open Source Solutions Showcase Week ( $T_0$ ). This event provided a forum for parties in the public and private sectors to exchange information about FLOSS. One pair of scope statements confirmed the venue's role in information sharing between government department and agencies and public and private actors: "Advance the implementation of federated architecture goals, process, standards and methodologies among departments, agencies, and their partners." and "Serve as a catalyst for practical knowledge-sharing, organizational learning and innovation via public-private-education sector IT collaborations." (Open Source Solutions Showcase Week Schedule of Events, 2002). Event  $T_1$  is the 2002 RFP soliciting a service provider to analyze potential FLOSS business opportunities for the Canadian government and  $T_2$  was the consequent e-Cology study. This contract was sponsored by Industry Canada, PWGSC and the Treasury Board Secretariat, each bringing set of requirements for investigation to the study. Events  $T_0$  through to  $T_2$  cannot be effectively classified as examples of policy change because they are a similar set of policy events that reflect the research, analysis, and deliberations around the nature of and possible policy applications for FLOSS -- a part of the "puzzling" through of problems in Hecló's parlance. However, together they do constitute a set of activities that can be classified as social learning and, in the cases of the Showcase Week and the e-Cology study, also examples of lesson drawing. The social learning aspect of  $T_0$  through to  $T_2$  was the knowledge gained by Industry Canada, PWGSC, DND, and the Treasury Board Secretariat through the participation in forums of knowledge sharing, shared sponsorship of studies, and surveys of the FLOSS "landscape" outside of the federal government, including its communities of development

and practice, the sociology/anthropology of the FLOSS movement, and its use by Canadian and American non-profits, businesses, and foreign governments.

Lesson drawing was in evidence in the policy events  $T_0$  and  $T_2$ , although there were no policy instruments produced and thus no causal relationship between the two could be established. However, policy network members confirmed the presence of deliberate lesson drawing on the part of Canadian policy-makers in Treasury Board and Industry Canada, citing the example of Brazil's FLOSS policies as something that would *not* be likely in Canada, and noted the examination of the U.S. experiences with FLOSS as well. There are a number of general examples of Canadian policy makers drawing upon the experiences of other governments in their deliberations around specific implementations of FLOSS (Schick, 2006).

Activity that can be interpreted as significant policy change didn't appear until interval  $T_3$ , taking the form of the GoC's Proposed Position on Open Source Software in 2004. This DRDC-authored document recommended that FLOSS be given equal consideration alongside proprietary software in DRDC projects and be extended to other parts of DND progressively. The DRDC study architects cited a number of benefits, including avoidance of vendor lock-in, support for open standards and interoperability, and technical excellence. They also addressed the possibility of administrative or organizational constraints to the adoption of FLOSS, such as PWGSC procurement guidelines or Treasury Board Secretariat approved software standards and found none that would prevent FLOSS use (Charpentier, Côté, & Carbone, 2004).  $T_3$  is an example of first-order policy change because it reflects the shift from exploratory work to a set of tangible recommendations around policy goals and instruments.

The formalization of a role for FLOSS in Canada did not occur until the events associated with times  $T_4$  and  $T_5$ . The FLOSS Overview and Guidelines and FLOSS positions were developed in these intervals and defined the position of FLOSS within the federal government FAP, alongside proprietary software and within the architectural guidelines and Treasury Board Secretariat governance model. When taken together,  $T_4$  and  $T_5$  facilitated the creation of a set of policy instruments and governance processes that can be interpreted as an example of second-order policy change. The epistemological foundations for situating FLOSS within the FAP had been laid in

previous policy events through the social learning and lesson drawing done by the policy network.

**Table 23. Canadian Policy Change**

Time	Policy	Nature of Change
T <sub>0</sub>	Open source solutions showcase	N/A
T <sub>1</sub>	FLOSS Business Capabilities RFP	N/A
T <sub>2</sub>	E-Cology Study	N/A
T <sub>3</sub>	GOC Proposed Position on OSS and Next Steps	First-order
T <sub>4</sub>	FLOSS Overview and Guidelines	First-order
T <sub>5</sub>	FLOSS Position	Second-order
T <sub>6</sub>	Request for Information (RFI)	N/A

**Table 24. Canadian Policy Learning**

Time	Policy	Evidence of Learning?
T <sub>0</sub>	Open source solutions showcase	Social Learning and Lesson Drawing
T <sub>1</sub>	FLOSS Business Capabilities RFP	Social Learning
T <sub>2</sub>	E-Cology Study	Social Learning and Lesson Drawing
T <sub>3</sub>	GOC Proposed Position on OSS and Next Steps	Social Learning
T <sub>4</sub>	FLOSS Overview and Guidelines	Government Learning
T <sub>5</sub>	FLOSS Position	Government Learning
T <sub>6</sub>	Request for Information (RFI)	N/A

T<sub>4</sub> and T<sub>6</sub> have been associated with government learning as they exhibit evidence of policy-makers grappling with the most suitable organizational arrangement for governing the use of FLOSS and, drawing upon the accumulated knowledge of FLOSS usage in the federal government, its use in other jurisdictions, made the decision to use the GOC Federated Architecture as the governance mechanism for FLOSS. These two policy events were characterized primarily by bureaucratic actors assembling their accumulated knowledge with respect to the most suitable processes for FLOSS governance and making the necessary organizational changes to achieve that objective.

The most recent policy development, a 2009 RFI for information on no-cost software, T<sub>6</sub> appears an information gathering exercise, likely part of the GoC's assessment of the current status of such software. Beyond being able to identify its initiation by the FLOSS policy network, this event lacked sufficient supporting data that would permit an assessment if it represented any policy change of significance or what policy learning process might be associated with it.

## **7.5. Conclusion**

In comparison to the Belgian case, there was no paradigm shift in Canadian FLOSS policy. Instead, the Canadian experience can be characterized as a set of sporadic and incremental events primarily oriented towards knowledge accumulation and policy learning in its social, lesson drawing, and governmental forms over the approximately ten year period of examination. Policy learning assisted in establishing the norms and a consensus about approaches for the network that formed around FLOSS but has not, thus far, played a factor in any new challenge to a policy and framework that has been in effect for nearly eight years.

Despite the proliferation of FLOSS in the federal public service and increased lobbying efforts by interest groups in favour of a more proactive position from the government, FLOSS policy has not changed significantly since the high point of activity in this area in 2004. FLOSS projects are celebrated but do not have strategic importance, nor are they part of any policy that envisions a larger role for it within the federal government. With the Canadian case explored, it is to the final case – Germany

– to which this investigation turns, before moving onto a comparative analysis of the three cases and their policy network implications.

## 8. The German Case

### 8.1. Introduction

The German case can be summarized as one of comparatively early recognition of the importance of open source software by a broad range of actors (cataloged in Table 26) with a number of policies supportive of FLOSS appearing initially, followed by a set of policy reversals that appear to be the result of a change of the political environment and discourse around software use by the civil service. At the federal level, the German government's FLOSS deliberations date back to the late 1990s. The resulting policies range widely, from statements of support for the use of open standards and FLOSS, financial support for FLOSS projects and skills development, to implementation of FLOSS within federal agencies and departments. By and large they have been supportive of FLOSS. Early statements by influential policy-makers suggest a certain enthusiasm for FLOSS at high levels of government. One such comment was made by Siegmar Mosdorf, the Secretary of State in the Ministry for Economy and Technology at an open source conference, Linuxtag, in 2000, stating

I am convinced that open source development can form the European base model in the information age. (Gillespie, 2000).

However, in later years examples of actors' ambivalence with respect to FLOSS policy objectives appear and, in some cases, a number of outright reversals of policy direction have been evident. These policy events, stretching out over approximately a decade, are summarized in Table 27. The German case study is structured identically to those studies of the previous cases, namely: a summary of German FLOSS public policy, accompanied by explanation of the specific policies observed and a time series analysis of relevant events and policies composes the majority of the case. The policy network is described through an APES and a set of related actor-event and actor-actor matrices, and finally a sociogram. Hall's model of policy change, combined with theories

of policy learning, is used an attempt to understand the changes in German federal policy in (approximately) a ten year interval.

## 8.2. German Policy

The earliest public case of FLOSS policy in Germany was in the form of a decision to assist in the development and proliferation of security software that could be used by the public (and although not stated explicitly, likely by government agencies as well). The Bundesministeriums für Wirtschaft und Technologie (BMW) provided a FLOSS project developing encryption software with direct funding in 1999 (Krempf, 1999). This decision was undertaken within the broader policy set by the Federal Cabinet -- supporting the use of encryption software by its citizenry without regulation -- a policy that drew opposition from the United States, concerned by the security and economic implications of readily available and free encryption software (Schulzki-Haddouti, 1999). What is notable, however, is the German selection of FLOSS as the instrument to implement this policy. The government was able to avail itself of the same liberties available to individual users of FLOSS with respect to distribution and cost to meet its policy goals. The German government also funded other FLOSS projects, for example the Berlin Open Source or BerliOS project which was a joint initiative between the BMW and FOKUS, a Fraunhofer Society institute. BerliOS was created in 2000 to provide support to organization and individuals using, developing, and servicing FLOSS (Muffatto, 2006). It also engaged a team of private companies in 2002 to improve the e-mail and calendaring components of a popular graphical environment used on top of major FLOSS operating systems (Shankland, 2003). These components are commonly used in enterprise environments.

**Table 25. German Policy and Goals**

Policy	Objectives
Funding of GNU PG Project	Improving security of communications and data for citizenry and government.

<b>Policy</b>	<b>Objectives</b>
Funding of BerliOS	Support open source interest groups (developers, users, and commercial organizations producing/servicing FLOSS).
Recommendation of FLOSS Use by Public Sector	Reduction of costs. Vendor independence.
Foreign Office FLOSS deployment commences	Improving security of communications and data. Interoperability
Funding of Kroupware Project	Interoperability
Switch Infrastructure to Linux	Technical capabilities
Migration Guide Published	Technical capabilities and standardization.
No Preferential Treatment for FLOSS	Eliminate preferential treatment for FLOSS
Migration Guide Withdrawn	Indeterminate
Coalition Contract Support OSS	Promotion of FLOSS use by Federal Government
Foreign Ministry reduces use of FLOSS	Indeterminate

Less tangible -- but still important – are the policy recommendations or resolutions that promote FLOSS development or use by government. A number of these statements have been made over the last eleven years, starting with a 2001 Federal Court of Auditors report to the Ministry of the Interior recommending the use of FLOSS by the public administration (Lewis et. al., 2010). Later that year, a resolution passed in the Bundestag on “Germany's Economy in the Information Society” including language in support of FLOSS use by the administration, citing the cost advantages of FLOSS over proprietary software (Evans & Reddy, 2003). This was followed by another resolution in 2002 “Creating the Information Society for All”, that again referred to the potential financial benefits of FLOSS in addition to the improved security and performance provided by this software. A final example of this type of policy activity is the 2009-published coalition contract between the CDU/CSU and FDP including a section that expressed support for open standards and open source software (OSOR, 2009).

German policy has also taken the form of deliberate decisions to implement FLOSS in federal agencies and departments, to provide resources to assist the implementation of FLOSS, or to give preferential treatment to FLOSS in procurement of software for government use. In 2001, facing the major challenges of how to secure its expansive global communications network between embassies and consulates and share information between its employees, the Auswärtiges Amt (Foreign Office) undertook a multi-year project to implement these capabilities using FLOSS (Schuster, 2004). This initial deployment was successful and further FLOSS projects followed in 2004 and 2005. Another early example of an implementation decision was the senior council of the Bundesrat's decision to switch its computing infrastructure to Linux in 2002 (HeiseOnline, 2002).<sup>15</sup> This decision was made primarily for technical reasons because the Bundestag's computing infrastructure was close to the end of its life cycle, but the implications of the choice of FLOSS over continuing to use proprietary software was debated seriously. A number of resources have been developed to assist public agencies migrate their IT infrastructure to FLOSS. The Ministry of the Interior produced a migration guide for servers and desktop computers in 2003 and released it for public use. It went through a single revision before being discontinued suddenly in 2005. Finally, FLOSS policy activity has been evident in the area of procurement. Coalition government statements and ministry policies of preferential treatment of FLOSS or giving equal consideration to FLOSS solutions were evident in 2002. For example, the federal government also entered into a pricing agreement with a pair of IT firms to grant German public organizations more advantageous financial terms for FLOSS acquisitions (Shankland, 2002).

The FLOSS policy area has been an active one in Germany and evident when the number of policy events are compared to those in the Belgian and Canadian cases. However, not all of these policy events have been favourable to FLOSS and there have been a number of retreats from previous policy positions outright reversals. Although ministries and political parties were proponents of a greater role for FLOSS in

<sup>15</sup> Also see Evans and Reddy, 2003.

procurement of IT systems, in 2003 the Ministry of Economy stated FLOSS would not receive preferential treatment and instead it emphasized the need for competition between FLOSS and proprietary alternatives. Despite repeated positive assessments of FLOSS in the Foreign Office made by a third-party organization the Office decided to migrate away from its technology deployment -- at least in part (Diedrich, 2011). Several observers have pointed to the election of a federal CDU-FDP coalition in Germany in 2009, suggesting that policy reversals were coincident with the increasing political influence of economic liberalism in the government. Specifically, new leadership interested in increasing the efficiency of the public administration, combined with accommodation of business interests, are cited as the rationale for the change in attitudes towards FLOSS. This policy reversal in the Foreign office was certainly noticed by the German Social Democrats (SPD) and generated requests for further information on why this decision was made (Henning, 2011). However, the view that a change in political ideology challenged the epistemological context and reoriented it from fragmented, but generally supportive of FLOSS to one antagonistic may be difficult to reconcile with the abovementioned same coalition's statement of support for FLOSS deployments in government (also) in 2009 unless the latter is seen as the product of a competing set of interests.

**Table 26. German Policy Actors**

<b>Actor</b>	<b>Type</b>
BMWi	Public
BMI	Public
Erfrakon	Private
Intevation	Private
Klaralvdalens Datakonsult	Private
Werner Koch	Private
Bundesrechnungshof	Public

Actor	Type
Bundesrat	Public
Governing Coalition (CDU/CSU/FDP)	Public
Auswärtiges Amt (Foreign Ministry)	Public
McKinsey & Company	Private
FOKUS	Private

**Table 27. German Policy Events**

Event	Date
Funding of GNU PG Project	1999
Funding of BerliOS	2000
Recommendation of FLOSS Use by Public Sector	2001
Foreign Office FLOSS deployment commences	2001
Funding of Kroupware Project	2002
Switch Infrastructure to Linux	2002
Migration Guide Published	2003
No Preferential Treatment for FLOSS	2003
Migration Guide Withdrawn	2005
Coalition Contract Support OSS	2009
Foreign Ministry reduces use of FLOSS	2011

### 8.3. The German APES and Policy Network Graph

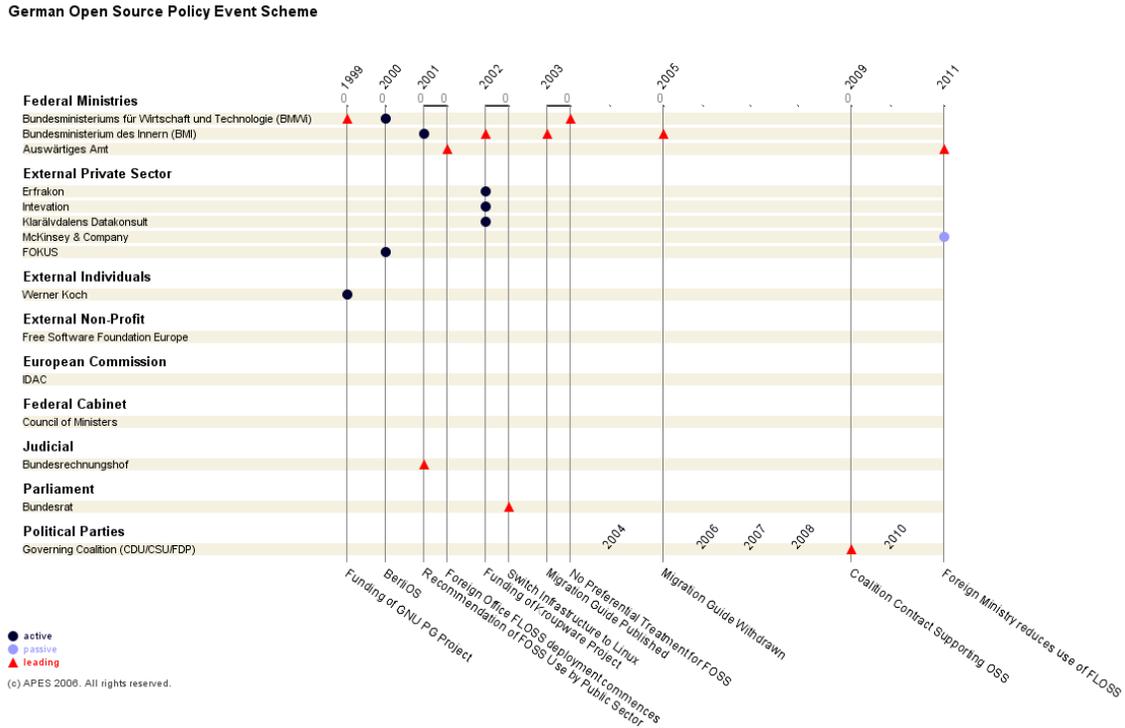
The final set of graphical network models in this project was that of the German case. In line with the process followed in the Belgian and Canadian cases, the APES and policy graph were generated using information provided by a variety of artefacts

including policy documents, newspaper and journal articles, blog postings, email communications. These were combined with information from surveys and interviews of Germany public and private actors from a number of organizations. This combined set of data was harvested for a list of network actors and the events in which they participated. These were presented in the form of tables of actors, actor types, and events, and years of occurrence that were reused in the comparative analysis sections of this project.

The German actors were also assigned integer values based upon an assessment of their participation in a policy event: a one, two, or three, corresponding to a passive, active or leading role. The actors, their role assignments, and events were run through the APES software to produce the APES graphic (first output) and the two actor-actor and actor-event matrices (second output). The German policy network was produced using Ucinet and Netdraw.

The German network graph shows a strongly decentralized network with a large number of individual actors participating in single or a few policy events and a group of actors clustered around a related set of events. In terms of network size, this one is clearly the largest of the three under investigation. However it is also the least cohesive and dense. The list of individual actors involved in a single policy event includes the CDU/CSU/FDP governing coalition and the Bundesrat. A number of private actors such as consulting companies (e.g. McKinsey and Company) are limited to participating in single events as well, reflecting their engagement as subject matter experts for development projects or to assist knowledge transfer to policy-makers. There is a cluster of actors around the Bundesministerium des Innern (BMI) or the Interior Ministry with strong participation from private sector companies involved in the Kroupware project and the former's participation in a number of follow-on projects, reflecting its more long-term FLOSS policy activities.

**Figure 10. German Actor-Process-Event Scheme**



**Table 28. German Actor-Event Matrix**

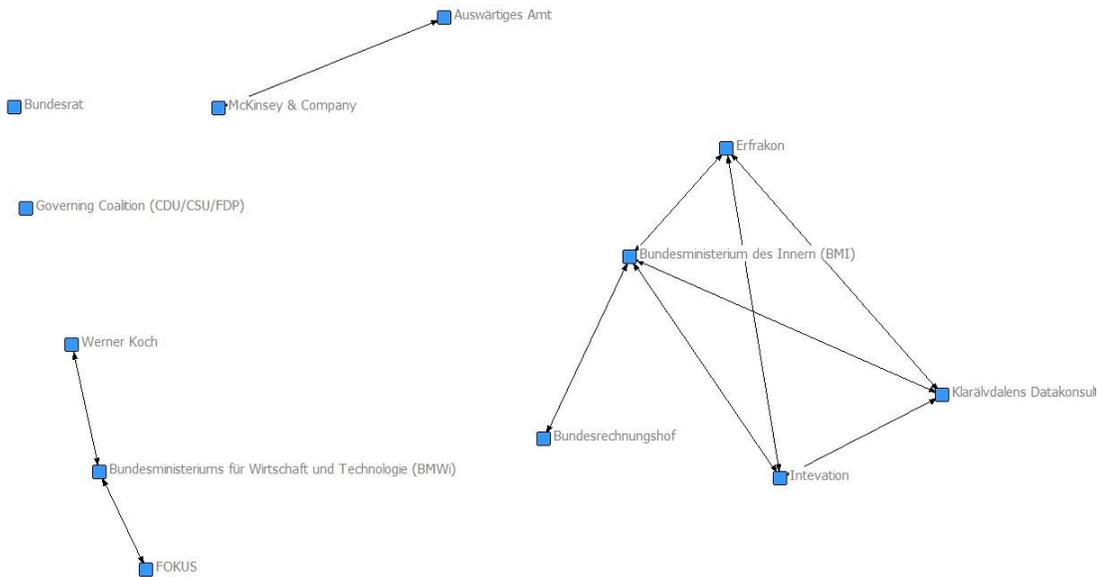
Policy Actors	Policy Events										
	Funding of GNU PG Project	BerliOS	Recommendation of FOSS Use by Public Sector	Foreign Office FLOSS deployment commences	Funding of Kroupware Project	Switch Infrastructure to Linux	Migration Guide Published	No Preferential Treatment for FOSS	Migration Guide Withdrawn	Coalition Contract Supporting OSS	Foreign Ministry reduces use of FLOSS
Bundesministeriums für Wirtschaft und Technologie (BMWi)	3	2	0	0	0	0	0	3	0	0	0
Bundesministerium des Innern (BMI)	0	0	2	0	3	0	3	0	3	0	0
Auswärtiges Amt	0	0	0	3	0	0	0	0	0	0	3
Erfrakon	0	0	0	0	2	0	0	0	0	0	0
Intevation	0	0	0	0	2	0	0	0	0	0	0
Klarälvadens Datakonsult	0	0	0	0	2	0	0	0	0	0	0
McKinsey & Company	0	0	0	0	0	0	0	0	0	0	1
FOKUS	0	2	0	0	0	0	0	0	0	0	0
Werner Koch	2	0	0	0	0	0	0	0	0	0	0
Bundesrechnungshof	0	0	3	0	0	0	0	0	0	0	0
Bundesrat	0	0	0	0	0	3	0	0	0	0	0
Governing Coalition (CDU/CSU/FDP)	0	0	0	0	0	0	0	0	0	3	0

**Table 29. German Actor-Actor Matrix**

**Policy Actor Relationships**

	Bundesministeriums für Wirtschaft und Technologie (BMWi)	Bundesministerium des Innern (BMI)	Auswärtiges Amt	Erfrakon	Intevation	Klarälvdalens Datakonsult	McKinsey & Company	FOKUS	Werner Koch	Bundesrechnungshof	Bundesrat	Governing Coalition (CDU/CSU/FDP)
Bundesministeriums für Wirtschaft und Technologie (BMWi)	0	0	0	0	0	0	0	1	1	0	0	0
Bundesministerium des Innern (BMI)	0	0	0	1	1	1	0	0	0	1	0	0
Auswärtiges Amt	0	0	0	0	0	0	1	0	0	0	0	0
Erfrakon	0	1	0	0	1	1	0	0	0	0	0	0
Intevation	0	1	0	1	0	1	0	0	0	0	0	0
Klarälvdalens Datakonsult	0	1	0	1	1	0	0	0	0	0	0	0
McKinsey & Company	0	0	1	0	0	0	0	0	0	0	0	0
FOKUS	1	0	0	0	0	0	0	0	0	0	0	0
Werner Koch	1	0	0	0	0	0	0	0	0	0	0	0
Bundesrechnungshof	0	1	0	0	0	0	0	0	0	0	0	0
Bundesrat	0	0	0	0	0	0	0	0	0	0	0	0
Governing Coalition (CDU/CSU/FDP)	0	0	0	0	0	0	0	0	0	0	0	0

**Figure 11. German Policy Network Graph**



**Table 30. German Policy Change**

Time	Policy	Nature of Change
T <sub>0</sub>	Funding of GNU PG Project	Third-order
T <sub>1</sub>	Funding of BerliOS	Second-order
T <sub>2</sub>	Recommendation of FLOSS Use by Public Sector	Second-order
T <sub>3</sub>	Foreign Office FLOSS deployment commences	Second-order
T <sub>4</sub>	Funding of Kroupware Project	Second-order
T <sub>5</sub>	Switch Infrastructure to Linux	Second-order
T <sub>6</sub>	Migration Guide Published	Second-order

Time	Policy	Nature of Change
T <sub>7</sub>	No Preferential Treatment for FLOSS	Third-order
T <sub>8</sub>	Migration Guide Withdrawn	Third-order
T <sub>9</sub>	Coalition Contract Support OSS	Second-order
T <sub>10</sub>	Foreign Ministry reduces use of FLOSS	Third-order

**Table 31. German Policy Learning**

Time	Policy	Evidence of Learning?
T <sub>0</sub>	Funding of GNU PG Project	Social Learning
T <sub>1</sub>	Funding of BerliOS	Lesson Drawing
T <sub>2</sub>	Recommendation of FLOSS Use by Public Sector	Lesson Drawing
T <sub>3</sub>	Foreign Office FLOSS deployment commences	Lesson Drawing
T <sub>4</sub>	Funding of Kroupware Project	Lesson drawing
T <sub>5</sub>	Switch Infrastructure to Linux	Lesson drawing
T <sub>6</sub>	Migration Guide Published	Lesson drawing
T <sub>7</sub>	No Preferential Treatment for FLOSS	Social Learning Lesson drawing
T <sub>9</sub>	Migration Guide Withdrawn	Social Learning Lesson Drawing
T <sub>9</sub>	Coalition Contract Support OSS	Lesson Drawing
T <sub>10</sub>	Foreign Ministry reduces use of FLOSS	Social Learning

The actor-actor and actor-event matrices and policy network graph in the German case depict a relatively large number of policy events over an extended period of time. However, there is a notable lack of connectivity between actors in the policy network graph (see Figure 10). Despite the leading role played by federal ministries in policy, described in the case study materials and depicted in the APES (Figure 9), it is clear that they generally do so in isolated policy events or in cooperation with a small number of other actors.

## 8.4. Policy Change in Germany

Assessing the German case from the perspective of policy change and policy learning illuminates a number of interesting aspects. The German policy landscape can be characterized as fragmented. While there are a large number of FLOSS-supportive policies, there are also a number of policy reversals. Policies do not appear to be cumulative or progressive and establishing the existence of patterns of policy change is problematic because of this lack of linear or directional events. In some aspects there are no patterns of policy change and that a number of policy events are effectively “standalone” and isolated instances, despite their initiation by members of the policy network. Utilizing Hall’s model of policy change, and applying concepts of policy learning the analysis of policy events starts with  $T_0$  ( the direct funding of the GNUPg project in 1999). We have categorized this event as a third-order policy change. On the surface it appears to be solely a new policy and an implementation of an instrument. However, on closer inspection, this event is revealed to be indicative of a major shift in German policy-makers’ perception about the technical and social potential of FLOSS to empower citizens and the role of government in directly funding this kind of technology. This direct support would not have been possible without a consensus about FLOSS on the part of a group of policy-makers. With a set of foundational ideas in place, favourable to FLOSS and confirming its legitimacy as a mechanism to solve problems such as the security of government data and communications, events  $T_1$  to  $T_6$  can be interpreted as a set of first and second-order policy changes. Variations in instruments are consistent with Hall’s model definitions of first and second-order policy change, but the variation in policy goals

and objectives would be seen as third-order change. Consistent with our harmonization of Hall's model, the role given to social learning in driving a paradigm shift, we can qualify third-order policy change as major policy goal change. In this case, we consider a movement towards or away from FLOSS-supportive policy third-order change, particularly when it occurs in the context of a paradigm shift. Events  $T_1$  to  $T_6$  also were cases of lesson drawing from other jurisdictions (for example, municipal government deployment of Linux such as undertaken by Munich) and from within the German federal government on the part of the policy network actors, resulting in a variety of policy instruments that reflected the approaches required to meet policy objectives.

However, with the exception of  $T_9$ , events  $T_7$  to  $T_{10}$  were reversals of previous policy supportive of FLOSS. Starting with the 2003 Ministry of the Economy emphasis on agnostic procurement processes, followed by the Ministry of the Interior retraction of its FLOSS migration guidelines, a number of policy instruments were dismantled. The decision to reduce FLOSS use by the Foreign Ministry in 2011 capped these reversals.

These reversals clearly reflected an outside challenge to the prevailing paradigm. The election of a CDU-FDP coalition appears to have changed the epistemological context that had, up to that point, been supportive of FLOSS. The market-orientation of the Freie Demokratische Partei (FDP) and the appointments of the Foreign Minister, Guido Westervelle from that party and a new IT Commissioner, Dr. Michael Gross, has been noted (Diedrich, 2011). The absence of any business or technical justification became a point of issue for observers such as a SPD parliamentary group headed by Oliver Kaczmarek, who have requested the Foreign Office justify its decision, particularly in the wake of two positive reviews of that organization's previous IT strategy in 2009.

The policy changes in the Interior Ministry and Foreign office are consistent with Hall's experience in the case of British social policy, specifically that aspect of change requiring the supporters of the new paradigm gain the necessary authority to make organizational changes to institutionalize it.

## **8.5. Conclusion**

It is too early to determine the ultimate affect this policy change will have, or whether this is a temporary or transitory movement away from FLOSS. The immediate question of what impact the Foreign Office decision has upon the perception of open source in other government agencies has been highlighted given the participation of these ministries in the policy network that has generally been producing policy initiatives supporting FLOSS. This internal policy learning was noted in the observation that “The use of Linux desktop systems in the Foreign Office also acted as a beacon for the use of open source software in other government departments.” (H-Online, 2011)

The examination of the German case concludes the study of the three selected countries. It is to the comparison of the three to each other, and an analysis of the policy network implications that the next section turns.

## 9. Comparative Analysis of Cases

### 9.1. Introduction

With a framework for analyzing the case studies established in the previous chapters, and the development of a set of case studies summarizing the policy actors, the events in which they were involved and a timeline of the policy events for each country, the next step is to compare and assess these cases. This analysis is undertaken in a series of complimentary activities. First, as part of the case studies, the actors and policy events were extracted for each country and analysed using the Actor-Process-Event Scheme (APES) techniques. The latter were described in previous chapters and have been used to construct models of the policy networks. The first stage graphical representation of the APES is also a part of each case study chapter. The characteristics of the networks are isolated and assessed against the theoretical framework described in chapter three. Together this data is tested against the hypotheses of the investigation.

It is to a description of each network and its attributes that the investigation now turns. Each case, starting with Canada, then Belgium, and finally Germany, is described in turn in the following manner. The first table of each section enumerates the actors in the particular country's network. The next describes the events that are used to structure the APES. A summary figure presents the APES constructed from the actor and event lists, with accompanying participant categories. A second figure in each case arrays policy actors against events. This matrix describes the participation of each actor for each event, coded correspondingly using the integer values from Table 10 in chapter five. A final figure is a matrix composed of actor-actor relationships in the policy environment. All actors are arrayed against each other and the presence of a relationship between them is coded as a 1 if it exists or a 0 if it does not.

## 9.2. Quantitative Comparative Analysis

The summary of the survey and policy artefact data reveals a number of notable characteristics of each network (see table 32). The Canadian network is composed of a comparably smaller sample of actors than the Belgian and German networks – 8 versus 13 and 12, respectively. In line with expectations the participation level of public policy actors, all of the networks are predominantly composed of governmental participants, with Belgium the highest at approximately 85% public actor composition and Canada the lowest at 50%. However, the German case has comparably more private sector participants than the other two.

**Table 32. Network Analysis Summary**

	Belgium	Canada	Germany
<b>Number of Policy Actors</b>	13	8	12
<b>Number of Policy Events</b>	6	7	11
<b>% governmental actors</b>	85%	50%	54%
<b>Network density</b>	14.55%	44.00%	15.15%
<b>Degree Centrality</b>	12.81%	20.83%	25.45%

Network density differs significantly between the pair of close scores observed in the Belgian and German cases (at 14.55% and 15.15% respectively) and Canada at 44%. This can be partially explained by the observation that Canadian actors appear together in more events and have more relationships positively correlated with those cases of shared participation.

From a high-level perspective, degree centrality scores for the three actors are all low indicating a generally low level of centralization of these networks. Differences between the three become a matter of relative comparison. Degree centrality scores are

quite close between the Canadian and German cases (20.83% and 25.45 %). The Belgian network degree centrality score is significantly lower suggesting that this network is particularly decentralized in terms of actor relationships and that there are no individual or sets of core actors through which everyone is connected.

We turn now from description and relatively high-level analysis of the three policy networks to testing them against the modified Marsh-Rhodes model developed in chapter 4. This was facilitated by a number of techniques: assignment of values to network variables or network characteristics directly from the network summary data; interpretation of network summary data or empirical data gathered in the case studies; use of survey data.

**Table 33. Networks by Marsh-Rhodes Model**

<b>Network Variable</b>	<b>Belgium</b>	<b>Canada</b>	<b>Germany</b>
<i>Membership</i>			
Participant Numbers	Medium (13)	Low (8)	Medium (12)
Composition of interest	Narrow range of interests	Narrow range of interests	Relatively broad range of interests.
Stability	Unstable	Stable	Unstable
<i>Integration</i>			
Frequency of Interaction	Frequent interactions between individuals or groups specifically focused upon the policy issue of concern	Infrequent interactions	Frequent interactions
Consensus	Share basic values	General agreement but conflict present	General agreement but conflict present
<i>Resources</i>			
Resource Distribution within network	Uneven resource distribution and relationships are	Uneven resource distribution and relationships are	Uneven resource distribution and relationships are

Network Variable	Belgium	Canada	Germany
	primarily consultative	primarily consultative	primarily consultative
<i>Power</i>	Unequal power distribution	Unequal power distribution	Unequal power distribution
<i>Epistemological Context</i>	General understanding of core FLOSS concepts but no comprehensive set of foundational concepts. Focus shifted to agreement upon open standards instead.	Network actors had a common understanding of core FLOSS concepts and a vision for use (also described as a policy architecture) developed over interval.	Understanding of core FLOSS concepts but no comprehensive set of foundational concepts. Challenges to FLOSS becoming evident.

## **9.2.1. Membership**

### **9.2.1.1. Participant Numbers**

Policy network membership numbers are classified in a relative fashion. Rather than being ranked using ordinal numbers, we established some standards for network type based upon number of participants in chapter 4. Participant numbers are considered low if under 10 and high if above 20, corresponding to a policy community and issue network, respectively. Given that both the Belgian and German cases fell approximately in the middle of these two, their participant numbers are ranked as “medium”. There were few actors (8) in the Canadian network, reflecting the observation that it was a small and relatively tightly associated group of participants.

Consequently, the participant number for Canada places it into the category of an issue network. According to our modified typology, a medium number of participants place Germany and Belgium into the “indeterminate” category.

### **9.2.1.2. Composition of Interests**

In line with our qualification of composition of membership, the range of interests in the three networks is relatively narrow. FLOSS policy is a niche area and this reflected in the network composition of the actors. More specifically, Belgium and Canada are largely composed of public sector actors with some private sector or non-profit foundation participation. By comparison, Germany has a somewhat broader range than Belgium and Canada, with more individuals, firms, and academic participants in addition

to the majority public actors. One could argue that the mere presence of public or private actors is not sufficient indication of the existence of a narrow range of interests. The distinction is a qualitative one - not quantitative. The interests involved in all three networks have been coded as leading, active, or passive actors in policy events in the APES. However, these categorical variables do not explain their characteristics as actors. In all three cases the interests were very specifically empowered to engage in FLOSS policy-making activities, either by virtue of their administrative mandate (e.g. Canadian Treasury Board Secretariat), view FLOSS as an instrument to achieve policy goals (German Foreign Office as an example) or are FLOSS subject-matter experts (SMEs) that bring knowledge assets required by the network (e.g. Patrice-Emmanuel Schmitz in the Belgian case, CGI in the Canadian one, and in the German study). Upon closer examination of the roles played by network actors, we see that in the Belgian and Canadian cases a greater percentage of the policy network population was directly involved in policy-making than in the German case.

The characteristics of interests are compared from a relative perspective. Given the relatively constrained set of actors in the Belgian and Canadian cases, predominately represented by the public sector interests, for this variable, these two countries have been coded as policy communities. Germany, by comparison, has been designated as an issue network.

#### **9.2.1.3. Stability**

Observing the stability or persistence of actors throughout the period and events under investigation resulted in a number of interesting findings. Network stability is a function of the turnover of actors: a low level of movement in and out of the network is associated with a stable policy subsystem. There were numerous cases where actors were observed moving into and out of the network. However, what was notable was the observation of periods of stability for certain sets of key actors that are characterized as leading actors in the policy network for their country. For example, in the German case, the Federal Ministries (BMWi and BMI) participated in policy events from 1999 to approximately 2005 and thereafter appear to have no associated policy events. Whereas in the Belgian case, the reverse occurred: one of the primary actors, Fedict, joined FLOSS policy deliberations only later in the policy period (2004) but has remained an

active and major player until the final set of observations. When the persistence of major actors is considered, the Canadian policy network membership is perhaps the most stable in this regards. The Treasury Board Secretariat has participated in the majority of policy events chronicled in the Canadian APES.

A low level of subsystem stability was observed in the Belgian and German cases relatively to the Canadian case. There appeared to be more cases of actors entering and leaving (or becoming inactive) the policy networks in the two European states. In line with this set of observations the Belgian and German networks have been designated as issue networks and the Canadian case a policy network from the perspective of the stability variable.

## **9.2.2. *Integration***

### **9.2.2.1. Frequency of Interaction**

The German case had the highest number of interactions, followed by the Canadian and then the Belgian cases. This reflects this observation that a greater number of interactions are positively correlated with the number of policy events.

On this variable, the German case was coded as a policy community and the Canadian and Belgian cases as issue networks.

### **9.2.2.2. Consensus**

This variable measures the extent to which values and agreement around policy goals converge among actors in the network. Examining each network through this lens reveals a number of interesting aspects. In two of the cases, namely the Canadian and Belgian, a consensus with respect to the primary policy goal of the network, namely how to fit FLOSS into a framework, evolved over time. Initially, each player brought their own perspectives and goals to the policy process. For example in the Canadian case, the federal Treasury Board Secretariat, Industry Canada, and National Defence participated from the perspective IT governance, the promotion of industrial development and the assistance if Canadian firms, and a technical assessment of FLOSS suitability and of software quality, respectively. In the Belgian case, the early set of actors entered into the

network with an intent to secure FLOSS as a technical standard and for preferential procurement policies. The consensus around open standards developed later.

We found no evidence of evidence of consensus in the German case. While there was initial general agreement that FLOSS had potential as an instrument to solve a number of policy problems, no set of common values held by that network's actors developed around how it could be used or how the policy network would be structured to agree upon a set of achievable objectives. Given these observations, the Canadian and Belgian cases were coded as policy communities and the German, an issue network.

### **9.2.3. Resources**

All three networks were characterized by uneven resource distribution, which was largely a function of the heterogeneous capabilities of the participants. Some participants had financial, organizational, or informational resources to leverage, others didn't bring any. The limited resources possessed by a number of the government network actors were also of note. This was largely explainable as them operating without resources from their "parent" or "home" organizations – possibly because their participation was not considered to be a core activity for their department or ministry and funded/staffed accordingly.

On this dimension, all cases fall into the issue network category.

### **9.2.4. Power**

Direct evidence of the exercise of power on the part of actors was not always obvious in the three cases. Instead the use of power by actors or within institutions was implied in a number of survey responses or derived from the body of documentation that was gathered for this investigation. After analysis, it became clear, from the information available, that capabilities that could be interpreted as power were distributed unevenly among actors. This, unsurprisingly, was the result of heterogeneous resource capabilities among actors, the empowerment provided by institutional mandates granted

to actors, and other structural factors. Secondly, the qualities of power – as capabilities possessed by actors, evident in the relations between network participants or structural, institutional, or organizational characteristics were as varied as their distribution. By using the concepts of power established in chapter 4 to identify and classify observed phenomena we find evidence of nearly all of them in the three policy networks. Using the data provided by the sequence of actions/events involving leading actors (coded as “1” in a number of policy events in their respective APES), we can attempt to associate types of power with these actors.

**Table 34. Power within Policy Networks**

Country	Leading Actor	Type of Power Displayed
Belgium	Fedict	Organizational, discursive
Canada	Treasury Board Secretariat	Organizational, dispositional
Germany	BMI	Organizational

Of interest was the requirement to associate multiple types of power with actors to adequately describe how power manifested itself. None of even the most influential agents in policy networks could rely exclusively upon one “type” of power in the pursuit of their policy goals. For example, in the latter stages of FLOSS policy in Canada, the Treasury Board Secretariat was arguably in a position of greater power vis-à-vis other network actors, given its ability to set standards for the federal government, but yet not in a clearly dominant role, because those standards required “buy in” from other departments and were subject to amendments, depending on those department’s specific IT needs. The mandate of the Treasury board Secretariat granted it organizational power (from Arts and Tatenhove’s summarized concepts and definitions of power) but it needed to also have dispositional power or resources in the form of expert knowledge to draw upon to give it the credibility to situate FLOSS within FAP. In the Belgian and German cases, power appeared to be a combination of the organizational management capabilities brought to the network by actors and discursive competencies exhibited in discussions between network actors and the active shaping of a discourse to build support for ideas around open standards, and FLOSS respectively. This combination of capabilities was particularly relied upon by the Permanent IT

Steering Group (PICTS) in Belgium in that it had to use its knowledge of the network players, their position in their organizations, and a consensus-building process to establish a policy position that could be taken to the Council of Ministers. By comparison, it was not clear if the Treasury Board Secretariat relied upon influence derived from discursive means to achieve a leadership role in the Canadian policy network.

Knowledge alone was necessary but not sufficient to influence the policy network. There were a number of actors who played roles as subject matter experts (SMEs) but did not exercise any influence beyond providing specialized knowledge about FLOSS, sharing it broadly with many network actors or limiting their advice to their patrons within the network. Knowledge specifically had to be paired with other types of power such as organizational power in order for it to be an effective asset for an actor.

Power as implied in relationships between actors in all three networks, and expressed in the interactions of network participants was consistent with the break with Marsh and Rhodes' notion of power in policy network and a rejection of the zero-sum attribution of power in their typology described in chapter 4.

### **9.2.5. *Epistemological Context***

The epistemological context varied across the three cases, in line with expectations that the different actor capabilities, the institutional environment, and the policy goals of the actors would be both factors in and outcomes of the knowledge base in each policy area.

In the Canadian case, general agreement between participants on the technical desirability of FLOSS - specifically that it could have applicability alongside proprietary software – evolved over time. And that perspective was ultimately formalized in the Treasury Board Secretariat's open source software position, which it situated within the Federated Architecture Program. Knowledge acquisition activities were salient in the development of the Canadian policy network: examples of these included the FLOSS solutions showcase week, the eCology Study, and the DRC's FLOSS research. A number of actors brought their knowledge about FLOSS technical capabilities, its development model, and social and anthropological distinctiveness to the policy network

– either directly (for example, the team of scientists at Defence Research Canada) or by utilizing the expertise possessed by outside contractors or consultants (eCology analysis initiated by Industry Canada, PWGSC, and Treasury Board or CGI representing Treasury Board in discussions). This knowledge diffused through the policy network. However, there was some conflict over what specific knowledge was required to implement and governance FLOSS usage, whether FLOSS benefits were realizable by the Canadian government, and what the policy role would be of each organization involved in the network. Ultimately this knowledge became institutionalized as a policy and framework within the Federated Architecture Program. Despite broad knowledge about FLOSS' particular benefits, the policy decision classified FLOSS as a functional equivalent to proprietary software from a financial decision-making and governance perspective.

In the Belgian case, there was a similar and general level of understanding of FLOSS capabilities on the part of the majority of actors. This common agreement on the desirability of FLOSS to provide technical solutions for public sector problems also didn't translate into a generating a set of policies that were supportive of FLOSS. An epistemological context based upon the participants' agreement and common understanding with respect to the role of open standards developed over time, facilitated by the core expertise possessed by a group of actors led by Fedict. This process was driven bottom-up with the involvement of representatives from several departments (Foreign Affairs and Economy) who constituted the membership of PICT. PICT in turn, reported to through to the Council of Ministers. There clearly was a shared level of knowledge among the members of PICT that facilitated the consensus necessary to develop a comprehensive policy around open standards. The epistemological context was largely focused upon open standards. However, indications that FLOSS had not entirely left that context appeared in statements that FLOSS might still have a future policy role and that open standards might be a means to that.

In the German case, there was evidence of broad acceptance of the capabilities of FLOSS on the part of all participants in the initial stages of the policy period under investigation. However, this understanding was not evident in any policy activities that might have supported a broader role for FLOSS at the federal level. There were a number of attempts at policy formulation and some successful individual ministry-level

policies but no coherent set of FLOSS supportive policies developed federally. A number of the actors clearly possessed advanced knowledge with respect to the technical capabilities of FLOSS and these were evident in the Foreign Ministry and Bundesrat's FLOSS deployments. Despite the German case displaying the most frequent interactions between actors it did not appear that this played a role in knowledge formation. In this state, the epistemological context could be characterized as "siloeed", specifically describing the observation that knowledge appears to have been distributed unevenly among actors.

The epistemological context in the Canadian case was more weighted to a policy community. The German case exhibited the characteristics of an issue network on this dimension. Given the deviation of the Belgian case from the categories in the typology, it was not easily assigned to either and coded as *indeterminate*.

### 9.3. Classification

Each network's set of variables can be classified according to network type – specifically, where they fall into the Rhodes Marsh typology we have adapted. Table 35 classifies each variable by network type by country. The categories are policy community, issue network, or indeterminate.

Table 36 enumerates the occurrences of variables by network type. From this roll-up of variable assignments, we see the majority of variables in the Canadian case are classified as the policy community network type. By comparison, Belgian and German variables are predominantly issue network ones.

**Table 35. Classification of Variables by Network Type**

Network Variable	Belgium	Canada	Germany
<i>Membership</i>			
Participant Numbers	Indeterminate	Policy Community	Indeterminate

<b>Network Variable</b>	<b>Belgium</b>	<b>Canada</b>	<b>Germany</b>
Composition of interest	Policy Community	Policy Community	Issue Network
Stability	Issue Network	Policy Community	Issue Network
<i>Integration</i>			
Frequency of Interaction	Issue Network	Issue Network	Policy Community
Consensus	Policy Community	Policy Community	Issue Network
<i>Resources</i>	Issue Network	Issue Network	Issue Network
<i>Power</i>	Issue Network	Issue Network	Issue Network
<i>Epistemological Context</i>	Indeterminate	Issue Network	Policy Community

**Table 36. Classification Summary**

	<b>Belgium</b>	<b>Canada</b>	<b>Germany</b>
<b>Network Type</b>			
Policy Community	2	4	2
Issue Network	4	4	5
Indeterminate	2	0	1

## 9.4. Policy Learning and Policy Change

There were clearly identifiable instances of policy change in each of the three cases. However, the Belgian, Canadian, and German policy networks each exhibited distinctive configurations of policy change, accompanied by sets of policy learning

activities that were also dissimilar across the cases. All three cases displayed instances of Hallsian first-order policy change in the form of standard, routine, and incremental policy activities. The presence of this type of policy change was anticipated in all cases, reflecting the “normal” operating processes of actors within a policy network. All three cases also included policy events that were interpreted as second-order policy change. In the course of the approximately ten-year interval, new policy instruments were developed and program changes occurred in each setting. The occurrence of these types of events was also expected: given the duration of the study, technical developments with respect to software in general and FLOSS specifically, the organizational changes that occurred in all three governments, and the movement of actors into and out of the network. However, the three cases diverged with respect to third-order policy change. As described in the case studies, the Belgian and German cases exhibited third-order policy change, whereas the Canadian case did not.

The Belgian and Canadian cases summaries of policy change (tables 15 and 22, respectively) did not immediately lead to the classification of policy events. The first few events involving both policy networks, specifically  $T_0 - T_2$  in the Canadian case and  $T_0$  and  $T_1$  in the Belgian were coded as “not applicable” (N/A) because there was no evidence of significant policy change. The initial events in which the Belgian and Canadian policy networks engaged, were generally studies or research and part of the basic information gathering required for actors to gain a sufficient level of understanding of the role of FLOSS, the potential form of policy instruments could take, and how they would be used in the pursuit of policy goals. Consequently we could not classify these as policy changes until there was an event that resulted in a measureable variation from these early exploratory policy events. These knowledge-building activities were prerequisites for later events that effectively became the first instances of policy changes in these two networks.

The German case was notable in this respect because of its number of third-order policy changes. Earlier in this investigation, German policy was characterized as “fragmented”. Specifically, this referred to multiple first and second order policy events with the involvement of a large number of actors from which no progressive development of policy has occurred. German policies were initially generally supportive of FLOSS as a policy instrument, but in later years were challenged by changes in the political culture

of the administration. These challenges resulted in some reversals of previous decisions and the dismantling of policy instruments. The social and political context external to the policy network underwent changes that affected the policy-subsystem, in line with Hall's view that this was a necessary precondition for third-order change to occur.

Third-order policy change also appeared in the Belgian case. When compared to the third-order change observed in Germany, it took a more significant form. A major shift from deliberations about the benefits of FLOSS and tentative policies supportive of it to policies based upon the use of open standards occurred, culminating in the creation of the Belgian Interoperability Framework (Belgif) and its approval by the Council of Ministers. This shift differed from the third-order policy change observed in Germany because in the Belgian case, policy change was facilitated by a build-up to a sufficient level of support and buy-in on the part of network actors. This build up was absent in German policies – change appears disjunctively and largely without prior indication that a change in policy is to be expected. Returning to the Belgian circumstances, change in that system was accompanied by an epistemological base that developed in parallel, providing a supportive environment for further activities that would formalize role for open standards, and common understanding that FLOSS was not a suitable instrument for the policy objective, namely interoperability.

A comparison of the role played by learning in policy change across the three cases is illustrative in revealing the mechanisms of knowledge transfer and the types of information actors actively sought in their problem solving activities. Utilizing the types of policy learning operationalized in chapter four, we classified and analyzed observed instances of learning in the case studies. It was evident that social learning and lesson drawing were the dominant modes of learning in all three cases. However, in many policy events there was evidence that multiple types of learning were present. For example, some policy-makers described operating under financial and time constraints to solve problems and seeking suitable solutions from other jurisdictions, while simultaneously being aware of technical developments in the market and the political preferences of their elected and appointed officials. Their testimonies suggested that exogenous (social) and endogenous (lesson drawing) learning could occur simultaneously within a policy subsystem – even on the part of the same actor. Turning first to social learning -- this type of learning was present in all three cases and appeared

to have been major factor in the paradigmatic change seen in the German and Belgian cases. However, the presence of this type of learning on its own is insufficient to establish a causal relationship between social learning and policy change in these two cases. Each intersection of variables must be explored further. Social learning was present in early stages of policy-making in all three cases, also calling into question the view that this type of learning is more prevalent in changing the context of established or mature policy subsystems and their policy-making goals.

In the Belgian case a paradigmatic shift occurred relatively early in the life of the policy subsystem. There also were instances of policy that were affected by developments outside of the policy network and reflected social learning on the part of subsystem members. The increasing prominence of FLOSS within Belgium and Europe and the benefits of its social mode of production motivated Belgian policy-makers to conceive of FLOSS as means to an end (policy instrument) and as an end in itself. These deliberations and how they originated were evident in the first few policy events and the communications of actors about them. That said, there was no instance of third order policy change evident until the creation of Belgif, when the policy network moved in an entirely different direction, confirming that interoperability as a goal was to be pursued through open standards – not by the implementation of FLOSS by federal departments. Social learning was present in the Canadian case but there was no commensurate paradigmatic change. As was noted previously, Canadian FLOSS policy developed incrementally, finally finding its footing within the Federated Architecture Program. The Canadian policy-subsystem integrated knowledge and ideas from outside throughout the policy period but the resulting policy change was only evident at a relatively late stage, and took the form of a FLOSS policy statement which prescribed its accommodation under FAP. In the German case there were a number of instances of social learning evident. The first policy event reported, which was the funding of GNUPg, was the first instance of direct government funding of a project. This type of policy ran counter to the prevailing orthodoxy of no government funding of projects. It established a precedent and gave FLOSS visibility within the German government. It also raised the profile of FLOSS globally and was cited as an exemplar by other governments. Later policy events were reversals of FLOSS implementation decisions. The policy network was subject to pressure by the FDP/CDU coalition and its public administration

appointees in at least once case (the Foreign Office). Parts of the network were directly replaced by more proprietary software supportive actors, while existing actors increasingly became aware of the challenge the new epistemology posed to FLOSS. These developments demonstrated a direct connection between political developments outside of the policy network and resultant adjustments to policy.

Lesson drawing was the other major category and instances of it comprised the majority of the cases of policy-related learning in the three studies (see Table 37). The cases of lesson drawing observed were consistent with the definition of it provided in chapter 4, namely learning about the feasibility of applying an effective policy program in one place to another (Rose, 1991). There were many examples of network actors seeking information on the experiences of other states with FLOSS, searching “across time and/or across space” in Rose’s words. For example, the eCology study was a vehicle for the Canadian policy network membership to understand the use of FLOSS by state and non-state actors. This lesson drawing also extended to searches within the federal system of a country (German federal government policy learning from the Munich city government Linux implementation); the same administration (German Foreign Office, Belgium ODF); and utilizing private actors to (Canadian eCology Study, Canadian no-cost software RFI)

An argument can be made that instruments such as requests for proposal (RFC) and requests for information (RFI) are instruments to facilitate lesson drawing, as they are direct transfers of knowledge about solutions or options to policy problems from private actors to policy-makers. However, these instruments also can be regarded as mechanism for political and social influence on the policy process because they often engage societal actors in a variety of relationships with policy-makers.

**Table 37. Policy Learning Summary**

	Belgium	Canada	Germany
Social Learning	3	4	4
Lesson Drawing	5	2	9

	Belgium	Canada	Germany
Governmental Learning	1	2	0
Total	9	8	13

In comparison to lesson drawing and social learning, government learning was limited to two cases – Belgium and Canada. We did not observe any cases of governmental learning in Germany. The primary qualifying criteria was learning on the part of bureaucrats with the intention of changing process or organization to better address policy problems. One such example was found in the Belgian case of its memorandum of understanding with the Netherlands. The actors participating in government learning in this instance were bureaucrats. The learning activity and subsequent policy did not include the societal actors in the policy network. A pair of observed instances of government learning in the Canadian case occurred under similar circumstances namely the FLOSS overview and FLOSS guidelines policy events.

We theorize that there were fewer occurrences of government learning across the three policy networks for the following reasons: the networks included a number of non-governmental actors or technical staff from various government agencies, neither group would be considered bureaucrats. Given the definition of government learning limits involvement to bureaucrats and the fact that FLOSS policy activities generally drew upon a larger pool of membership of the policy network that included societal and other actors, the majority of learning would not fit into the government learning definition. FLOSS policy was by and large not undertaken entirely by bureaucrats – the former sought knowledge through a number of means such as lesson drawing and social learning of which they were a part of larger group or broader process. Knowledge resources were not concentrated (at least not initially) in bureaucratic hands – a factor in the creation of networks of actors to facilitate information acquisition and development of common bases of knowledge (the epistemological context). Government learning, with its commensurate focus on organizational change, was simply insufficient on its own to provide the necessary knowledge for state actors. This type of learning only provides part of the change required in the FLOSS policy cases across the three studies. As an

associated observation were also fewer instances of process-oriented change or the reconfiguration of organizational structures, typically expected to correlate with this type of learning.

## 9.5. Policy Subsystems and Policy Change

The occurrence of policy change across the three cases generates a number of questions. The first is whether there is any relationship between the policy subsystem and policy change. If so, was a policy community or an issue network a more conducive setting for major changes in FLOSS policy? In the Canadian case, the actors in the smaller, more closely integrated network – which after comparison and classification appeared to possess in the majority the attributes of an policy community -- were found to be engaged in deliberate activities to acquire knowledge of a technical, organizational, and social nature to affect policy change. But this was true of the German and Belgian cases as well.

**Table 38. Policy Change Summary**

	Belgium	Canada	Germany
First Order	2	2	0
Second Order	1	1	7
Third Order	1	0	4
Not Applicable	2	4	0
Total Number of Policy Changes	6	7	11

## 9.6. Hypothesis Testing

The hypotheses central to this investigation are tested against the results of analysis of the qualitative data gathered from surveys, policy document reviews, articles, etc. and the quantitative data derived from these sources of information. They are evaluated using the modified policy typology, and the frameworks provided by theories of policy learning and policy change.

### 9.6.1. Hypothesis 1

*Policy change is less likely to occur when interconnections between actors in a policy network exceed a certain threshold.*

When it was first described in chapter one, the structural dimension of this hypothesis was highlighted. It suggested that the structural characteristics of networks, namely the links of communications between actors, would have an effect on policy variation. The assumption in this statement is that communications are related to policy change but in a sense that runs counter to the prevailing idea that communications between actors is a positive factor in policy change. One possible explanation is that the communications in a policy network do not scale effectively past a certain point and when this threshold is reached, the establishment of more links is subject to diminishing returns or actively inhibits effective communications. A related explanation may be that network actors are unable to engage in policy-oriented learning when tied to a large number of follow actors because of communications “load” and an inability to process information effectively.

In chapter four we defined a threshold for network density of 50% at which we expected policy change would be less likely. Of the three cases only the Canadian one came close to that threshold with a network density score of 44%. While it does not meet the criteria we established at the outset of this study, the score does have relevance as part of a relative comparison between the three cases.

From the perspective of policy change, the least significant variation in policy occurred in the Canadian case. The policies observed were limited to first and second-order events and were indicative of routine, incremental, and tentative policy initiatives,

versus the third-order policy changes found in the Belgian and German cases. The Canadian case does indeed have the greatest number of interconnections or relationships between actors as indicated by its network density score. At first glance this measurement suggests there may be correlation between network density and policy change in the Canadian case, however, there is insufficient evidence indicating a valid causal relationship between the two. Nor is this one particular positive observation generalizable or able to provide a defensible validation of this hypothesis.

However, this hypothesis does benefit from further examination of the empirical data and invites some speculation about why the Canadian network exhibited the highest network density score and how this might have played a role in inhibiting policy change. The high Canadian network density score was a function of the smaller number of more densely interconnected actors and a higher level of shared participation in policy events. These interactions were derived from the data gathered through analysis of policy-relevant documentation which, when assessed qualitatively, also supported the observation that the Canadian actors generally acted in concert with each other, in events that involved other network actors, and communicated and collaborated (generally) whenever engaged in FLOSS policy-making and policy-related events. Other factors played a role in the nature of change.

In the Canadian case, policy change was conservative and limited to first and second-orders because of a set of structural characteristics. The network density score was merely a numerical representation of the attributes of the Canadian subsystem as a policy community. In summary, the findings of this study hint at correlation between increased network density and the inhibition of policy change for a single case, but that a causal relationship between the two is not determinable, and that structural factors are a better indicator of policy change in network settings.

### **9.6.2. Hypothesis 2**

Hypothesis 2 takes this form: *A policy network has not appeared in Canada because prospective network participants are members of competing outside-government networks.*

Hypothesis two claims that there is no policy network in the Canadian case or that the arrangements of actors that have participated in FLOSS policy events do not constitute a policy network. Regardless of its validity, this hypothesis has intrinsic value as a check on the question: “Are policy networks present in this investigation?” The project operated under the assumption that policy networks exist in all three cases. At the outset, we used Katzenstein’s and Marsh and Rhodes’ definitions of policy networks to provide a rough outline for how we would identify one, in order establish that the observed structural relationships between actors would qualify. According to these definitions, links between societal and political actors tying both into the policy process were clearly in existence, having formed in all three cases. The actors that were identified were confirmed to be participants in these networks. A discussion of the choice of policy network definitions, how they were applied to this project, and the theoretical implications thereof will be left to the next chapter. While the presence of policy network was confirmed, this investigation found no evidence of prospective or confirmed Canadian network participants being members of competing networks. Indeed, there was no evidence of the existence of competing outside government networks found in all three cases. However, this absence of evidence does not eliminate the possibility that these networks exist. A good case can be made that expanding the survey sample size further may eventually uncover these networks and their participants.

Hypothesis 2 is invalid given that its core assumption is invalid and the lack of evidence for the existence of competing policy networks that were also assumed to prevent the emergence of a Canadian network.

### **9.6.3. Hypotheses 3 and 4**

*Hypotheses 3 and 4: A fertile epistemological context was a necessary precondition for the emergence of policy networks in the two European cases. And this context is lacking in the Canadian case.*

These two hypotheses were perhaps the most fruitful in terms of potential exploration. The first posited that a supportive context of shared knowledge between actors is necessary for policy networks to form and that this environment was present in

the Belgian and German cases. The second – contingent upon the first – stated simply that this context did not develop in the Canadian case.

Policy networks were present in the Belgian and German cases. Furthermore, in these cases, a coordinated effort between a number of federal agencies, over a multi-year period, drawing upon the assistance of private actors to assess FLOSS for technical, financial, legal, and organizational fit was evident. And in both these cases there was clear evidence of a shared base of knowledge. Of interest is that in the Belgian case, this body of knowledge underpinned policy processes that eventually shifted from FLOSS to a broader focus upon open standards. By comparison, German FLOSS policies were typically tactical measures. In the German case, the absence of coherent federal policy supportive of FLOSS or related policies such as those that would be supportive open standards, for that matter, was apparent.

There also was clearly a policy network in the Canadian case. A number of federal agencies mobilized resources cooperatively and with the participation of private actors, assessed the market, technical, and financial, legal, and organizational characteristics of FLOSS – just like in the German and Belgian cases. The Canadian policy network also developed its own set of foundational knowledge which was used to inform policy activities. However, the network didn't come up with an outcome (specifically policy) necessarily favourable to the broader adoption of FLOSS at the federal level in Canada. The epistemological context was characterized by a developing consensus that FLOSS was merely another way to solve existing technical problems and the resulting policy outcome meant FLOSS was suitable for inclusion in federal governments Federated Architecture Program under the aegis of the Treasury Board Secretariat.

Also pertinent to this hypothesis is the question whether there was any evidence of communication of information or ideas between these networks. From the survey responses and the analysis of policy-relevant documentation there was only a single direct link found between the Belgian and German networks. And there were there none found between the German and Canadian networks. By direct linkages we mean any of the following: public or societal actors who participated significantly in policy events in two or more of the networks, where significant participation would be defined as shaping

or assisting to affect policy outcomes (coded as an “leading” or “active” actor in the APES); formal institutional cooperation between two or more networks; or the movement of actors between networks. The one case of a direct link between two policy networks was an event shared by Canadian and Belgian participants: namely (already mentioned) Patrice-Emmanuel Schmitz (the author of the *Study into the use of Open Source Software in the Public Sector* which was a Belgian policy documents) making the keynote presentation at the 2002 Open Source Solutions Showcase in Canada. Schmitz’s participation in this event was coded as a “two” or active in the APES because of the nature of his activity – a major presentation to a number of Canadian network policy actors. Consequently, in the absence of significant evidence of direct links among individual actors or their institutions in the three networks, policy learning was a key – perhaps *the key* -- process for the introduction of knowledge into all three policy networks.

Patrice-Emmanuel Schmitz’s participation in a Canadian policy event was not only an example of a direct link between networks, but also an explicit instance of a policy-related learning opportunity used by policy-makers in the Canadian subsystem. This would fall under the lesson drawing or social learning categorization used earlier in this investigation. Schmitz imparted knowledge to his audience about specific FLOSS programs in other jurisdictions, along with implicit information about the social context in which FLOSS was used in the European context. This example highlighted the importance of policy-related learning to the development of basic literacy in a policy area, required by network participants. This context was a function of information imparted to the network through all three processes discussed in this investigation.

The findings of this study partially supported hypothesis three -- specifically, that a suitable epistemological context was necessary for the emergency of policy networks in the German and Belgian cases. However, this was true for the Canadian case as well.

## 10. Conclusion

### 10.1. Policy Learning and Policy Change Theories

The existence of policy networks in the Belgian, Canadian, and German studies has been substantiated – all constituted clear cases of interdependent political and societal actors engaged in activities that led to the formulation of policies. Network attributes were described using a modified form of the Marsh and Rhodes typology and the three policy subsystems were classified according to this framework. A number of theorists have argued that policy network theories lack explanatory capabilities (Pemberton, 2000; Dowding, 1998). Marsh and Rhodes' later work clarified the assumption that their typology was reliant upon a concept of network and related policy change driven exogenously (Marsh, 1998). However, the causal relationship between network and change was not adequately defined by these theorists. Consequently concepts of policy learning and policy change were brought into the equation in order to explain policy change. However, the relationships between these theories and how they have been integrated and the implications for these theories in a broader sense has not been explored to any significant extent in the previous chapters.

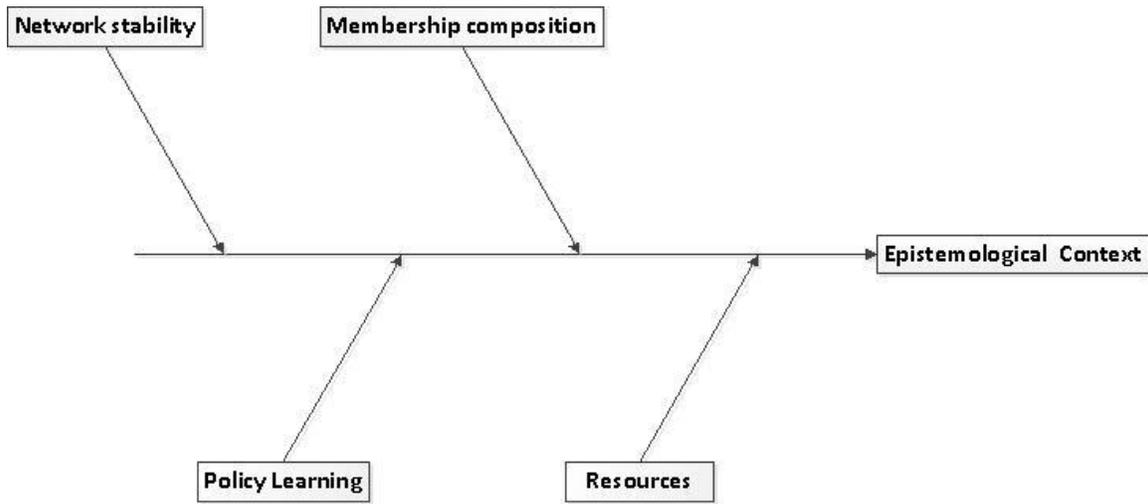
The use of the Marsh and Rhodes typology was an attempt to (a) bring in a theoretical framework that would assist us to understand networks with (potentially) a large number of dimensions and (b) address the limitations of classification limited to policy communities and issue networks by providing a broader range of attributes that could be used in an analysis. It was also applied to avoid the definitional weaknesses observed by some theorists, by offering relatively strict categorization of variables (Thatcher, 1998).

Policy learning became the primary linkage between policy networks and policy change. There have been a number of studies integrating policy networks with social learning (Pemberton, 2000; (Knoepfel & Kissling-Näf, 1998). Pemberton revisits Hall's

study of post-World War 2 economic policy-making in the UK through the organizing influence of a schema that links social learning feedback with policy change in the network. By comparison, this study has sought to integrate all *three* types of learning described by Howlett and Bennett (1992) with theories of network and policy change. This approach proceeds from the important observation that all of the policy learning types identified by Howlett and Bennett are able to affect policy-subsystems at different levels and in different manners but with the common effect of eventually changing the state of the epistemological context that in turn results in policy change.

The Ishikawa diagram in figure 11 describes the role played by network variables in combination with policy-related learning to affect the epistemological context. Of the variables, membership composition, resources, and network stability, policy-related learning is the major factor in the creation, maintenance and change of the epistemological context. Resource distribution and capabilities (as defined in chapter four) do contribute to the initial set-up or formation of the knowledge foundations required by the policy network. Actors bring their expertise or informational resources to the network, either as its progenitors or by joining it in later stages. Their existing knowledge base becomes part of the context in which the network operates. Membership composition is another factor in the development of a context. The role of experts in epistemological communities was touched upon briefly in chapter four and specific examples of their policy role have been covered in the case studies. By virtue of membership in epistemic communities, policy network actors act as conduits for the introduction of new information to a policy subsystem (Haas, 1992). Network stability or more precisely, the degree of persistence of knowledgeable actors, plays a role in how knowledge is retained and disseminated in the network. At some point turnover affects the ability of the network to retain knowledge and maintain its epistemological context.

**Figure 12. Development of Epistemological Context**



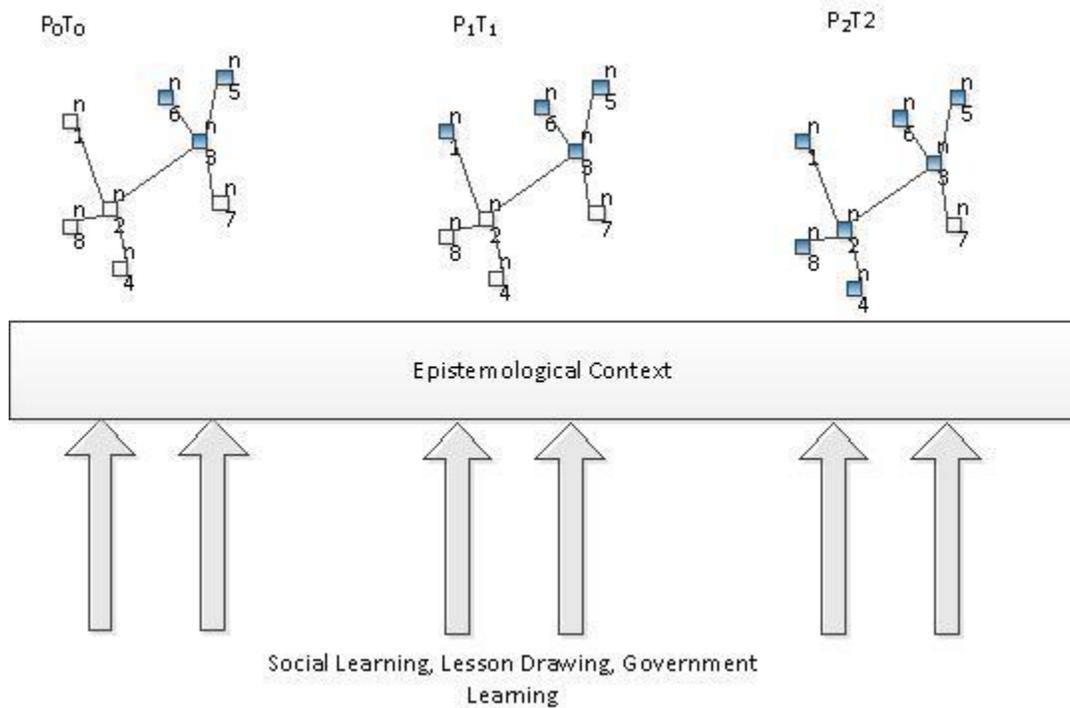
While there are other network variables that have an effect on the epistemological context, it is largely a manifestation of the knowledge possessed by the network actors and the continuous process of policy-related learning. This process occurs in the following manner: policy-related learning brings new knowledge into the networks. The agents are, by and large, actors in the policy subsystems, but can conceivably be “facilitators” outside of the network. Some roles associated with specific types of learning. For example, government learning, as was explained above, is done by bureaucrats. This knowledge alters the epistemological context through a variety of mechanisms: new technical, procedural, or organizational knowledge may drive revision of the existing base of knowledge or the discarding of old information; new knowledge might also reveal contradictions in the current understanding of a policy shared by the actors, leading to a cycle of discussion, deliberation, and revision. The primary effect of a changed epistemological context can lead directly to policy change.

The changes in the shared base of information possessed by the subsystem may also have secondary effects on the network. Certain types of learning might be more likely to generate these secondary changes. For example, from our experiences of the Germany policy subsystem, social learning on that part of that policy network has been a key factor in bringing new actors in, challenging the policy directions taken by previous participants. These secondary effects act on the part of the policy network that is driven

by policy learning and the resulting change in the network's knowledge base. These secondary effects can also lead to policy change.

With a change in the network's epistemological context, and a number of second-order network changes, the policy change described in Hall's model becomes plausible. Second and third order policy change may be accompanied by network reconfiguration as new interests move into the subsystem to undertake new policy-making taking the form of new programs/policy or objectives, respectively.

**Figure 13. Policy Change and Policy Networks**



Finally, another major aspect of this study was an effort to create linkages between the structural characteristics of the political and social environment in which the actors and networks operate. Specifically, we attempted to bridge the interorganizational approach and the structural approach by studying both the characteristics of the policy actors and the variables that affect their environment. For the purposes of this investigation we borrowed an approach common to the policy analysis literature -- that of dividing the environment into macro (typically system or institutional), meso (the

midrange or sectoral), and micro (individuals, or unitary state actors) levels. Atkinson and Coleman utilized such a schema in order to study state capacity and autonomy empirically (Coleman & Skogstad, 1995). Jervis also adopted this classification in his analysis of turbulence in international politics. He argued the improvement of individual (micro) capabilities through learning and technological change play an important role in institutional change and the establishment of subgroups or supranational organizations at the meso-level (Jervis, 1997). These webs of relationships are juxtaposed against competition and cooperation with the pre-existing state system -- their interactions with the activities of individuals and institutions at lower levels are evident in the turbulence of overlapping and interacting global political, economic, and social systems.

**Table 39. Policy Learning and Secondary Network Change**

Type of Learning	Secondary Network Change
Social Learning	Entry of new actors into policy subsystem. Exit of existing actors from network. Change of values.
Lesson Drawing	Entry of new actors into policy subsystem. Exit of existing actors from network
Governmental Learning	New organizational structure. Entry of new actors into policy subsystem. Exist of existing actors from network. Resources of actors augmented/reduced.

## 10.2. Policy Network Theory

The Marsh and Rhodes typology was a compromise from a number of perspectives. It provided a framework for the definition of policy networks and their attributes but only covered the two ends of the continuum – issue networks and policy networks. The majority of the case studies’ network attributes could be classified within this typology but in some instances had to be coded as “indeterminate”. Taken on its own this model was largely descriptive and could not provide an explanation of the

network structural change over the interval in question, nor could it provide any insights into policy change. Nevertheless, the typology was useful in classifying the attributes of the subsystems and shedding light on the structure of the Belgian, Canadian and German policy networks. The use of complementary methods to assess these network characteristics further assisted in tying together the analysis provided by the different perspectives. Only thereafter could the process of assessing the putative relationships described in the three hypotheses begin. This dissertation was in a unique position of being able to follow the formation and early life of three policy subsystems. The variables adapted from Marsh and Rhodes, when coded and accompanied by the APES and the case study descriptions, painted a picture of a set of relatively fragmented policy subsystems that did not cleanly fit into the issue network or policy community dichotomy. While not technically a compromise, these observations do suggest that Marsh and Rhodes was perhaps an appropriate model for the stages of development through which the policy subsystems went in the last decade. Sabatier and Jenkins-Smith's model could become more appropriate to the analysis of this maturing or evolved set of subsystems as their actor composition settles down into more formal or institutional structures and the behavior of individual actors (or particular policy entrepreneurs) becomes governed.

The policy network typology required significant augmentation in order to be a contributing factor in explaining instances of policy change in the case studies. The importance of the epistemological context as a structural characteristic and a critical attribute of network formation and persistence had already been established at this point. However, the role of knowledge as a primary driver of policy change had not been explored. Policy-related learning was cited (in aggregate) as the mechanism for the transfer of knowledge into the policy subsystem, and specifically as an agent involved in the creation and maintenance of the epistemological foundations for the network. Lesson drawing, social learning, and government learning continued to play a role in influencing this epistemological context, changing resource distribution in the network (as some actors gained access to informational resources or found their knowledge to be obsolete or less relevant to new requirements of policy-making); affecting subsystem stability by influencing the entry and exit of actors; providing information on programs in other jurisdictions; and finally suggesting new organizational forms for policy-making. New

information also challenged the epistemological context, highlighting inconsistencies or paradoxes, and consequently driving a process of issue resolution that would result in new policies being developed.

The linkages between policy learning and policy change were established through Hall's model. The policy events observed in the three cases were classified according to Hall's type or order of change, and relationships drawn between learning and the event. Admittedly, the causal relationship between learning and change was a challenge to substantiate. First, there was a difficulty in achieving a level of certainty that learning had actually taken place (Knoepfel & Kissling-Näf, 1998). Throughout this investigation inferences were made, supportive of learning occurring, based upon discussions with actors and from survey responses. These inferences were further reinforced by interpretation of events and actor testimony from policy-relevant documents. We also assumed in cases where there was significant contact and interactions between actors that knowledge transfer was present.

The findings of this project raise important theoretical and methodological implications that are addressed here. The use of a "stack" of techniques (described in Figure 5), including the comparative method in conjunction with case studies, mixed methods/models, and the Actor-Process-Event Scheme (APES), is consistent with a pragmatic methodological approach. From the perspective of the positivist versus constructivist dichotomy, the inclusion of both quantitative/empirical and qualitative methodologies comes from the recognition that neither a pure positivist nor a constructivist approach is feasible. Instead, the research assumptions are qualified and the analysis undertaken within an understanding that there are limits to knowledge, and of the awareness of the existence of bias on the part of the investigator

Positivism and constructivism differ with respect to their view of values, knowledge, and reality - specifically axiology, epistemology, and ontology. With respect to axiology, or the role of values, the analysis was conducted with an acceptance that the inquiry is somewhat subjective and that values do indeed play a role in how the research is structured and how results are interpreted. I have made an effort to be aware of the existence of values on the part of investigator and subjects and how these shape

specific parts of the project such as the selection of hypothesis, the structuring of the survey, and the form responses would take.

Reality is a contested concept among social scientists -- in particular by constructivists, who have long argued that it is relative to an observer's perspective, can take different forms dependent upon context and identify, and is constructed and shaped by the interactions between the subject and the object. Ontology is dealt with in this investigation generally from a positivist perspective. More precisely, this project takes the perspective that there is an objective reality external to the investigator and subjects, and that this reality is tangible and predictable. We also take the view that this reality can be analyzed systematically, providing for common understanding of the relationship between subject and object, and permitting an investigator to communicate findings to others.

Knowledge played a key role in this investigation as an intervening variable. As such it takes on aspects of positivism and constructivism. The assumption in this project with regards to epistemology or the nature of knowledge is that knowledge exists outside of the investigator as something that is identifiable and fungible. The existence of this knowledge independent of the observer makes it replicable. This by extension makes the study replicable and the goal of any work that aspires to be scientific. However, there is also the recognition that knowledge is hidden until discovered and this process of discovery creates a link between the researchers and the subject.

In sum, this investigation proceeded from a predominantly positivist perspective, but one tempered by an awareness of the insights provided by constructivism. There were a number of advantages to taking this approach. Firstly, quantitative data were primarily acquired through empirical means. A variety of scientific methods were used to analyze them. Together they provided a broad base of repeatable and verifiable techniques. Qualitative methods were brought in as well, but tempered by an understanding their selection reflected the values of both the observer (for example in their selection and application) and the observed (in their choice of responses).

### 10.3. Summary

The global FLOSS policy arena is an active one and has provided fertile ground for an investigation of its appearance on the policy agenda of three states. This project covered a significant part of the lifecycle of the networks that engaged in FLOSS policy in Belgium, Canada, and Germany, examining their creation and their operation to date. This study was divided into three major sections. The first was dedicated to establishing the framework under which the investigated proceeded, and included a summary of the history, salient characteristics, and policy relevance of FLOSS. Salient in this discussion was the importance of FLOSS to the global economy, its social dimensions, and the political implications it has for governments. While not falling into the realm of high politics, FLOSS, like other creations of a technological society such as the internet, biotechnology or artificial intelligence, has a surprising breadth of application, is socially complex, and possesses a philosophical dimension that extends its importance beyond that simply of a tool. FLOSS attracts strong opinions – pro and contra. This first section also included a policy network literature review that drew together the relevant theoretical concepts, including the Marsh and Rhodes policy network typology that was modified for use to classify the structural characteristics. Finally, the operationalization of a number of related concepts, including policy learning and change, in combination with the customized policy typology, provided a framework for analysis of policy network attributes that would be used in the later chapters.

The second section was dedicated to the case studies. These three chapters described FLOSS policy events and the actors involved in them. They demonstrated that the structure and characteristics of each policy network varied between the cases. This section also revealed significant differentiation in the process of their evolution and the characteristics of the actors involved. In one of the three cases, namely Belgium, the policy focus vacillated between exploration/analysis of the experiences of other jurisdictions with FLOSS and its benefits, and a set of policies that were seen as a possible alternative to FLOSS, open standards, until it the policy subsystem eventually settled on the latter. In the Canadian case, FLOSS was similarly assessed in a number of policy events and eventually was relegated to a component of the federal government's overall information technology architecture. What was notable in both

cases is that despite a process of policy evolution both the Canadian and Belgian cases, the composition of the policy network with respect to actors remained relatively stable. By and large the individuals that were involved in the initial set of events persisted and remained active in FLOSS policy to the end of the analysis period. The German study was the most substantial of the three in terms of numbers of tangible policies affected, with a number of cases of FLOSS standardization and deployments, albeit localized in specific government departments and agencies. The German case also had an instance of policy of funding of specific projects (e.g. the GNUPG project, BerliOS). However, this particular case also demonstrated a set of recent reversals of previously-supportive FLOSS policy.

There were also aspects of the policy network common to all three cases. The first was the near absence of direct involvement by supranational actors in the policy networks. Granted, there were exceptions: supranational actors in the Belgian case included the European Commission. Local (Belgian) representation from Unisys in developing the EC Study on FLOSS in 2001 could also be interpreted as an event involving a supranational actor. This class of actor was not found in the German and Canadian cases. FLOSS policy network membership was largely demarcated along national lines. The actors looked outside their networks for information about FLOSS and FLOSS policy but generally did not include actors from other states in their network. FLOSS policy networks appear to be composed largely of national interests, a fact that differs from the composition of FLOSS developer networks which are generally international in participation (Ghosh, Krieger, Glott & Robles, 2002). Policy learning, specifically lesson drawing, social learning, and government, from other jurisdictions was a key part of policy development. These processes borrowed heavily from contacts in states but the actual mechanics of policy-making were centralized in the policy networks themselves.

There may be a number of reasons for this. From a membership and resource perspective, actors in the three networks were generally dependent upon a certain level of legitimacy in order to undertake their policy functions. This legitimacy was in turn a function of the accountability and responsibility of actors by virtue of being situated within public organizations engaged in policy, irrespective of whether these roles were formal or informal. The private or societal actors assisting them occupied the same privileged

positions, accrued to them by formal (legal/contractual) involvement in these structures as consultants or advisors.

An interesting finding common to all three cases was the involvement of the policy networks in formulating and implementing policy that attempted to resolve problems of governance of FLOSS within federal administrative structures as well as involvement in policies that faced “outward”. The latter took the form of implementation of systems that would be used by the citizenry and other interests or direct funding of external organizations engaging in FLOSS development, for example. The implication of these subsystems performing such a dual-function in terms of their policy constituencies was not explored and might become a future avenue of inquiry.

An analysis combining the empirical aspects of the case studies with data derived from the policy materials and surveys using social network analysis techniques and their situation within the modified typology established in section one comprised the third and final portion of the study. From this analysis and hypothesis testing it was clear that the least policy change over the interval of this investigation was the case that displayed the most interactions between policy actors -- namely Canada. A consensus among policy-makers with respect to FLOSS was not evident in all three cases and played a role in the dissimilar outcomes evident in Belgium, Canada, and Germany.

In light of the findings of this study, the assumptions described in chapter one of this study can be critically examined. A first set of assumptions were that North American policy networks were characterized by hermetic separation between public and private policy-makers, reflecting a general divide between public actors in the this sector and social and business networks of information technology professionals, and that consequently private actors have limited roles to play in policy in this area. Of the three cases, Canada fell into the low end with respect to the composition of public versus private and non-profit actors (50% were public) and given the lack of comparability with other north American states (namely the United States) it is unclear whether this assumption can be validated or not. Certainly the assumption that private actors in North America participate less than their European counterparts is not accurate. Broadening this sample and looking at the role of IT professional and business networks may be an area for future investigation.

The European networks, however, did demonstrate that public and private actors were had more common understanding of the role to be played by FLOSS. An epistemological context was clearly established in the German and Belgian cases. However, this epistemological context drove a consensus towards open standards in the Belgian case and while in the German case, played a role in the proliferation and diversity of policy; it did not lead to common FLOSS policies across that federal government. Consequently, we saw a different set of policies between the two.

We found no direct evidence that Canadian policy makers consider software a manufactured good or that this view has shaped policy in this area. And while we did find evidence that Canadian policy makers are lobbied in a significant manner by commercial organizations such as the BSA or CAAST, we found no support for the assertion that the Canadian FLOSS policy network was influenced by these types of lobby groups. That said, a lack of evidence does not mean that there is a real absence of influence that the software as manufactured good idea or that IP property rights and opposition to reverse engineering and fair use positions might have on policy-makers. The limitations under which this study functioned included a (natural) reticence on the part of policy-makers to disclose all of their policy deliberations and choices, which might have provided evidence of exchanges or cooperation with such parties.

## **10.4. Lessons Learned**

Not unexpectedly, this project encountered a number of issues as it unfolded. This researcher experienced challenges in undertaking the data collection and analysis, the interpretation of the results within the appropriate theoretical context and, finally, the testing of the hypotheses. Data collection required significant effort, starting with the identification of an initial set of survey respondents. This was accomplished by working through policy-related documents, articles, blogs, and archived emails to identify a list of contacts. These individuals were then solicited via email and telephone. The survey respondents were generally forthcoming with their feedback. However some were hesitant to identify others with whom they worked or simply refused to do so, citing confidentiality concerns, the preservation of trusted relationships, and in one case, a contact revealed that their policy involvement was in an unofficial capacity and “off the

radar”. In a few cases respondents were hesitant to identify themselves directly as involved in the policy process, emphasizing their role as facilitator or advisor. This self-classification was not entirely accurate for everyone in this group of respondents and the rationale behind minimizing ones involvement in policy-making is unknown. Consequently, snowball sampling was significantly less productive than what had been viewed as likely at the outset of the project, and follow-on contacts were limited to under a dozen, with only a handful of actual responses generated from these solicitations. Ongoing identification of contacts through documentation and links between documents became a necessary complement to working through the initial list of contacts and conducting their follow-up discussions. The result of this lack of data was a greater reliance than expected upon document analysis.

Data acquisition through documentation analysis came with its own set of challenges. As has been established in this study, FLOSS is a technically specialized and politically insular area. As a result, policy artefacts were not always available. Policy decisions are often made without generating of policy documents and those that are available are not always publically accessible, or require freedom of information (FOI) requests or similar measures to secure. The recognition that information communications are a key part of policy formulation and implementation was early in this project and the survey structured in an attempt to captures those interactions. That said, there was a sufficient volume of documentation in the form of government reports and white papers, conference and seminar presentations by network actors to not only provide information on prospective (and then confirmed) network participants, but background on policy-relevant decisions. The investigator also utilized trade publications and blogs as sources of information on those individuals or organizations who were directly involved with FLOSS policy-making or to validate these and other contacts’ disclosure about the activities of other actors or organizations involved in the same activities.

Turning from challenges to success in this project, the utility of some of the methods and models was demonstrated through their use. First, the modified Marsh and Rhodes typology was a useful tool to organize and classify network attributes and establish what type of policy network each case fell under. Second, Serdult and Hirschi’s Actor-Process-Event Scheme (APES) was of considerable use in modelling and

depicting in a clear, graphical manner, the connections between actors and events. It provided a way of turning the significant body of qualitative data gathered in the course of the project into relationship tables (matrices) that in turn could be reworked with other tools to provide informative quantitative measurements of networks and their characteristics – namely network density and centralization.

There were a number of additional lessons learned by the author in the course of this project. First, the survey developed for this investigation was constructed with the goal of acquiring social network-relevant data. This was predicated on the assumption that a sufficient number of completed responses would be provided from which an initial map of the networks of policy actors could be derived. This assumption was incorrect. The survey was of limited assistance in establishing a complete list of policy network participants and their interactions. The survey data did help initiate this process but required a complimentary body of documentation to provide enough data to map networks. Surveys on their own are insufficient to identify network participants even when additional valid contacts are brought in through snowball sampling. This method is more suitably applied in the cases where a population can be reliably identified. Rishab Ayer Ghosh describes similar problems with gathering empirical data on FLOSS developers using survey methods, suggesting the use of secondary sources to validate or check the primary ones (Ghosh in Feller, Fitzgerald, Hissam & Lakhani 2005). While this project used secondary and (in some circumstances) tertiary sources of data to provide mutual and overlapping checks for establishing the existence of networks and their nodes and structural attributes, this information was brought in only after a significant amount of energy was expended on the survey instrument alone. Having recognized this earlier would have reduced time spent on data gathering, and reduced particular cases of “contact exhaustion” associated with having to make multiple requests for discussions with respondents.

Another important lesson taken away from this work was how important mixed methods research and the use of mixed methodologies were to the success of the project of this type. It relied upon a set complimentary of different approaches to address the bias and constraints that exist with individual methods. In line with the multi-level (e.g. meso and micro) analysis requirement cited at the beginning of this dissertation, mixed methods were utilized for multiple purposes. They were described in chapter five,

and summarized by Greene and her collaborations in their 1989 article: namely triangulation, complementarity and development (Green, Caracelli, & Graham, 1989). One purpose of mixed method studies that was not discussed in that chapter was the concept of expansion or to,

Extend the breadth and range of inquiry by using different methods for different inquiry components. (p. 259)

This was an implicit goal behind the use of social networking techniques for the mapping of policy network actors and their interactions, the use of APES to relate actors to events in a longitudinal form, and a customized typology. The investigation benefited significantly from the inclusion of such methods and models through the illumination of a particular aspect of network structure and its relationship to policy that they provided. However, with multiple methods comes the risk of losing clarity and explanatory power. One issue related to mixed methods is that they add complexity with the risk of negatively affecting the reproducibility of results, potentially leading to a low level of external validity. The inclusion of multiple methods and models increases the difficulty for other researchers to duplicate a study even with the original or source data. Consequently, there is a requirement that the idiosyncrasy of a case study be disclosed up-front and its limitations accepted. A somewhat contradictory second lesson learned was that analysis of set of case studies with indistinct boundaries, complex relationships between actors and events, is nearly impossible without a mixed method approach.

Finally, the difficulty of building a theoretical framework under which the analysis of empirical information could be undertaken became evident early on in this project. Although this is a *sine qua non* for any dissertation in the social sciences, the effort to introduce and extend an applicable and valid set of theories was still underestimated. Policy network theories are still largely oriented towards description. Other theories had to be integrated into the investigation to assist in explaining how networks form, persist, and affect policy. The related concepts of policy learning and change performed this function. Admittedly, this project would have benefited from more planning to identify the relevant theoretical concepts up-front versus bringing them in during the course of the data collection and analysis work.

## 10.5. Future of FLOSS Policy

The three case studies were a microcosm FLOSS policy on its global scale. The Belgian, Canadian, and German policy development over the last decade was representative of the experiences of many other states, exhibiting a broad range of policy instruments and objectives with respect to FLOSS, pursued in a variety of ways – from purposive and progressive to fragmented or incremental. The future of FLOSS policy is likely a continuation – in the majority of cases a repeat - of past developments. The proliferation of FLOSS continues. FLOSS policy initiatives have been undertaken by a large number of states reflecting an increased level of interest in this area in the last 3 – 5 years (Lewis, Keiber, Krieger, Rasmussen & Sladka, 2010). Specific recent examples include the decision to create a common pool of FLOSS for government use in Spain (Scherschel, 2012), Iceland’s migration project of all public administration to FLOSS initiated within a policy framework originally defined in 2007 and 2008 (Karia, 2012), and Brazil, which has been an enthusiastic official supporter of FLOSS since the late 1990s, using open source software technologies to build their open data portal which was launched in April 2012. While FLOSS is increasingly becoming a standard component of technology-related policy in states, it has seen challenges from proprietary software vendors and their interest associations, resulting in some cases in reversals of policy. Microsoft has been a major opponent of policy that favours FLOSS over proprietary software through standardization of government IT systems, preferential procurement, or the direct funding of software projects. Their position is rarely presented in the form of direct opposition to FLOSS, instead supporting “neutral government software procurement policies”, arguing that preferential policies actually reduce government’s ability to select the best technical solutions, lock public organizations into vendors, and reduce incentives to engage in research and development (Microsoft, 2008). The merits of the Microsoft claims aside, the position of this company is indicative of the broader concerns the proprietary software industry has with FLOSS and the struggle they have attempting to contain a technological process that does not fit into conventional market logic.

Government changes have been another factor in retreating from FLOSS-supportive policies. The German case of the removal of Linux from use in the Foreign

Office and its abandonment of policy supporting these types of deployments in the future (Henning, 2011), described in chapter eight, provides one such example. This particular decision has been tied to an ideological change less conducive to the retention of FLOSS-supportive policies arising out of a new neo-liberal administration. In the absence of a detailed analysis of government type versus FLOSS policy successes and failure, no valid relationship between the ideological basis of government and FLOSS can be drawn. However, there are examples of observations that FLOSS support is less likely when right-wing or more market-oriented governments are elected (Gardner, 2005). The German case study has revealed what might be indications of a gradual retreat from supporting FLOSS and the Canadian case study demonstrated a comparably low level of supportive FLOSS policy. Both states have market-oriented governments that actively pursue reductions of administrative costs. However their support for proprietary software runs counter to this general principle, given that FLOSS is an opportunity – at least *prima facie* -- to reduce the costs of software acquisition. This observation raises the questions of how states make decisions between competing priorities related to procurement, technical standardization, and their incumbent providers of software, and what role these commercial organizations might play in those decisions as interest groups.

Technical or organizational failures associated with FLOSS are a potential source of retreat on FLOSS policy. However, this investigation has not found any tangible cases of issues with FLOSS technology, project management, or organization capability cited as rationale for federal-level policy revisions.

The Belgian case highlighted an interesting development among states attempting to grapple with interoperability problems and how to make their information more accessible to their populations. Open standards policy is appearing on more states' agendas. This policy has taken a number of forms including recommended and mandatory standards with regards to document exchange formats used within government administrative agencies, between levels of government, intra-government, and with the citizenry, procurement preferences for open standards, and financial or logistical support for software projects that use or implement open standards. The two types of policies are related, but not interchangeable. They are solutions for different types of policy problems and as policy instruments can take completely different forms.

Open standards and implementable using proprietary or closed methods. For this reason, they have a different policy dynamic. Organizations that oppose FLOSS have been, in some cases, more receptive to open standards policy. A significant population of states have been undertaking open standards initiatives in parallel with their continued development of FLOSS policy the commensurate creation of instruments to implement both types of policies. Others have been doing so in lieu of FLOSS. A global look at developed countries reveals a cross-section of examples of federal and unitary states that are adopting a two-pronged approach with respect to software-related policy. The two types of policies can coexist because they, in most instances, have different goals, some of which have been expounded upon in earlier chapters.

**Table 40. Cases of Open Standards and Open Source Policy in Parallel**

Country	Policies
Germany	German Standards and Architectures for eGovernment Applications mandate open standards FLOSS policies described in chapter 7: 1999 - 2012
Hungary	Federal government mandates open standards for document exchange and recommends that departments use FLOSS to provide this capability (Henning, 2012).
France	FLOSS recommended and deployed widely (Defence, Education, etc.) since 2001 (Lewis, 2010). Open standards defined in JORF n°143 du 22 juin 2004 page 11168.
Iceland	Icelandic public institutions moving \ towards standardizing on open source software. Policy direction started in 2008 but has recently become more aggressive (Brown, 2012).  Open standards part of Iceland's National Interoperability Framework project started in 2008. Part of policy objective toward interoperability with principles of "User centricity, openness, integrated architecture, administrative simplification."
United Kingdom	Open standards policy (q.v.) process started in 2011. Challenged and now new consultative process underway.

Country	Policies
	FLOSS part of UK 2010 ICT plan.
Brazil	Open standards FLOSS “strategic choice of Brazilian federal government since 2003” (Paiva, 2009)
United States	<p>US military issues policy on open standards to address ERP failures (Ballard, 2011b).</p> <p>FLOSS policy cases in administrative organization at US federal level (Merrill, 2012).</p>

However, similar to the challenges faced by FLOSS policy, open standards initiatives still face opposition from the software industry. Indeed some of nascent government attempts at creating FLOSS policy have been successfully defeated by interest groups or coalitions of proprietary software firms. Yet other policy has been subjected to lobbying that has reduced its effect upon the proprietary software industry’s interests by amending or actively subverting it into a favourable format. First released in 2004, the European Union has published several revisions to a set of standards to govern IT systems interoperability between member state administrations. Collectively these standards are referred to as the European Interoperability Framework (EIF).<sup>16</sup> Its first release included a number of recommendations with respect to open standards, defining them in the following terms:

The standard is adopted and will be maintained by a not-for-profit organisation, and its ongoing development occurs on the basis of an open decision-making procedure available to all interested parties (consensus or majority decision etc.). The standard has been published and the standard specification document is available either freely or at a nominal

<sup>16</sup> Version 1.0 of the EIF was released in 2004 and version 2.0 in 2010. Functionally this framework is very much like the Belgium Interoperability Framework discussed throughout this document.

charge. It must be permissible to all to copy, distribute and use it for no fee or at a nominal fee. The intellectual property - i.e. patents possibly present - of (parts of) the standard is made irrevocably available on a royalty free basis. (European Commission, 2004)

In addition to prescribing open standards to address problems of system and data interoperability, EIF version 1.0 also recommended that open source software be given consideration. This ground-breaking policy document was updated in a process that commenced in 2006 with a Gartner Group study on revising the EIF, and eventually undergoing significant changes as a consequence of the highly contested, political process that materialized around these open standards and open source provisions. The latest version of the EIF dropped language of open standards and replaced it with references to “formalized specifications”. Proprietary software vendors, represented specifically by Microsoft, Oracle and the Business Software Alliance (BSA), were active in lobbying against the open standards recommendations, but some observers have pointed out that “standards” in the European context refer specifically to technical specifications that are recognized by standards bodies and therefore were removed from the EIF (Baker, 2010). That said, the royalty-free licensing of open standards mentioned in EIF 1.0 has been deemphasized and situated alongside licensing based upon the principle of FRAND which is an acronym for “Fair, Reasonable and Non-discriminatory”. FRAND are a set of licensing conditions that technical standards organizations apply to their members, essentially ensuring that any party that wants to license from the standards body is free to do so and that this freedom is not limited to the members of the organization. In principle, FRAND should prevent potential abuse of monopoly control over IP on the part of standard-setting body members. However, some variants of FRAND licenses may still permit major industry players to control the implementation of technologies by requiring that licensees establish relationships with these patent holders in advance of their use of these standards (Open Source Initiative, 2012). Finally, the ink lavished on open source software in EIF 1.0 was reduced considerably in EIF version 2.0. The changes from EIF 1.0 to 2.0 were undoubtedly the result of industry lobbying.

Another, more tangible example of a challenge to open standards is that of the commercial software industry’s opposition to the UK government’s attempts over the last two years to introduce policy that favours open standards in software. In the March 2011

Government Information and Communications Technology (ICT) Strategy, open standards were given prominence as way to achieve interoperability between systems and to would receive priority with respect to their procurement (UK Cabinet Office, 2011). This position sowed concern among proprietary software vendors – again represented by a set of now familiar firms and an interest group - Microsoft, Apple, Oracle, and the BSA – but surprisingly, also the British Standards Institution (BSI), who then organized against the strategy. The backroom opposition to the open standards provisions of the strategy drove the government to seek more public input on it, and consequently, it opened the process to consultation late in 2011 (Ballard, 2011). The key issue in this conflict was the use of the royalty-free condition in the UK’s open standards definition which was strongly opposed by the BSI and the proprietary software vendors, favouring royalty-based or FRAND licensing. The BSI and the International Standard Organization opposed the strategy, from their understanding that it would prevent use of their own standards. The proprietary software vendors objected to it from the (understandable) perspective that their financial interests were under threat, but used a number of arguments, including linking the UK’s economic health to this issue. Their direct lobbying of members of Parliament resulted in the Cabinet Office rescinding the policy at the end of 2011 (Ballard, 2012). However, this retraction of policy was not the end of the issue. Further public consultations on the policy were underway well into 2012, attended heavily by representatives from the software and telecom industries, along with supporters of open standards and FLOSS (Ballard, 2012b).

Turning from the specific to general, there are a number of broader concerns identified in this work. First an apparent paradox: despite the open nature of FLOSS as a social and technical process, the policy networks observed around it could not be characterized as open. In all three cases the majority of policy-makers – corporate, public, and individual – were integrated into relatively tightly knit groups. Entry into the policy networks was limited to actors with the technical capacity or organizational legitimacy to participate in policy-making. Peters (2005) observes an inverse correlation between the political complexity of a policy area (the number of actors and interests) and the programmatic complexity (technical content and the existence of multiple or competing ideas of causation in a policy area) and summarizes it thusly:

“... as problems become more technical, and hence more dominated by experts and information, it becomes difficult for other groups of actors, such as interest groups, to intervene effectively in the policy process.”

Consequently, this raises the question whether these networks lack accountability to democratic institutions and by extension, to the public. The insular nature of policy networks is exacerbated by the poor public accessibility of the policy area and a commensurate lack of interest on the part of most non-actors. Software is an esoteric technical topic and specialized knowledge is, in some cases, required to understand the dialogue between actors, grasp the broader implications of public policy, and to effectively contribute. This specialized discourse is present in policy activities as well, although somewhat attenuated by the focus upon the legal, administrative, social, or ideological aspects of FLOSS and not just the technical. A critique of the potentially anti-democratic nature of policy networks is valid. This point may be particularly relevant in these cases under investigation given the general lack of directly accountable actors involved. Does this perspective call into question the legitimacy of policy networks in this area? But given their esoteric focus and relatively limited impact does it matter to the democratic political systems in which these particular cases are situated?

A counterpoint to the above: while the isolated nature of FLOSS policy networks observed in this investigation appears to be a function of the combination of the topic and their structures, the characteristics of FLOSS as an open, non-hierarchical process may lend itself to potential applicability on other areas. Some theorists have speculated about the general applicability of open source principles to the natural and social sciences (von Krogh & Spaeth, 2007). One of the survey respondents emphasized the social ecology aspect of by FLOSS (E-Cology, 2006 – interview). He suggested that free and open source software as a social phenomenon is similar to the evidence-based medical model with which he regularly works, in that both are collaborative, empirically-driven models. Finally, and perhaps most interestingly, from his perspective the fundamental value of FLOSS lays within its process, not the software it generates, and that this process may be applicable to policy development too. The implications of this statement are intriguing. Could policy be created effectively in a collaborative, open fashion, with inputs from stakeholders outside of formal organizational structures? What about its implementation? Or does this aspect require a certain level of centralization or

coordination by an institutional core? And finally, are there certain types of policy that would be suitable for development within the methodology provided by FLOSS? All of these questions are potential topic for future research.

## 10.6. Future Research

This project raised a number of questions that were left unanswered. The first is whether a relationship exists between FLOSS policy and broader policy with respect to software. Using their approach to distinguish lower level relationships within a policy sector, Marsh and Smith (2000) might take a perspective that FLOSS is subsectoral and that it potentially is constrained or affected by policy activities within the larger software sector. They might ask whether it is the threat of FLOSS to proprietary interests within this sector that is generating some of the social pressures that have challenging FLOSS proliferation – pressures that we have noted as being a factor in social learning on the part of policy actors within at least one of the networks assessed. While we have found no evidence of a dominant coalition or community challenging FLOSS, this might be an area of future investigation.

The feasibility of the extension of the open source model to other areas such as policy development is a third possible topic of future research and one that has been explored broadly by analysts of open government and open politics (e.g. Rushkoff, 2003) but may benefit from a greater focus on the use of the model to inform the mechanics of agenda setting, policy development and implementation, instrument choice, etc. within government. The issue of the viability of democratic governance of largely expert-steered policy networks is another. A second iteration of this project may also help address one of the major weaknesses of this investigation, namely a lack of opportunity to do deep analysis arising out of constraints of resources. One option is to revisit the data assembled to date and attempt to broaden the survey distribution and repeat the network analyses. This might provide a better understanding of what low-level interactions are at play. Particular focus would be paid to substantiating the directionality of relationships between actors with an eye to deriving some prestige-related measurements. Key actors were identified empirically or via the analysis of pertinent documents. However, it would be interesting to see if the results from the quantitative

process validated those gained through document analysis. Of course, the latter could not be used as inputs into the APES and its source data would be limited to survey findings. With an expanded network sample the opportunity to try different social networking techniques to investigate whether centrality and connectivity measures change and to explore the theorized existence of competing policy networks that also was not developed further in this investigation would be present as well. Finally, future work deepening the amount of description and analysis used as inputs by the APES would be useful to confirm the “course of the policy process” (Serdült, Hirschi, et al., 2005). This is the link between the actors in charge of the policy network and the FLOSS policy activity. That relationship was not entirely clear in all cases. The active actor was not always the one “in charge” of policy and responsibility for a given area didn’t always translate into formal control over policy.

The focus of this investigation has been policy networks in which states are the dominant actors – despite the important roles played by private interests. As a consequence of hypothesis two and the Marsh and Rhodes view that multiple networks are able to coexist in the same policy area (Marsh & Rhodes, 1992), there was some effort made to locate competing networks, possibly composed of the proprietary software firms, their interest group representatives, and related public actors. This search was inconclusive. However, a more thorough investigation may turn up these competing networks or a deeper look at the participants from private organizations might reveal the existence of non-state market driven systems (NMSD) in information technology. Indeed even without establishing the presence of these alternate networks, this project already hinted at the existence of some aspects of NMSDs described by Bernstein and Cashore, namely governance given legitimacy by the market and voluntary submission of actors to market-driven certification processes (Bernstein & Cashore, 2000; Cashore, 2003). What form did this take? In the FLOSS area this was public and private actor acceptance of the technical merits of specific types of FLOSS and the understanding of their fitness as solutions to problems based upon their position in their respective markets. “Markets”, in this case, has an analogue in the community endorsement of FLOSS technical and social capabilities. This endorsement provides the legitimacy for FLOSS to become a valid tool or objective of public policy by public and private actors. NMSDs may also provide private actors with the means by which they can achieve political legitimacy,

allowing networks of private or societal actors to peer with government and participate in policy development, standards settings in international bodies, etc. Given the apparent disconnect between the objective of reduction of costs within public administrations and the large sums spent on software products, the role played by private actors might be an interesting avenue of future inquiry.

This project might provide a template suitable for the investigation of comparable cases in the biotechnology and cyber security policy fields, which in turn would provide opportunities to draw comparisons between similarly complex policy areas. Such an analysis could be used to test the assertion that biotechnology and cyber security policy are characterized by the presence of expert-focused networks that interact similarly, and where policy change is driven by a variety of types of learning with differing actors and affects.

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## **Appendices**

## Appendix A. Survey and Interview Respondents

Network Actor (Organization)	Country	Activity	Date
Treasury Board	Canada	Survey	
Department of National Defence	Canada	Survey	
Clue.ca	Canada	Survey	
GOSLING	Canada	Survey	
GOSLING	Canada	Survey	
Federal Government Co-ordination and Advisory Agency for IT in the German Federal Administration	Germany	Survey	
Software Consultant	Canada	Survey	
BMWi (Ministry of the Economy)	Germany	Survey	
Software Consultant	Germany	Survey	
Software Consultant	Belgium	Survey	
Academic	Canada	Survey	
Industry Canada	Canada	Survey	
Foreign Ministry	Germany	Survey	
e-Cology	Canada	Interview	August 2006
Defence Research and Development Canada	Canada	Interview	October 2006
Fedict	Belgium	Interview	January 2007
Treasury Board Secretariat	Canada	Interview	March 2007

<b>Network Actor (Organization)</b>	<b>Country</b>	<b>Activity</b>	<b>Date</b>
Free Software Foundation Europe	Belgium	Interview	August 2007
Software Consultant	Germany	Interview	September 2007
Open Government Consultant	Canada	Interview	September 2007

## Appendix B. Survey Questionnaire

### Interview Background

The author of this survey is studying how the structure of networks of individuals plays a role in the presence and nature of public policy in a given area. In this case, the topic of study is free/libre and open source software (FLOSS) public policy. The purposes of this interview are:

- a) to help the surveyor better understand your role as an individual that influences the policy-making process, and;
- b) to identify and describe any connections (formal or informal) you may have to other individuals and organizations (also formal or informal), involved in this issue area.

We would like to extend an invitation to participate in this study to other individuals who you indicated may be of assistance.

As the focus of this interview is individuals who are actively influencing the FLOSS policy-making process, the first question to be asked is whether you are one of these individuals. Please identify your role as one or more of the following:

an individual who works within a larger group to influence, create, or implement public policy with respect to free and open source software. Examples of this activity might be a policy analyst working for a government department who has been asked to write an executive brief on FLOSS.

Yes\_\_\_\_\_ No\_\_\_\_\_

an individual who works independently to influence, create, or implement FLOSS public policy. For example, a FLOSS developer or consultant who is lobbying for government procurement policy changes or for the increased uptake of FLOSS by public organizations.

Yes\_\_\_\_\_ No\_\_\_\_\_

**If you answered 'no' to both of these questions, please do not complete this questionnaire. However, if you believe you can identify other individuals who are participants in the policy-making process, and are comfortable doing so, please pass along the questionnaire to them and notify the interviewer that the survey has been passed along.**

Questions 2 - 6 ask about any involvement in FLOSS projects and exist for the purpose of providing the investigator with some general background about you as a subject.

2. Do you participate in any open source projects? If 'yes', proceed to the next question. If 'no', please proceed to question 7.

Yes\_\_\_\_\_ No\_\_\_\_\_

3. With what open source project or projects do you have personal involvement?

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4. If you are involved in one or more projects, for your project or for the project which you consider to be the MOST significant, what is your role?

a) developer	
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b) tester	
c) evangelist	
d) project leader	
e) writer or maintainer of documentation	
f) a FLOSS user actively submitting feedback or bug reports to a project	
g) other (specify)	

5. If you are involved in more than one project for the project which you consider to be the SECOND most important, what is your role?

a) developer	
b) tester	
c) evangelist	
d) project leader	
e) writer or maintainer of documentation	
f) a FLOSS user actively submitting feedback or bug reports to a project	
g) other (specify)	

6. If you are involved in more than one project for the project which you consider to be the THIRD most important, what is your role?

a) developer	
b) tester	
c) evangelist	
d) project leader	
e) writer or maintainer of documentation	
f) a FLOSS user actively submitting feedback or bug reports to a project	
g) other (specify)	

Questions 7 – 43 will ask about the organizations (either formal or not) to which you belong and which facilitate your work as someone who influences, creates, or implements FLOSS public policy as one of your primary goals.

These questions also deal with the cooperation (again formally or informally) that you or your organization might undertake with other individuals or organizations in the FLOSS policy area.

7. Are you a member of one or more formal organizations that has a primary purpose or activity to influence, create, or implement public policy in the FLOSS area? If yes, please identify the organization or the MOST important of the organizations if you are member of multiple. If no, please skip to question 33.

Yes \_\_\_\_\_ No \_\_\_\_\_

\_\_\_\_\_

8. If you are a member of one or more formal organizations that has a primary purpose or activity to influence, create, or implement public policy in the FLOSS area, please describe the mandate of the single or MOST important organization in which you are a member.

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9. Is this the only activity of this organization, or one of many? If there is more than one activity, please rank them in order of importance.

Activity	Rank

10. Please identify one or more functions of the MOST important primarily FLOSS related organization to which you belong. If there is more than one function, please rank them in order of importance. Some of the relevant functions might include:

a) government department or ministry	
b) private lobby group	
c) think tank	
d) corporation	

e) consultancy	
f) working group	
g) a group of activists	
h) project team	
i) university or college	
j) research group	
k) other (specify)	

11. Please identify the policy area of the MOST important primarily FLOSS related organization to which you belong.

a) information technology/telecommunications	
b) health	
c) biotechnology	
d) social services	
e) education	
f) government	
g) other (specify)	

12. Is this a public or private organization?

Public \_\_\_\_ Private \_\_\_\_\_

13. Please list other organizations or groups with which your MOST important primarily FLOSS related organization or group cooperates in the influence, creation, or implementation of FLOSS policy (if applicable).

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14. If you identified organizations in your response to question 13, do you collaborate with other individuals working in these organizations with the goal of influencing, creating, or implementing FLOSS policy?

Yes \_\_\_\_\_ No \_\_\_\_\_

15. Please list the individuals in the groups you identified in question 13 with whom you collaborate or communicate regarding the influencing, creation, or implementation of FLOSS public policy? Please identify their group affiliation and classify the importance of your





Activity	Ranking

19. Please identify one or more functions of the SECOND most important primarily FLOSS related organization to which you belong? If there is more than one function, please rank them in order of importance. Some of the relevant functions might include:

a) government department or ministry	
b) private lobby group	
c) think tank	
d) corporation	
e) consultancy	
f) working group	
g) a group of activists	
h) project team	
i) university or college	
j) research group	
k) other (specify)	

20. Can you please identify the policy area of the SECOND most important primarily FLOSS related organization to which you belong?

a) information technology/telecommunications	
b) health	
c) biotechnology	
d) social services	
e) education	
f) government	
g) other (specify)	

21. Is this a public or private organization?

Public\_\_\_\_ Private \_\_\_\_\_

22. Please list other organizations or groups with which your SECOND most important primarily FLOSS related organization or group cooperates in the influence, creation, or implementation of FLOSS policy (if applicable).

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26. Is this the only activity of this THIRD most important primarily FLOSS related organization, or one of many? If there is more than one, please rank them in order of importance.

Activity	Ranking

27. Please identify one or more functions of the THIRD most important primarily FLOSS related organization to which you belong? If there is more than one function, please rank them in order of importance. Some of the relevant functions might include:

a) government department or ministry	
b) private lobby group	
c) think tank	
d) corporation	
e) consultancy	
f) working group	
g) a group of activists	
h) project team	
i) university of college	
j) research group	

k) other (specify)	
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28. Can you please identify the policy area of the THIRD most important primarily FLOSS related organization to which you belong?

a) information technology/telecommunications	
b) health	
c) biotechnology	
d) social services	
e) education	
f) government	
g) other (specify)	

29. Is this a public or private organization?

Public \_\_\_\_\_ Private \_\_\_\_\_

30. Please list other organizations or groups with which your organization or group cooperates in the influence, creation, or implementation of FLOSS policy (if applicable).

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31. If you identified organizations in your response to question 30, do you collaborate with other individuals working in these organizations with the goal of influencing, creating, or implementing FLOSS policy?

Yes\_\_\_\_\_ No\_\_\_\_\_

32. Please list the individuals in the groups you identified in question 30 and in your own organization, with whom you collaborate or communicate regarding the influencing, creation, or implementation of FLOSS public policy? Please identify their affiliation and classify the importance of your collaboration or communication over FLOSS issues using a scale of 1 – 5, where a 1 is of low importance, 3 corresponds to medium importance, and 5, high importance.

Finally please identify the frequency of your collaboration or communication where 1 is infrequent, 3 corresponds to medium frequency and 5 frequent collaboration or communication.

Individual	Group Affiliation	Importance	Frequency



35. If you are a member of one or informal or ad-hoc groups that has a primary purpose or activity to influence, create, or implement public policy in the FLOSS area, please identify the SECOND most important group in which you are a member and describe its mandate.

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36. Is this the only activity of this group, or one of many? If there is more than one, please rank them in order of importance.

Activity	Ranking

37. If you are a member of one or informal or ad-hoc groups that has a primary purpose or activity to influence, create, or implement public policy in the FLOSS area, please identify the THIRD most important organization in which you are a member and describe its mandate.

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38. Is this the only activity of this organization, or one of many? If there is more than one, please rank them in order of importance.

Activity	Ranking

39. Are you a member of an organization or group, either formal or informal that does not have as its primary goal the influence, creation or implementation of FLOSS public policy, but supports your efforts (either by formal recognition or resource support, or by not actively obstructing your work) to influence, create or implement FLOSS policy? If so, please identify this organization. If you are not a member of an organization that meets these criteria, please proceed to question 45.

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40. Please identify one or more functions of the relevant group or organizations to which you belong? If there is more than one function, please rank them in order of importance. Some of the relevant functions might include:

a) government department or ministry	
b) private lobby group	
c) think tank	
d) corporation	
e) consultancy	
f) working group	
g) a group of activists	
h) project team	
i) university of college	
j) research group	
k) other (specify)	

41. Can you please check the policy areas of the groups to which you belong?

a) information technology/telecommunications	
b) health	
c) biotechnology	
d) social services	

e) education	
f) government	
g) other (specify)	

42. Is this a public or private organization?

Public \_\_\_\_\_ Private \_\_\_\_\_

43. Do you collaborate with other individuals working in your organization with the goal of influencing, creating, or implementing FLOSS policy?

Yes \_\_\_\_\_ No \_\_\_\_\_

44. Please list the individuals in your own organization with whom you most frequently collaborate or communicate regarding the influencing, creation, or implementation of FLOSS public policy? Please identify their group or organizational affiliation and classify the importance of your collaboration or communication over FLOSS issues using a scale of 1 – 5, where a 1 is highly important, 3 corresponds to medium importance, and 5, low importance.

Finally please identify the frequency of your collaboration or communication where 1 is infrequent, 3 corresponds to medium frequency and 5 frequent collaboration or communication.

Individual	Group Affiliation	Importance	Frequency



