

Chapter 2

Open Innovation Networks: The Evolution of Bureaucratic Control

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Keywords Open innovation • Innovation networks • Control • Bureaucratic rules

2.1 Introduction

Chesbrough (2003) popularized open innovation at the firm level as the use of purposive inflows and outflows of knowledge both to accelerate internal innovation and to expand the markets for external use of that innovation. Open innovation can discover new market, product, and service landscapes that stretch beyond the current core businesses of the organizations and that would be hard to imagine, discover, or develop by individual organizations themselves (Almirall and Casadesus-Masanell 2010). The innovations might be sold as services or products on a market, offered as public goods, integrated into existing products and services, or developed further for other private or commercial purposes by a smaller subset of organizations (West and Gallagher 2006; von Hippel and von Krogh 2003).

At the interorganizational network level, open innovation refers to a collective focusing on innovation, so that a large group of industrial and research organizations pool their diverse and complementary resources to stimulate and accelerate innovation; they increase innovative outputs (e.g., knowledge-based competences and technologies) and match them with a wide variety of customer preferences and market needs (see, e.g., Vanhaverbeke 2006; Odasanya et al. 2008). Compared to a research and development (R&D) consortia, in which research program participation is often

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limited to the consortia-owning members only (Pisano and Verganti 2008), open innovation networks welcome non-owning members in their research programs and promote change among the participants from one program to the next. These open innovation networks comprise suppliers, customers, rival companies, research units of universities, and other institutions that aim to develop breakthroughs in technology, products, and services that can be further commercialized (Chesbrough and Schwartz 2007). The open innovation networks do not only imply high levels of uncertainty of innovative outcomes, but also bring a diverse set of interests to collaboration.

How are these diverse interests coordinated under high levels of uncertainty? The parties in open innovation networks include industrial enterprises (IEs) that look for firm-specific advantages (i.e., private interests), as well as parties like research units (RUs) that look for knowledge spillovers and knowledge externalities that benefit the public (i.e., public interests). Public interests can conflict with private interests, creating tensions. There has been paucity of research on coordination mechanisms, both inside and outside, to understand how tensions are managed in open innovation networks (Enkel et al. 2009).

Control is one of the key mechanisms in the OD literature that motivates cooperation among participants that only partially share congruent objectives (Ouchi 1979). Control involves one party's influence on another party (Tannenbaum 1968). Control motivates acceptance of common goals and behavior that is in accordance with those goals (Ouchi 1979). The control literature distinguishes between informal and bureaucratic (formal) control. Informal control operates through values and norms via shared culture, peer pressure, and social events (Cardinal et al. 2004). Bureaucratic control includes a range of formal or officially sanctioned and usually codified institutional mechanisms, such as written rules, contracts, procedural directives, and penalties (Sitkin 1995; Sitkin and Bies 1994; Cardinal et al. 2010). Bureaucratic control systems emphasize the specification, monitoring, and compliance in regards to rules and regulations, specialized jobs, and hierarchies (Ouchi and Price 1978; Lebas and Weigenstein 1986). Bureaucratic control is prevalent in situations of high uncertainty (Eisenhardt 1985). Prior literature on bilateral relationships suggests that in situations where task uncertainty is high and the knowledge of the other parties is limited, the use of bureaucratic control increases (Rustagi et al. 2008). In such settings, it is difficult to forge shared beliefs and values that underlie informal control. Adler and Borys (1996) argue that in large-scale projects, bureaucratic control brings the much needed structure and formality that mitigate risks of opportunism, provide guidance, clarify responsibilities, and enhance the effectiveness of collaboration. The existing literature on bureaucratic control is primarily focused on individual firms or on bilateral relationships between firms, rather than on collectives.

The literature of open innovation has not established a prevalence of bureaucratic control. Control is discussed more generally and related to the logic of efficiency and is portrayed as an impediment to innovation and creativity (Gassman 2006) – and not just control in the hierarchical sense, but also in autonomous, self-managing teams “controlled” by strong normative pressures to conform (Stewart and Gosain 2006; Xu et al. 2011), not unlike those found by Barker (1993). Open innovation networks thrive on dynamism, whereas bureaucratic control is commonly depicted as a static

design variable that promotes stability and consistency (Miles et al. 2005, 2009; Snow et al. 2009; Raisch et al. 2010), and thereby, can be argued to stifle change and innovation. The question we examine in the remainder of the chapter is whether and how bureaucratic control can have a role in open innovation networks to manage uncertainty and diverse interests in the formative phases of the networks.

The chapter is structured as follows. We briefly review literature on open innovation networks from the perspective of three coordination mechanisms: trust, shared culture, and bureaucratic control. We then report on an empirical study on the role of bureaucratic control in the early phases of government-initiated open innovation networks in Finland. We discuss the evolution of bureaucratic control and its effect in three different phases of the networks' existence. Finally, we discuss the contributions of this study to community-based organizational design literature and control literature.

2.2 Open Innovation Networks as a Community-Based Organizational Form

In the OD literature, an open innovation network is subsumed under the community-based organizational form (at the level of interfirm relations) (Astley and Van de Ven 1983; Adler 2001). Such a form emphasizes collaborative knowledge and interdependence among the diverse parties:

A collaborative community in modern industry needs to coordinate interactions that span a wide range of competencies and knowledge bases, and that shift constantly to accommodate the evolving nature of knowledge projects. The challenges it faces cannot be met through "teamwork" in the usual sense of small, homogeneous, and informal groups. (Adler and Heckscher 2006, p. 44).

The form has grown in popularity because the practice community has recognized that many innovations can benefit from a wide variety of diverse external inputs and that the innovation is more effectively appropriated when it is distributed among a wide variety of markets and customer segments (Chesbrough 2006). Given the form's increasing popularity, OD scholars must improve their understanding of how it functions in different settings, including government-induced open innovation networks.

2.2.1 Trust and Culture in the Community-Based Organizational Form

The literature predominantly argues that organizations characterized as a community-based organizational form coordinate their activities on the basis of trust (Adler 2001; Miles et al. 2009). In this form, trust manifests itself as "resilient trust," which

relies on the competence and integrity of the other community members rather than simply on goodwill and loyalty. High levels of informational transparency facilitate resilient trust and allow mutual adjustments in inputs, processes, and outputs as external conditions change (Adler 2001).

Complementing the role of trust, informal (social) controls that are based on shared culture also guide communication and behaviors to ensure consistency with the goals of the network (O'Reilly and Chatman 1996). The shared culture arises from shared experiences, shared values (e.g., trustworthiness based on competence and integrity), openness, and accepted norms of appropriate behavior (Snow et al. 2009). Miles et al. (2009) depict how actors in a collaborative community behave as in a clan (Ouchi 1979); that is, they freely share resources and trust in the equitable distribution of the resulting wealth. O'Mahony and Ferraro (2007) provide an analysis of the community form and how the form blends positional authority with informal (social) control. Markus (2007) emphasizes the role of shared cultural values in aligning behavior with community goals.

2.2.2 Bureaucratic Control in the Community-Based Organizational Form

Adler (2001) explicitly argues that some control, including bureaucratic control, is required to focus and define the community's activities toward collective goals. He specifically acknowledges the important role of bureaucratic controls (e.g., standards, plans, procedures, and laws) to ensure that members' actions are coordinated toward collective ends, and not just toward their individual, private ends (Adler 2001).

Although currently overlooked in the open innovation literature (e.g., Chesbrough et al. 2006; Dahlander and Gann 2010), bureaucratic control may be critical in aligning aspirations and interests of diverse parties in a collective. Controls can structure and manage attention (Ocasio and Wohlgezogen 2010; Weibel 2010) and integrate and transfer knowledge among a large group of diverse actors (Turner and Makhija 2006). Controls create both incentives and disincentives so that organizational members behave in a manner consistent with collective goals (Ouchi 1979; Eisenhardt 1985; Flamholtz et al. 1985; Snell 1992). Bailyn (1985) and Cardinal (2001) both found bureaucratic control to be critical among R&D staff members in large organizations.

Still, the picture of bureaucratic control (e.g., rules, directives, policies, and laws) that emerges from the current literature on community-based forms is perplexing. Snow et al. (2009) discuss the presence of formal controls (e.g., bylaws and rules of conduct) and conceptualize them as "enabling" the launch of the Blade.org community. However, they do not depict them as critical for the ongoing operation of the network. Miles et al. (2009) see formal controls as temporary; bureaucratic control (e.g., laws and regulations) imposed on community forms are likely to vanish once networks demonstrate their economic viability. West and O'Mahony (2008) acknowledge the key role of bureaucratic controls in the focal company's ability to

appropriate value from innovation, but they portray such control as largely coercive at the collective level and limiting the overall community's growth. Engeström (2007) sees bureaucratic control as coercive in community-based forms. Bureaucratic control is seen to signal distrust and reduce voluntary participation by lowering intrinsic motivation, loyalty, and concern for others. West and Gallagher (2006) depict bureaucratic control as limiting broad-based knowledge sharing but also the emergence of both collaborative processes and joint decision making. Engeström (2007) and West and Gallagher (2006) appear to focus on communities in a mature state and not in their formative phases. In summary, the literature suggests that bureaucratic control has a negative impact except possibly during the formative phases of the community-based form, but the literature does not explain how and why.

2.2.3 Government Involvement in Open-Innovation Networks

None of the prior work has, to our knowledge, focused on bureaucratic controls instigated by the government in community-based organizational forms. Such bureaucratic control can be substantive in government-initiated networks. Although the open-innovation networks themselves initiate, select, prioritize, and monitor research programs, the governmental units have responsibility for ensuring collaboration in accordance with strategic network goals and laws regulating the administration of state aid, that require simultaneous balancing of private and public interests.

There is paucity of research on state-induced networks of innovation in recent OD literature. The absence might be explained by the trends in the 1990s to replace state-centered models of innovation with market mechanisms. Nevertheless, the pendulum seems to have begun swinging back in the other direction to some extent (Barney et al. 2011). Governments are seen to play a critical role in shouldering high innovation risks, promoting spillovers at the community level, and providing incentives for innovation (Autio et al. 2008). In addition, governments affect the appropriability of innovation and knowledge spillovers and other innovation-related externalities (West 2008; Lichtenhaler 2010). West and O'Mahony (2008) mention the rise of government-induced or -sponsored collaborative communities but do not discuss them. To help fill this gap, we report on an empirical study on open-innovation networks that operated as public/private partnerships in Finland.

2.3 Methods

The study reported in this chapter grew out of a 5-year research program examining the evolution of collaboration in large, open innovation networks, each composed of representatives from 50 to 100 different Finnish organizations. The networks were selected for a study because the initial goals set by the Finnish government emphasized networks that were "open, widely connected," that would "grow over time..." were "gradually developing," and had "flexible centers."

Bureaucratic control was not a concept that we planned to study at the outset; instead, it emerged as a relevant focus during data collection as various interviewees described and explained their collaboration in the networks. A subsequent literature review on control revealed little focused attention on bureaucratic control in open networks or collaborative communities at large, suggesting a need to develop new insight in this area. Within this effort, we defined bureaucratic control *as the rules and regulations that the governmental units imposed on the networks to meet the strategic goals the units had set for the networks.*

The research design is a qualitative case study with multiple embedded case units. The embedded case units consist of six open-innovation networks that were in operation ranging from 1 to 3 years. The networks, called Strategic Clusters for Science and Technology, and Innovation, or “SHOKs,” were initiated by the Finnish government; the government also set the networks’ common goals. The different networks studied are used as part of a replication logic (Yin 2003). Because the purpose is to highlight commonalities in how bureaucratic control affected the networks, we do not report on the network differences. We selected a case study design for its capacity to help us (1) examine a complex contemporary phenomenon (Yin 2003) and (2) identify the circumstances that gave rise to the various bureaucratic controls and their consequences for network collaboration.

2.3.1 Setting

To maintain Finland’s global competitiveness and international status as an exemplar of innovation systems, the country’s government launched a program to provide incentives for both industrial enterprises (IEs) and research units (RUs), such as universities, to develop more collaborative and open innovation practices. Under this program, six SHOK networks were operating by 2010, each addressing a different industrial sector.

Each SHOK network defined long-term research themes, approved and coordinated multiple research programs, facilitated funding, and promoted outreach in a particular industrial sector (e.g., forestry, energy and environment, health). All SHOKs had their legal basis as a non-profit SHOK limited liability company (SHOK OY), with IEs and RUs as their shareholders.

The research collaboration in SHOKs happened in multi-year RESEARCH PROGRAMS. The PROGRAM participation was not tied to shareholder interest in SHOKs, although the approval of a new PROGRAM and the continuing funding required the approval of shareholders. The process of selecting program participants varied across SHOK networks. We repeatedly heard from participants that SHOK networks established programs that involved a much larger group of collaborating participants than what traditionally has been the case in government-initiated research programs. The individual research programs could have as many as 60 different participating organizations (see Table 2.1). Each network had many parallel programs. The organizations in a single program included competitors, suppliers,

Table 2.1 Background on SHOKs

Network	Year founded	No. of shareholders	No. of Programs	Volume of research funding	Core industries
Network 1	2007	20 (10 IEs, 10 RUs)	5 programs	40–50 M€ annually	Wood products
Network 2	2008	46 (27 IEs, 19 RUs)	6 programs	50 M€ in 2010	Electronics, software, telecom services, content
Network 3	2008	30 (17 IEs, 13 RUs)	6 programs (3 more in 2011)	42 M€ annually (185 M€/5 years)	Raw metals, metal products, machinery and vehicles, Marine technologies
Network 4	2008	44 (28 IEs, 16 RUs)	3 (4 more are to come)	20–30 M€ annually (estimate is from 2009 for 2010)	Energy and fuel production and distribution, water maintenance, waste management and recycling
Network 5	2009	52 (42 IEs, 4 cities, 6 RUs)	3 programs	40–50 M€ (goal volume)	Real estate, construction
Network 6	2009	28 (16 IEs, 12 RUs)	1 ongoing, 1 to come	26,4 M€ for the ongoing program for 3 years	Health and wellbeing, diagnostics, food, pharma, imaging, services

customers, universities, and national research institutes, all of whom had varying interests. Successful collaboration required constant negotiation among these different interests.

One of the advantages that SHOKs offer as a research setting for a study of bureaucratic controls in open-innovation networks lies in the multiplicity of interests represented. The SHOKs functioned as public–private partnerships because of substantial state aid. The aid imposed a *public interest* requirement (i.e., a major effect on Finnish society and economy). Public interests had to be balanced with the firm-specific interests of IEs. The state aid rule specified that half of the invested labor of the research programs had to come from IEs to ensure that research was jointly carried out by IEs and RUs.

2.3.2 Data Collection

Between September 2009 and December 2010, we conducted more than 100 interviews with a wide range of informants both inside and outside the networks who were knowledgeable about their networks' activities. To ensure that our sample included the most knowledgeable informants, we used a "snowballing technique," asking each informant to recommend others who could offer further insight.

An interview protocol was designed with an open-innovation phenomenon in mind, but the questions did not specifically focus on bureaucratic control. The interviews centered on general topics, including network history and structure, current programs, the management of intellectual property rights (IPR) and other rules, relationships, future plans, and challenges. We encouraged informants to openly share what they felt was important for us to understand about the networks and how they functioned. The length of the interviews ranged from 45 to 120 min, and most involved two researchers as interviewers. The interviews were taped and transcribed to facilitate analysis. In addition, researchers observed five all-hands program meetings. Additional data came from archival and public sources, industry reports, Web material, and internal SHOK documents. Emails and phone calls were used to clarify specific issues, such as the exact changes in the public funding rules.

2.3.3 Data Analysis

Our analysis focused on triggers, targets, and the effects of bureaucratic controls in terms of strategic goals of the networks.

Stage 1. On the first round of analysis, we coded transcripts for general themes (irrespective of bureaucratic control), as is recommended for qualitative research by Corbin and Strauss (2008). The interviews highlighted that governmental bureaucratic control had a significant effect on research collaboration. Because SHOKs had governmental guardianship, oversight was provided by a governmental policy group

on Science and Technology (hereafter referred to as the “policy group”). The financial aid for SHOK programs came from the Finnish government’s funding agency for technology and innovation (hereafter referred to as the “funding agency”).

Stage 2. This stage involved identifying the rules that governmental units imposed on SHOKs. We prepared a white paper that contained all these rules and their legal source and circulated it among the administrative heads of SHOKs, as well as several attorneys of firms and universities participating in the SHOK programs, for comments and additions.

Stage 3. In the third stage of analysis, we reviewed the interview and archival data to understand the triggers and the targets of rules, as well as how the rules affected the strategic goals of the networks set by the Finnish governmental policy group. We identified “phases” that related to the emphasis of the targets of controls: PUBLIC INTERESTs and PRIVATE INTERESTs. The phases are only loosely tied to time periods because each of the SHOKs was developing independently, and dividing the phases strictly by time periods would not have been illustrative. In the next section we report on the findings associated with the phases.

2.4 Findings

2.4.1 *Phase 1: Mobilizing the Networks with Emphasis on Private Interests*

In Phase 1, the bureaucratic rules were primarily targeted at the strategic goals of the networks. There was little bureaucratic control over the form and content of research collaboration in the networks. The autonomy left room for private interests to prevail in Phase 1.

The main trigger for the governmental founding of networks was the national interest in ensuring and increasing the international competitiveness of industries in Finland. The governmental policy group underscored three sets of strategic goals for networks: (1) the network secures the commitment of IEs and RUs to network activities and goals; (2) the networks practice dynamic, collaborative, and far-sighted research that leads to wide dissemination and exploitation; and (3) the high-quality research expertise and reputation is to attract innovative, global IEs and experts to Finland. A member of the policy group recalled, “The main idea of SHOKs was to collect together the intellectual and financial resources of a small country and focus on them effectively.”

The rule that formed the networks along the industrial lines substantially ensured the commitment of IEs by legitimizing their leadership in the networks. An IE executive explained, “SHOKs were intended to create new industries and connect different sectors... but to get moving forward, we had to focus the topics and identify the core first.” A manager explained to us how a SHOK network had resulted in

a fivefold increase in state aid for applied research in his enterprise's industry. He elaborated on the network value to his employer: "The SHOK collaboration ensures that research has relevance for business, focuses on something more ambitious than what we could do with our internal resources, and means much tighter collaboration between industrial and academic partners than before." The IEs' interests varied. Many IEs joined the networks with a genuine will to conduct far-sighted research. Some were attracted by the large sums of public funding or opportunities to collaborate with their customers. Others saw SHOKs mainly as a means of being informed about developments in their fields but were not ready to contribute to the research.

Phase 1 rules did much less to secure the RUs' commitment. Some members of RUs were involved initially in limited roles as consultants and experts. Many RUs complained about the lack of transparency. A researcher recalled, "It looked like the networks had already been formed and started up before we had been invited [to] the negotiation table." The alignment of SHOKs along industrial lines was seen by RUs as an impediment for greater multi-disciplinary collaboration: "I cannot understand what they were thinking when they identified the networks along the existing mature sectors, when the innovation happens at the boundaries of the fields!"

RUs criticized the research programs for their short-term orientation and for their dependence on established harmonious relationships of the past. Although RUs did not challenge the strategic goals that the government had set for the networks, they expressed a sentiment that, if they had greater involvement earlier, the research programs that followed would have been even more ambitious and far reaching. They were dissatisfied because the policy group did not suggest any qualitative requirements for the research. "The policy group never took any stance regarding the long-term research goals in the network."

Another key rule that affected the mobilization of the networks was the governance structure for the networks chosen by the policy group. The choice of a limited liability company imposed the fewest operating restrictions. Because the networks were intended to connect a wide range of organizations, the model had to be flexible in terms of allocation of shares, risk, investments, and control, depending on the needs of the network. The structure also enabled new organizations, both RUs and IEs, to become shareholders of SHOKs, thus increasing the potential openness and heterogeneity of the networks. A member of the policy group commented, "we decided to suggest the limited liability form because... it is the most versatile legal instrument." Within this autonomy and flexibility, each network independently developed its collaboration policies, which tended to reflect prior traditions in joint collaboration in the particular industries. The governmental policy group had a hands-off approach in terms of the actual collaboration in the network, acknowledging that different networks had different needs and ways of collaborating.

By early 2009, four SHOKs were established and two others were in the process of formation. A member of the policy group noted, "From the [government] perspective, the fact that SHOKs started operating is a success, after [the] many hundreds of negotiations in industry that they required. For the network to get started, the industry and the public sector had to create a common vision, and this is already something valuable."

Yet, there was trouble on the contractual front. The research programs in different networks faced major delays in contract negotiations. IPR issues became contentious. There was much confusion and disagreement in terms of what knowledge would be brought to programs and by whom, as well as how knowledge would be shared to increase the application of knowledge in subsequent research. A manager remarked, “the negotiations were difficult because of so many practices and cultures [at] the table. Universities had recently discovered the value of IPR and expected to get a reasonable compensation for their discoveries. There were differences among companies, too. Some companies who relied on IPR wanted to maintain [the] widest possible ownership and user rights at the lowest possible expense. Other companies had little tradition of competing with IPR and were not focused on IPR in negotiations.” A university member noted, “Everyone was pulling in their own interests. From our perspective, the company demands were unreasonable as they kept asking us to agree to things that were against the law.” [The university law prohibits universities from agreeing to be held liable for excessive damages in contracts (e.g., IPR infringement)].

2.4.2 Phase 2: Tightening Bureaucratic Control with Emphasis on Public Interests

The second phase represented a swing toward public interests. The funding agency that allocated the state aid to the networks exercised its bureaucratic control along its traditional lines of responsibility. The two rules that were instituted and that became contentious in the second phase involved internationalization and IPR. The rules were seen to undermine private interests.

The funding agency was responsible for ensuring that state aid was effectively spent and had a broad positive effect on the economy and society. An agency official noted, “The public funding agency can only grant money that is in accordance with evidence-based policy. Funding requires an agreement [about] how the collaboration will happen and what and when the program yields results and what the effect is on society.” However, how to fulfill this goal was not entirely clear as the agency had shifted much of its traditional decision authority to the SHOKs.

The funding agency issued (or partially reissued) rules on restrictions on international collaboration in the networks. The funding agency representative explained that “a foreign company is not eligible for public funding unless it is registered in Finland and it has an office here. The benefits of taxpayers’ money must be returned to the Finnish economy and society... The foreign companies are eligible to participate in the SHOK networks, as long as the SHOK shareholders give approval. The company needs to have its own funding or funding from sources other than the Finnish government.” The agency further narrowed the interpretation of the policy by stating that the foreign company’s office had to engage in R&D activity in Finland and could only participate in the most public type of SHOK network collaboration or otherwise would face limitations of its rights to program results. The restrictions also

applied to foreign RUs of Finnish multinational companies. The regulation ran counter to the strategic goals of internationalization and openness. The IEs perceived the rules to represent significant disincentives for international companies to participate in collaboration – companies who were seen as critical for developing new markets. In addition, some RUs had international corporate partners that because of the rule they were unable to bring into the SHOK collaboration.

The funding agency issued an IPR rule that based its interpretation on the EU legislation. The rule drew sharp criticism from the IEs: SHOK programs (that received more than 50% of their funding from public funds) would have to institute a free user-right to all program participants for all foreground material; that is, research results such as IPR created in the program. The background information (e.g., software platform and other material needed for the execution of the program or for the use of foreground) would be licensed to all participants either for free or for a reasonable fee. The final deliverable(s) from the program would have to be released to the public after a certain grace period. The trigger for the rule had been the complex and difficult IPR negotiations in the first phase. The funding agency introduced the rule to reduce the future complex pricing negotiations regarding foreground (i.e., research results) at the outset of the program when the precise nature of the foreground was not even known. The rule aligned with the governmental goal to encourage broad collaboration and the dissemination of results via knowledge spillovers. An agency representative explained, “The policy was [intended] to eliminate hold-up situations and complex transfer pricing negotiations when the programs start and end.” Another agency representative explained, “SHOKs have many disagreements and conflicts that we do not interfere with. But there are still many misunderstandings of how the background and foreground information is brought to the program and can be used. We are reducing the misunderstanding and problems that would hinder collaboration.”

Although some IE representatives acknowledged the potential technology transfer benefits of the rule, these benefits were overshadowed by the rule’s disincentives to create and appropriate intellectual property (IP): “Why on earth do we need to agree to IPR terms before the collaboration has even started? It can harm the collaboration fundamentally. What we agree about the IPR and who owns what can direct the collaboration in a different direction than where the research itself would pull us.” Even if the rule was seen to ease the sourcing and revealing of IP, particularly between RUs and IEs, it limited the IEs’ autonomy for commercial transactions on acquiring and selling their IPR. The policy was seen to make it more difficult for IEs’ to manage confidentiality and to undermine future business opportunities. It also fueled fears of others’ free-riding.

The vague IPR rule bewildered and confused lawyers in IEs, who saw the rule complicating collaboration by increasing risks from information leaks. There might be a potential loss of future business opportunities in cases where an employee accidentally shared proprietary information. A legal staff member commented, “I have advised our employees not to bring any background information... if some of our international shareholders hear that we have bound ourselves to such a

license, [our stock] would lose... value.” The atmosphere of reduced sharing fueled mistrust in networks.

In contrast, some RU representatives welcomed the policy because they saw it highlighting the importance of scientific publications and potentially promoting more far-reaching scientific goals: “the headlines of some of the research programs are quite traditional, not that far from what could be product development in some companies. The new policy will promote new opportunities that will really create something new.” The rule was seen to facilitate open information sharing and greater dissemination of foreground information for different applications.

Not all RUs agreed, however. Some considered the free licensing rule to eliminate RUs’ ability to get compensation for their IPR. An attorney from an RU conveyed his frustration: “I cannot understand the public funding agency’s IPR terms that force you to agree about IPR in the beginning. They do not provide incentives to innovate at all. What’s the point if the whole Finnish industry gets a slice of it, and all you get are the patent expenses? How are you able to sell such IP when it is encumbered with such broad licenses?” Another argued that “We have developed this software, and since almost all the players of the industry are in the same program, they will get it for free. How can we be sure that the program is used in accordance with the license and not shared around carelessly? It’s practically impossible to monitor how the program will be used and shared.”

In some networks, suspicions about free-riding were targeted toward small enterprises. A manager recalled, “The most painful negotiations did not concern how much money people were going to invest in a program in terms of human resources, but [centered on] the hesitation to bring any proprietary knowledge to the program. There was concern that a small enterprise would get free access to all background and foreground for a significantly smaller investment.” One network even set a minimum floor for an IE’s investment in a program, which reduced the involvement of small IEs in its programs. A manager who had opposed the threshold noted, “The large companies worried about small firms getting access to all their material with their smaller investment and then possibly getting acquired by a competitor who would get access to the program results.”

The new IPR rule required major revisions to the existing contracts in SHOK research programs. The revisions were complicated by the vague nature of the rule. To reduce confusion and risks, the individual networks asked for SHOK-specific rule interpretations that reflected their particular circumstances. The funding agency was torn between the goal to closely collaborate with SHOKs and the need to remain impartial. The agency also lacked the resources to respond to all the networks’ needs. In reaction to the flow of inquiries, the agency adopted a policy that only general interpretations would be given: “We have a policy that the interpretation would need to be applicable to every SHOK. So the aim is to be remain impartial; we are not going to give sector-specific interpretations....” This response frustrated IEs because it slowed down the revision of the contracts. The general interpretation also made resolution of some issues difficult, such as the transferability of the free user-right in mergers or acquisitions.

2.4.3 Phase 3: Adaptation to Balance Private and Public Interests

The third phase involved less the introduction of new rules and more the adaptation of existing rules to fit the needs of the networks and to balance the competing interests. Over time, the IEs and RUs in the networks, along with the funding agency, had developed a deeper understanding of each other's interests and improved their collaborative capabilities. During Phase 3, existing bureaucratic rules were adapted to be either broader or narrower to reflect the common needs of networks and to help them achieve the strategic goals originally set for them by the Finnish government.

The new rules that were introduced aimed to reduce the risks originating from interdependencies in the communities. One new rule related to the departure of organizations before the end of the research program. This rule specifically tried to balance the interests of the RUs and IEs, as well as promote their commitment to research programs. Securing both the IEs and RUs commitment was one of the government's strategic goals for the networks. IEs' departures from programs had negative ramifications on RUs. The amount of state funding was proportionally related to IEs' investments; in situations where IEs left the program, the RUs faced reduced budgets, jeopardizing the continuity of the research and the livelihood of researchers. The funding agency issued punitive rules for organizations that opted to leave the RESEARCH collaboration prematurely. A departure would strip the organization of all its rights to the foreground of the program, but the departing organization would be held to its obligations concerning the foreground it had developed or the background it had brought to the program. The rule provided more predictability for RUs' funding and greater security for IEs against free-riders in the program.

The adaptation phase meant narrowing the interpretation of the rules in some cases and broadening the interpretation of the rules in other cases to meet the common needs and goals of the networks. The adaptation of the rules appeared to balance equitably the IE and RU interests in the programs. For example, the funding agency narrowed the scientific criteria of the SHOK programs. Such narrowing made it less likely to have research programs that resembled an enterprise type of product development and more likely to have ambitious scientific goals. Prior to Phase 3, some of the research programs had experienced outcomes that were close to enterprise product development, which had complicated the collaboration and increased tensions between RUs and IEs. When research encroached on or had specific usefulness in product development, some IEs tried to hide the research results that were relevant for their business from the rest of the participants to ensure their appropriation of foreground. RUs became concerned about the program's lack of scientific contribution and their prospects for disseminating their research results in scientific journals. Narrowing the scientific criteria aligned with the strategic goal of inspiring ambitious, far-sighted RESEARCH, which the Finnish government had set for the networks.

The rule change required very close collaboration of RUs and IEs during research program preparation, which in turn meant they had to be willing to put more resources into program preparation that was not covered by public funding. To maintain high

motivation for organizations to participate in the research programs, the funding agency started working more closely with networks in the preparation for a new research program. The funding agency also provided seed money for preparations.

The adaptation of rules also occurred when the SHOK networks united on a particular joint need. For example, on the international issue, the networks demanded that the funding agency broadens the interpretation of the internationalization rule. The agency was torn between the state aid requirements, SHOKs' needs, and the strategic goal of the internationalization of networks. In response to the demands, it approved a revised rule that allowed foreign companies to participate in research programs with more flexible terms. An agency representative explained, "There was pressure from SHOKs to change the participation rules for foreign companies... We widened the rules as much as we dared."

To balance the tensions caused by the IPR rule in Phase 2, the agency narrowed the free license rule in terms of its targets (e.g., software platforms were excluded from the policy) and gave more autonomy to the SHOKs to define the rule's domain of applicability on a case-by-case basis. As a result, the research programs themselves could define the categories of information that the license applied to and what was meant by terms such as "background information" and "foreground information." A funding agency representative explained, "The SHOK programs are free to configure the openness to match the needs of the collaborating parties, as long as they do not violate the higher spirit of the policy. The SHOKS have developed their own guidelines and definitions that fit their environment."

The funding agency totally relinquished some monitoring; for example, it no longer wanted to review the contractual agreements among participants in specific research programs. This contractual freedom was welcomed by IE legal staff. The capability building that had taken place among the legal staff in IEs and RUs also helped the situation. The legal staff by now was more astute about what open innovation could mean to their organizations. One IE lawyer elaborated on how her understanding had improved: "I first thought that there are only two extremes – the closed innovation and the open source mode. But now I realize that open innovation is about that gray stuff in the middle. That middle is up to us to define and come up with a playbook." The contract negotiations in research programs proceeded more smoothly because participants understood not only each other's interests more clearly, but also the rules and how they applied in various contexts. Participants were more willing to experiment with different levels and forms of openness and to push the boundaries of pre-competitive research to include service and business models.

The networks had matured considerably in their collaborative processes, as well as in the scientific level of their research results. By the end of Phase 3, research programs had produced a large number of academic publications, theses, journal articles, conference papers, and book chapters, as well as more program-specific case analyses and technical reports. Several programs had also discovered new chemical compounds and materials, had produced a plethora of software demos that had been selected for international showcases and had completed pilots of new service models.

Table 2.2 illustrates some of the rules established by phases, the triggers behind the rules, the rule's relation to the strategic goals set for the SHOKs, and the

Table 2.2 The fulfillment of goals through bureaucratic rules

Rule	Trigger for the rule	Rule's target in terms of strategic goal	Implications of the rule
<i>Phase 1: Mobilization</i>			
Rule 1a: Founding SHOKs along existing industrial sectors	Trigger: Fast mobilization of SHOKs	Promoting IEs' commitment to network activities and strategic goals; much less RUs' commitment (Goal 1)	Implication: Enabled fast launch of SHOKs. IEs gained leadership role. Did not generate incentives for multi-disciplinary collaboration. Transparency lacking from RUs' perspective
Rule 1b: Non-profit limited liability company as legal form	Trigger : Providing maximum organizational flexibility for the network	Enabling dynamic RESEARCH collaboration and the internationalization of SHOKs (Goals 2 and 3)	Implication: SHOKs open for RUs' and IEs' heterogeneous participation. Enabled network-specific development of collaboration practices
<i>Phase 2: Tightening control</i>			
Rule 2a: Public funding can be given only to entities established in Finland and can only be used nationally	Trigger: Pressure to reinterpret the state aid rules to account for the global nature of SHOKs	Undermining promotion of internationalization of the SHOKS (conflict with Goal 3)	Implication: Attracting and including foreign IEs and RUs into the programs becomes problematic. International collaboration in SHOKs remains small scale
Rule 2b: The free-licensing rule	Trigger: Streamline contracting process, facilitate technology transfer, and enhance research collaboration	Promotion of RESEARCH collaboration and dissemination of research results (Goal 2)	Implication: Promoted RUs' scientific interests and streamlined contracting. Technology transfer easier. Limited IEs' autonomy in IPR management

Rule 2c: Only generalized interpretations of the rules provided	Trigger: Constant demands for network-specific interpretations	Reduced dynamicity in RESEARCH collaboration and fast dissemination of results (conflict with Goal 2)	Implication: IEs' and RUs' frustration about the slow revision process of research contracts
<i>Phase 3: Adaptation</i>			
Rule 3a: Punitive rules for departure from the program	Trigger: IEs' departure from programs harmed RUs	RUs' and IEs' commitment and internationally competitive research (Goals 1 and 3)	Implications: Provided more predictability for the RUs' financing. Relieved IEs' fear of free-riding
Rule 3b: Broadening the membership to include international companies within the limits of the law	Trigger: SHOKs joint demand to ease international collaboration	Internationalization of SHOKs (Goal 3)	Implication: Participation by foreign IEs easier
Rule 3c: Tighter research standards	Trigger: Too short-sighted research	Far-sighted, ambitious research collaboration (Goal 2)	Implication: More resources devoted to the preparation of higher quality research programs
Rule 3d: SHOKs' autonomy to interpret the IPR rules	Trigger : reducing legal confusion in contracting	Dynamic research collaboration and dissemination of results. (Goal 2)	Implication: Increased flexibility in IPR management that allowed both IEs and RUs to secure their interests in contracting

implications of the rules for the IEs' and RUs' interests. We have simplified and abstracted the rules to make them more generalizable and understandable. As the table shows, the rules in Phase 1 predominantly favored IEs' interests and neglected to some degree the RUs' interests. In Phase 2, bureaucratic control shifted the emphasis to public interests, undermining private interests. Phase 3 improved the alignment of rules with the strategic goals of the networks.

2.5 Discussion and Implications

Our longitudinal study of SHOK networks provided a unique opportunity to examine the evolution of bureaucratic control in government-initiated open innovation networks. The study produced several findings: (1) bureaucratic control was present and had an effect on the functioning of the networks; (2) bureaucratic control was situational and evolving, rather than static, as commonly portrayed in the literature; and (3) the evolution of bureaucratic control appeared to be a response to interest imbalances. Our findings have implications for both community-based OD literature and control literature.

2.5.1 *Implications for Community-Based OD Literature*

The open innovation literature is here subsumed by the community-based OD literature. The community-based literature underscores the importance of coordination and integration of the activities of organizations to achieve network goals, and how the coordination happens via trust and informal (social) controls (Adler 2001; Snow et al. 2009; Miles et al. 2009). The literature does not adequately recognize the difficulties that such community-based organizations face in forging trust and shared values and norms under high levels of uncertainty and with limited knowledge of the other participants – the two conditions that are likely to prevail in the formative phases of the networks. Bureaucratic control is also largely absent from the literature on open innovation (Vanhaverbeke 2006; West et al. 2006), perhaps because it is associated with closed innovation. The related literature that does address bureaucratic control depicts it as temporary (Snow et al. 2009; Miles et al. 2009) or as coercive in its effects (Engeström (2007); West and O'Mahony 2008; O'Mahony and Bechky 2008).

The current findings contrast these prevailing views. The findings suggest that open innovation networks do not rely solely on trust and shared culture to achieve collective goals; instead, they suggest that bureaucratic control is instrumental in transcending diverse interests of the participants in government-induced innovation networks. The findings of this study suggest that the bureaucratic control was an important means to ensure that collaborations adhered to the strategic goals set by the government.

The findings echo recent streams in the control literature that treat bureaucratic control as capability building (Adler and Borys 1996; Weibel 2010). In situations where benefits are shared but costs are individually incurred by organizations, bureaucratic controls can provide incentives, guidance, and standards to align activities in accordance with the goals. Particularly when appropriately calibrated, bureaucratic controls can enhance collaboration among diverse actors and promote interactions intended to share and combine collective resources and to transfer learning across different organizations in the network.

The findings also suggest that the community-based organizational literature has much to learn from the literature on bilateral organizational relationships that underscore the need for bureaucratic control under high-task uncertainty and with limited knowledge of the other parties (Choudhury and Sabherwal 2003; Rustagi et al. 2008). These findings also suggest that at least in the formative stages the network participants face high levels of transaction costs that arise from bureaucratic control. This speaks to the importance of future studies to focus on the coordination and competition costs in open networks, a topic that remains highly under researched (Dahlander and Gann 2010).

2.5.2 Implications for the Control Literature

The study examined government-initiated, open innovation networks, which are a rarely researched context in the control literature. The bureaucratic control was exercised by the governmental units responsible for initiating and financing the networks and for ensuring that they act consistently with the strategic goals set for them and adhere to the various national and international laws.

Empirically, we contribute to the control literature by studying innovation networks. The control literature has predominantly focused on bureaucratic control within firms (e.g., Ouchi 1979; Eisenhardt 1985; Henderson and Lee 1992; Cardinal 2001; Cardinal et al. 2004) or in bilateral relationships (e.g., Choudhury and Sabherwal 2003; Rustagi et al. 2008; Vlaar et al. 2006; Faems et al. 2008). The findings in this paper suggest that bureaucratic control is not a static mechanism, but can evolve over time to align strategic goals and the diverse interest of organizational participants. The findings have many similarities to those of Cardinal et al. (2004), in which controls were examined during an organizational founding; our examination, meanwhile, focuses on controls during a network founding. The ebb and flow of control discovered in the two studies suggests that, in nascent and dynamic organization forms, bureaucratic control can take on the characteristics of a dynamic process that continually adjusts to changes in the evolution of the organizational form.

Theoretically our findings are suggestive of evolutionary mechanisms of bureaucratic control that focuses on the management of paradoxical tensions. Cardinal et al. (2004) rely on familiarity and competence traps as well as latency of controls to explain the evolution of controls. While our findings do not exclude these explanations, they provide a complementary perspective. Not only did the triggers and targets

of bureaucratic control vary over the three phases (as also found by Cardinal et al. 2004); the variations appeared to be in response to paradoxical demands arising from different interests of the participants in the network. Paradoxes faced by the governmental units exercising bureaucratic control included the following: (1) the need to ensure a broad positive effect on the society and economy vs. the need to incentivize IP creation and appropriation; (2) the need for stability in core industries and competences vs. the need to develop new skill sets and support emerging industries and markets; (3) the need to safeguard autonomy and flexibility in collaborations vs. the need to break free from old mindsets and practices that constrain new competence; (4) the need to remain impartial and be a neutral facilitator vs. the need to upgrade the standards for scientific research; and (5) the need to provide continuity in nationally strategic research fields vs. the need to invest in global R&D networks.

The strategic goals set for the networks required balancing the public and private interests, but rules in Phase 1 and 2 polarized the tensions around interests. It was only in Phase 3 when rules balanced the interests. The swift mobilization of networks required getting buy-in from IEs because the state aid had to be proportionally matched with IE contributions. IEs, with their well-orchestrated industry lobby groups, exercised leadership in networks in Phase 1 and were able to exploit the interdependencies in networks for their own benefit. The funding agency intervened with increased bureaucratic control in Phase 2 that was meant to provide predictability and structure and to promote collective learning and spillovers; however, from the IEs' perspective, the rules restricted too much of their freedom to create and appropriate knowledge. Although some of the rules were direct responses to problems in Phase 1 (e.g., lengthy contract negotiations), the rules failed to acknowledge the new reality that required balancing simultaneously both private and public interests. By Phase 3, the funding agency, IEs, and RUs had developed a deeper understanding of each other's interests and were able to work in a collaborative mode to calibrate the rules to fit the needs of the networks and the strategic goals of the government, thereby an improved balance between the diverse interests.

In Phase 3, the rules exhibited what Lewis (2000) calls "transcendence" in her paradox management theory. Transcendence requires experimenting and getting feedback on the responses to tensions or paradoxes. Participants need to be able to reframe the demands from the perspective of the various others to stimulate responses that meet diverse needs; they can "transcend" the old boundaries and rethink their roles and the way they are organized (i.e., the way they see themselves in relationship with one another). By Phase 3, the various participants had much better understanding of each other and the various participants were able to more effectively communicate and motivate appropriate collaborative behavior. The public interest vs. private interest tensions were addressed with an integrative, transcendent approach. The findings are important as they suggest the productive capacity of a paradoxical lens to understand how to manage the conflicting demands originating from competing interests in open innovation networks. A paradoxical lens can be used to shed new insight about bureaucratic control in large collectives. Other works in the control literature have explored paradoxes (e.g., ; Harris et al. 2009) but have not built on the organizational paradox management theory (Lewis 2000).

The findings suggest the need to develop more advanced theorizing about how bureaucratic control is exercised effectively through rule design and rule implementation in network structures that minimizes transaction costs to various participants. Within the firm, the bureaucratic control is exercised through structural mechanisms such as direct reporting lines; within bilateral relationships, bureaucratic control is exercised through both structural (e.g., contracting) and relational processes (e.g., trust) (Rustagi et al. 2008; Faems et al. 2008). Our knowledge of mechanisms to exercise bureaucratic control in community-based organizational forms is much more limited. This paper was limited to examining bureaucratic control through formal rules.

2.5.3 Implication for Practice

For the practice of organization design, the findings suggest that bureaucratic control can enable innovation in open innovation networks. However, developing the appropriate rules takes time. Not until Phase 3 were the rules well in line with the strategic goals. The challenges arose from restrictions in national legislation and the paradoxical nature of the strategic goals. For example, the initial rule of the national use of the public funding contradicted the goal of internationalization. Meeting the strategic goal of internationalization was limited by the prevailing national legislation that had not been updated to address the new type of research collaboration in SHOKs. The strategic goals of the networks recognized the need to balance the interests of the IEs and RUs, but it was nontrivial to design rules emphasizing simultaneously both public and private interests. For example, this was evident in terms of the design and implementation of the free user right rule of foreground.

The findings suggest the importance of rules that promote transparency in the very early foundational phase so that all parties can make their interests known to the other parties. The findings also suggest that, given how the legal staff of IEs and RUs can be challenged in the face of open innovation, there is a need to educate not only the management and researchers but also the legal staff about the new form of collaboration and its implications for IPR management. For all parties, the community-based organizational form requires a great deal of new capability development – and the recognition that such capability development takes time.

2.5.4 Limitations and Conclusion

Although our findings are important contributions to the literature, readers should be mindful of the limitations of our study. We used a snowball-sampling technique for interviews that is commonly used in qualitative studies, but it is an inexact method that can introduce unobserved biases (Patton 2002). Further, as in any interview-based data, we cannot rule out the possibility of recall bias. Nevertheless,

some of the bias should be attenuated by the fact that our study was informed by a substantial set of interviews and archival data.

The analysis also ignored the multilevel phenomenon: We examined only the SHOK networks and the bureaucratic controls imposed on them at the network level. The results mask the differences that controls had on separate SHOK networks and on the different programs within the SHOK networks. Although we tried to tease out temporal patterns, longer study periods are required to understand whether the prediction of Miles et al. (2009) – that bureaucratic controls become less important over time – holds true.

Another major limitation is that all our networks are situated in a single country, and in a country where the government has a long history of engaging in initiatives to enhance the innovation capabilities of industry. The current networks differed from some of the prior Finnish initiatives (see Autio et al. 2008) by focusing on much larger groups of participants (IEs and RUs); the initiative also had a much broader agenda by focusing not only on technology advances, but also on new business models and service innovations. The cultural factors may have influenced our results. Thus, future studies should study open innovation networks in other countries.

In addition, our analysis focused on the broad-brush impact of the bureaucratic rules without deep exploration of how the bureaucratic rules interacted with other network-specific controls. Neither did our definition of bureaucratic rules address specifically the jurisprudential hierarchy of legal sources. Finally, our analysis did not quantitatively assess the effect of bureaucratic rules. Certainly, future studies should incorporate a broader array of methods.

In conclusion, the study reported here is novel in examining bureaucratic controls in open innovation networks. Past literature has examined bureaucratic control primarily within firms and across bilateral relationships. The study's findings suggest that bureaucratic control is not an oxymoron in open innovation networks; rather, it can be helpful in transcending competing tensions. In fact, the bureaucratic rules appeared to have many beneficial effects in enhancing openness and innovation capability. This transcendence of interests came in Phase 3 after a sequence of alternating approaches that individually addressed only one of the tensions in the rules and regulations in Phases 1 and 2. Open innovation networks clearly represent a new innovation environment for the government and for RUs, and IEs, and they require the development of a new set of competencies by all parties.

Acknowledgments Support for this research was provided in part by TEKES Finland to the first author.

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Collaborative Communities of Firms

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Bøllingtoft, A.; Donaldson, L.; Huber, G.P.; Håkonsson,
D.D.; Snow, C.C. (Eds.)

2012, VIII, 148 p., Hardcover

ISBN: 978-1-4614-1283-0