Cross-National Network Diffusion of Crowdsourcing Innovation Policy:

Peer to Patent

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Abstract

This study examines network factors in the cross-national diffusion of a recent crowdsourcing innovation in the public sector, called Peer to Patent. Policy diffusion theory, as applied to informational network exchange, suggests that information about innovation will be communicated through social networks among policy decision makers. Building on case studies from five countries—the United States, Australia, South Korea, Japan, and the United Kingdom—that have adopted Peer to Patent, this study finds that the pattern of adoption is best explained by the underlying network structure of professional and institutional actors that allow policymakers to exchange ideas and learn from others. The informational network framework includes epistemic communities, international organizations, and globalized corporate entities and is affected by other mediating factors such as regulations, peer-to-peer relations, and technology. Policy transfer is thus a complex concept that includes multiple streams of transnational communication and exchange.

1. Introduction

Various types of crowdsourcing have been adopted in the public sector to improve the efficiency and quality of public services as well as to increase public participation and engagement. Research has examined the potential costs and benefits [1, 2], designs [3], and adoption processes [4] of crowdsourcing within initiatives aimed at increasing government openness since 2009. Although many studies have focused on the diffusion of open government initiatives to promote transparency and data access [5, 6], less attention has been paid to smaller yet innovative policy diffusions that have taken place concurrently with the open government movement [7].

Previous research has demonstrated the diffusion process underlying large-scale adoption of a technological innovation across countries e.g., [8, 9]. However, we know little about the cross-national diffusion of small-scale innovation, especially at the agency level, which is less covered by the media and thus less visible to the public.

Furthermore, previous studies have demonstrated that policy entrepreneurs, institutional designs, and culture are important contributors to the process of innovation diffusion [9]. Bennett (1997) argues that transnational learning and communication fulfill distinct and essential roles in policy diffusion. A network perspective approach allows us to link these factors together and to examine the diffusion process more holistically [10]. However, further empirical research is needed [11].

Peer to Patent (PTP) provides a unique case for understanding the diffusion of technological innovation across five countries during the open government movement from a network perspective. Because the adoption of PTP requires a change in the patent review process to engage members of the general public as reviewers, adapting to PTP involves more than just a technology adjustment or adoption, but also entails a transformation of the operation of government services [1]. Previous studies, mostly in law journals, have examined and provided legal justification for this emerging incorporation of peer review in the patent application process [12, 13]. The adoption of PTP requires substantial changes in regulation and supportive resources.

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As this innovative program has created notable ripple effects and been diffused to numerous countries, its diffusion process deserves a careful study. Therefore, this paper examines factors that have influenced the policy diffusion of PTP from the United States to four other countries from 2007 to 2011. After an explanation of the program, we review relevant literature to reveal factors that can advance our understanding of the adoption of policy innovation across nations. We then analyze the PTP diffusion process itself.

2. What is Peer to Patent?

PTP incorporates an online peer review system into the existing patent review process. It was initially developed by Prof. Beth Simone Noveck of the New York Law School (NYLS) in cooperation with the U.S. Patent and Trademark Office (USPTO), which launched the first PTP pilot on June 15, 2007 [14]. Traditionally, examiners at the USPTO followed a closed and internal patent application process. This traditional model created a backlog of applications because the system could not respond to rapid changes in various industries. In contrast, PTP applies a community collaboration-based approach to draw knowledge from the open-source community, so as to alleviate the problem of examiner unfamiliarity with newly emerging and rapidly changing areas such as software development [7]. In such relatively new fields, the USPTO databases do not contain much "prior art," a legal term for previous patents, or evidence guiding examiners to make quality decisions. Figure 1 shows the web interface of PTP in the United States.

Figure 1. Peer to Patent protocol, from www.peertopatent.com

The PTP team builds a platform to match prospective applicants with volunteer reviewers. Prospective applicants first submit a signed "Consent to participate in community review patent pilot" form, which indicates that they will be notified of their submission's status within 30 days. Once accepted, participating applications are open for public review for 3 months from the date of posting and no more than 4 months from the date of publication, a much shorter time frame than with the regular application procedures. The review of applications follows a five-step process that involves the public at each step, as described in Figure 2 [14]. The steps are as follows:

(1) Review and discussion of patent applications in the community: Participants can find and review applications on the platform, including an application list, tag cloud, activity page, application page, discussion page, prior art page, and additional information.

(2) Research and find prior art: Participants can search and post prior art through the prior art page.

(3) Upload prior art relevant to claims: Participants can then submit prior art to the website.

(4) Annotate and evaluate submitted prior art: To reduce the problem of information overload, the patent examiner reviews only the top 10 prior art references. Participants can add annotations to posted research references or rank prior art by selecting the "thumbs up" or "thumbs down" symbols below each item. These comments and rankings determine which references make the top 10.

(5) Selected prior art references to USPTO: At the end of the review period, the top 10 prior art references are forwarded to USPTO for patent examiners to use in making the final decision.
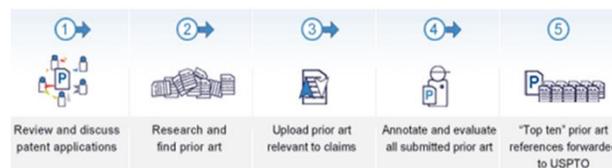

Figure 2. Peer review process within PTP

The international diffusion of PTP took place in the 5 years following its initial implementation in the United States, with four other countries adopting the model. In Japan, a sister PTP program called Community Patent Review was developed in 2008, followed by PTP Japan in 2011. Australia adopted PTP in 2009 and South Korea in 2010. In 2011, the UK launched its program jointly with the United States. As a result, this policy innovation was quickly diffused to patent offices in five countries that had traditionally implemented closed models, connecting them to outside communities for the first time.

To understand the influence of network factors on this policy diffusion, we will systematically examine each case, discussing its background, process of adoption, relevant stakeholders, and outcomes. Before that, we provide a brief literature review and summarize our methodology.

3. Policy diffusions

3.1. Factors influencing policy diffusion

In a recent review article on policy diffusion of e-government, Zhang et al. (2014) report that technological, organizational, and environmental factors influence the diffusion of e-government. Technologically, the advancement of information and communication technologies promotes its diffusion [8]. Organizational factors include the level of government [15], employees' knowledge and skills [16], interorganizational attention networks [17], and leadership [18]. Finally, environmental factors influencing the adoption of e-government include the institutional [19], cultural [20], and political contexts [21], all of which are also influenced by demographic characteristics [20].

In the policy diffusion literature, the adoption of a policy is also affected by the context of the policy program. For instance, Rose (1988) argues that programs with a single policy goal, a visible solution, lower risks, more information available before transfer, and highly visible outcomes are more likely to be transferred. Along with the importance of technological, organizational, and environmental factors and the policy context, a policy needs an actor or policymakers to "inherit" the policy on an agency's behalf [11, 22].

Bennett (1997) further examines factors influencing transnational policy diffusion, including the growth of government, democratization, and capacity for policy learning. He observes that to conduct a meaningful transnational policy diffusion case study, one must first show that domestic policymakers are aware of policy adoptions taking place in other countries. He finds that transnational learning and communication play a distinct and essential role in policy diffusion relative to the other environmental factors.

3.2. Network factors for policy diffusion

Previous studies have shown that networks and professional groups significantly influence policy

diffusion [10, 23, 24]. Lazer (2005) argues that "states, in an informational network perspective, are simply policy choosers and information producers" (p. 53) [10]. He further explains that international diffusion of policy innovation requires informational interdependence between the nations involved. Such informational interdependence occurs when one nation learns about or acknowledges the policy decision made in another nation. Lazer (2005) proposes a network perspective to understand the actors and institutions that disseminate and transfer information so as to produce policy diffusion. In doing so, he echoes Dolowitz and Marsh's (1996) emphasis on the importance of actors in the policy diffusion process.

At the domestic level, previous studies on the e-government law have shown empirically how professional conferences, councils, and committees serve as important intermediaries enabling local leaders or interest groups to exchange knowledge on policy and build competence in implementing such a policy [24]. For instance, McNeal et al. (2007) propose a dynamic framework to understand the state level adoption of policy instruments through identification of the professional networks across different states. In addition to the state's resource support of policy, they found that interest groups, professionalism, and education play significant roles in influencing the adoption and implementation of laws and regulations related to e-government at the state level. In particular, they found that the National Conference of State Legislatures and the National Governors Association play important roles in the United States in building networks of professionals or interest groups who then implement or advocate for policy adoption. Similarly, Hall and Karl [25] also identified a policy network, called the Strategic ICT Policy Group, within a particular government agency as an important driver of the adoption of e-government policy in Sweden.

At the transnational level, Dolowitz and Marsh (1996) identify key actors, including elected politicians, political parties, bureaucrats or civil servants, interest groups, policy experts, transnational corporations, think tanks, and supranational governmental and nongovernmental institutions in a policy transfer model for policy innovation. Similarly, Lazer's (2005) extended framework also identifies important interpersonal networks that share policy information between nations—namely, epistemic communities composed of cross-national collectives of individuals who share common interests, international organizations, and cross-national

corporate entities. The functioning of these peer-to-peer networks is in turn impacted by technology and other mediating factors. Karl (2009) argues that it is important to distinguish between actors who are essential for policy transfer and those responsible for policy implementation, although the boundary between policymaking and implementation can sometimes be blurred [11]. Also, the diffusion process regarding policy selection involves information on the decision process, the decision itself, and outcomes reported by information producers [10].

Building on this literature, we can describe by the following list the important network factors that might influence how information is exchanged among policy actors, thus leading to cross-national policy diffusion:

- ➢ Cross-national communities
- ➢ International organizations
- ➢ Global corporations
- ➢ Institutionalized networks
- ➢ Peer-to-peer networks
- ➢ Technology
- ➢ Other mediating factors

4. Method

Previous studies on the diffusion of technology adoption to improve public services have relied on the qualitative approach of analyzing a sufficient number of cases to illustrate a trend or explain the underlying diffusion mechanisms e.g., [26, 27]. To understand which actors (or institutions) within a country received information about PTP from other countries, this study selected several countries as unique cases [28]. Most studies on innovation diffusions such as open government or open data cannot tease out the strong influence exerted by public opinion and demand, because information on those initiatives is publicly available and well-known. Instead, this study has selected a small-scale innovation at the agency level that has been diffused across several countries. Since it has received little public attention, this case provides a better way to examine the network factors that lead to information exchange and transfer among the key network actors.

To understand the diffusion process, we also want to track what components of the PTP have been transferred across the four countries. Following Bennett's (1991) framework, there are seven objects of transfer: (1) policy goals, (2) structure and content, (3) policy instruments or administrative techniques,

(4) institutions, (5) ideology, (6) ideas, attitudes, and concepts, and (7) negative lessons.

We interviewed key actors involved in PTP in the five countries, asking how and where they received information or technology on PTP, if they have promoted or shared such information or technology with actors in other countries, and (if so) through what types of channels. By analyzing unique and relevant small-scale cases, we can provide more contextualized and insightful research through these interviews. At the same time, we acknowledge that pursuing a case approach will limit the generalizability of our research.

As a means of verifying our data, we used triangulation in the data collection process. Specifically, we verified the relevant network actors using three different sources: website content, government reports, and interviewees who implemented the initiative in each country. We were able to link the common personnel across the key events or committees involved with the initiative in each country. To do this, when performing content analysis, we created a listing of key personnel and their affiliations and associated countries; we then identified the overlapping personnel and institutions.

5. Peer to Patent

5.1. Peer to Patent US

From June 2007 to June 2009, the NYLS cooperated with the USPTO to operate the first PTP program, which was launched publicly on June 15, 2007. The areas covered were computer architecture, software, and information security. After its first year, the USPTO extended the pilot until June 15, 2009 [14]. A year later, in October 1, 2010, the NYLS and USPTO conducted a second pilot with an expanded scope that included patents relating to biotechnology, biopharmaceuticals, telecommunications, and speech recognition technology [14].

NYLS professor Beth Simone Noveck, the original developer of PTP, later became Deputy Chief Technology Officer for Open Government at the White House. On January 15, 2010, NYLS visiting professor Mark Webbink became executive director of the Center of Patent Innovations, which is responsible for the PTP project.

In the United States, PTP has been largely driven by the law school community, and some law students have served as student fellows. Various roles were designed to involve people in promoting the project

and in recruiting potential reviewers. Participants can be categorized as lawyers, other legal professionals, academics, undergraduate and graduate students, engineers, computer professionals, and patent professionals or researchers [14].

As of January 15, 2010, the project had recorded 456,785 page views and 83,780 unique visitors from 167 countries and territories [14]. There were more than 2000 registered users and more than 2600 visitors had registered to become peer reviewers [14]. These two pilot projects were made possible by financial support and technical expertise from institutions including the Omidyar Network, the MacArthur Foundation, International Business Machines Corporation (IBM), General Electric Company (GE), Microsoft, Hewlett-Packard (HP), CA Technologies, Red Hat, Open Invention Network, Article One Partners, and Intellectual Ventures [14].

5.2. Community Patent Review in Japan

PTP Japan, initially titled Community Patent Review (CPR), is a joint initiative between the Institute of Japan and the Japan Patent Office, in collaboration with PTP US. CPR had 39 applications in its first pilot. The aims of the PTP include maintaining and improving the quality of patent applications, improving technology, and harnessing knowledge from citizen experts. The first pilot took place from July 6 to December 6, 2008.

The initiation and implementation of CPR involved three types of stakeholders: advisors, the government office operating the program, and reviewers. According to the Japan Patent Office (2009), CPR worked closely with the NYLS team in setting up the platform. However, there are two subtle differences: (1) CPR has its own web interface and (2) it is open to all members of the public beyond the legal community.

On CPR's website portal, once applications are received and updated, they are further divided into two categories: those that are open to the public and those for which early examination has not been requested and that have already undergone review [29]. Throughout the pilot period, the targeted applications were in technological fields, such as products involving computers, software, networks, and information [29].

The Institute of Intellectual Property sent questionnaires to participating reviewers. Of the 11,950 who replied, 253 signed up to be reviewers with 22 who reviewed the 39 patent applications,

each submitted by a different applicant [29]. Most of the applicants who took part were major Japanese electronics companies that also filed for patents in the United States, such as IBM Japan, Fujitsu, and Ricoh. Throughout the pilot, there were 120 prior art submissions. Among these submissions, 12% involved non-patent literature and 11 of them received commented. Of the 39 applications, 35 were deemed eligible for patents; a total of 19 documents were cited in the reasons given for refusing the four other patent applications [29].

5.3. Peer to Patent Australia

PTP Australia is an initiative by the Queensland University of Technology, in collaboration with IP Australia and NYLS, to improve the patent examination process and the quality of issued patents through peer review by legal professionals. This initiative took place from December 9, 2009, to June 8, 2010. Although PTP Australia was open to public participation, most of the reviewers were recruited through outreach in the Australian legal community or to people affiliated with that community, as well as to people who have significant technical knowledge of patent applications.

The important stakeholders in PTP Australia, who initiated and implemented the project, consisted of a project team, an advisory committee, sponsors, and selected applicants. Besides Professor Brian Fitzgerald, Ben McEniery served as a project manager. The advisory team included members from IBM, GE, Hewlett-Packard, Aristocrat Technologies Australia Pty Ltd, the Center for Patent Innovations at NYLS, and the Institute of Intellectual Property in Japan [30].

NYLS also provided support for the setup of PTP Australia. For example, PTP Australia was able to use the PTP US software platform under license [30]. NYLS also shared connections and contacts that may have been helpful to the Australian team. PTP Australia was funded by IP Australia and by the Commonwealth of Australia Department of Innovation, Industry, Science, and Research (DIISR). Both these are government agencies. The government also supported the project through other initiatives, such as the Open Access to Knowledge Law Project and the Legal Framework for the e-Research Project [30].

In contrast to the US experience, during the 6-month pilot, only 31 applications from 8 applicants were reviewed; over 70% of the applications came

from multinational companies, and only three companies were based in Australia. Despite outreach efforts from IP Australia and PTP Australia, many potential applicants were not interested in participating. There were only 130 registered peer reviewers, of whom 40 were active participants. Throughout the pilot phase, 106 prior art references were submitted with 117 discussion comments on the 31 patent applications.

Even though few Australian legal professionals seemed interested, the project attracted 6000 visitors from 69 countries. Of the 126 registered reviewers, 72 were from Australia, 15 were Americans, 12 Indians, 8 from other countries, and 19 did not state their nationality. Survey results from six patent examiners who reviewed the project strongly suggested that it was helpful and effective. All of them said it was helpful in locating relevant prior art, 80% stated that it would be useful to incorporate PTP Australia into IP Australia's patent application practices, and half said they would welcome another pilot (the other three respondents were indifferent). However, unlike PTP US where interest was high, PTP Australia struggled to recruit reviewers.

5.4. South Korea Peer to Patent

Unlike the Japanese and Australian cases, the Korea Intellectual Patent Office (KIPO) developed its own official open patent review system called CPR on March 2010 [31]. The first pilot took place from March to June 2010, and the official CPR program has been running from early 2012 to present. The project's aim is similar to that of the other projects and has responded to the rapid development of the high-technology industry [31].

As in the other cases, the Korea CPR community consists of outside expert groups (technical professionals, professors, researchers, etc.) providing reviews of applications, which are then compiled by administrators and delivered to patent examiners for use in the examination process. Patent applications registered for review were selected from high-technology industries.

KIPO formed a Community Patent Consultative Group, with outside experts as members appointed by KIPO's commissioners, to receive direct feedback and prior art submissions. The representation on this consultative group was also from the high-tech industry, mainly home electronics.

In contrast to the three cases reviewed above, Korea's CPR initiative adopted a public review system [32]. In 2010, patent officers in KIPO learned about the PTP projects implemented in the other countries through participating in international conferences, and they then decided to create their own CPR system. There was no direct partnership with the other countries' patent offices.

So far, of the 180,000 patent applications submitted each year, only a few hundred have entered the public review system. Although the project received considerable initial attention, a decline in participation has been noted over time [31]. The establishment of the patent consultative group was intended to institutionalize the volunteer effort within the private sector and ensure the quality of reviewers over the long term.

5.5. UK Peer to Patent

The UK Intellectual Property Office (IPO) launched the UK PTP pilot on June 2011, in collaboration with PTP US. Although the UK IPO launched its initiative later than the other countries, the British patent law permits third-party observation, meaning that public viewing and commenting on the patents under review are allowed. The adoption of PTP introduces the public into the patent review process under this third-party observation guideline. In contrast to the US and Australian programs, the UK PTP also allows UK patent examiners to conduct a prior art search before uploading the patent applications for public viewing. In this way, the reviewers need to check only whether any additional prior art is missing.

The relevant stakeholders behind the UK PTP also overlap with the US and Australian PTP efforts. Those actors include NYLS, IP Australia, The Chartered Institute of Patent Attorneys, USPTO, IPKAT Blog and Patently-O Blog, Technology Strategy Board, software development companies, and the steering committee, with representation from GE, Red Hat, Open Invention Network, Article One Partners, Hewlett-Packard, IBM, and Microsoft [31].

Although the UK PTP collaborated closely with its US counterpart, it incorporated new features on its website to accommodate a modified operation of the peer review process, consistent with existing patent laws in the UK. For instance, the UK PTP uploads a report on its search for prior art, an item not included in the other PTPs. Also, due to the third-party observation law, all patent applications are posted on the website without any applicant consent requirement.

During the 6-month pilot, 450 individuals signed up as reviewers and there were 6,602 visits to the website [33]. About 172 patent applications were posted by the UK IPO during that period, and 11 prior art references were submitted by reviewers [33]. According to the evaluation report [33], the quality and participation rate were high. The outcomes of the UK PTP show that individuals in the general public can offer equally good reviews as the experts.

5.6 Diffusion Similarities and Differences

In sum, our case studies of these five PTP initiatives illustrate different forms of adoption and different hosting agencies (Table 1). There was no single agency network or regulation guiding a formal diffusion process. The variation among the hosting agencies allows us to explore the formal and informal information networks that influenced the decisions in favor of PTP adoption in the five studied countries. Both the United States and Australia involved a university–patent office collaboration model, whereas Japan, South Korea, and the UK relied on leadership from the IPO.

Table 1. Hosting agency and regulations for Peer to Patent across different countries

Countries	Hosting Agency	Relevant Legislation	Year Initiated
US	New York Law School	Third-party submission	2007
Japan	IIP and JPO	Third-party submission	2008
Australia	OUT & IP Australia	Third-party submission	2009
South Korea	KIPO	Third-party submission	2009
UK	UK IPO	Third-party submission	2011

Putting our findings into Bennett's framework (1991), all five countries have shared the same policy goal of making the patent review process more efficient and transparent by incorporating public review. The United States, Japan, Australia, and the UK also share generally the same structure and content, policy instruments, ideology, and ideas, attitudes, and concepts. Different countries have adopted different institutional hosting arrangements, as discussed above and shown in Table 1. Figure 3 indicates that the United States, Japan, Australia, and the UK even shared similar PTP logo designs and have included each other's portal on their official

websites. All four countries included links to another portal, but the South Korean initiative did not, as it did not have a direct relationship with the US PTP group and its developers learned about PTP by attending a conference. The South Korean PTP also adopted structure and content undergirded by different ideas, attitudes, and concepts. The review process was less transparent, and the reviewers were selected by invitation only.

Figure 3. PTP logos in the five countries

Table 2 shows the outcomes of the PTP across the five countries. Although the United States and UK were able to attract 220 and 172 applications, respectively, and completed a decent number of reviews, the other three countries seemed to have less participation. As mentioned earlier, not many Australian legal professionals were interested in the PTP. The South Korean patent office was also more cautious in selecting the reviewers who would review the patents. The US and UK PTP programs shared, to some extent, the same reviewers, as the two initiatives shared the same portal during the implementation period.

We will now offer network-based explanations of these variations in design, implementation, and outcomes.

Table 2. PTP structure and outcomes in five countries

Countries	Reviewer Criteria	No. of Apps	No. of Revs	Filter and Selection
US	Open to all	220	2092	Vote
Japan	Expert only	38	253	Expert review

Australia	Open to all	106	130	Vote
S. Korea	Expert only	50	53	None
UK	Open to all	172	450	None

6. Network factors for Peer to Patent diffusion

Lazer (2005) points out that governments, from an informational network perspective, are "policy choosers" and "information producers" (p. 55), and he further argues that information affecting policy choices might be "information generated by the choices of the other states, where that information may include predecision or postdecision" (p. 55) [10]. For instance, cross-national communities or international organizations can reduce the degree of separation caused by geographic distance and bring policymakers together to share information. In the literature review, we discussed some important mechanisms that can help to channel the information that policymakers need to make decisions. Here we will discuss how these mechanisms functioned in the five PTP adopting countries.

6.1. Cross-national communities

A cross-national community includes a group of individuals with common interests and a set of professional standards, such as academia [10]. In the PTP cases, a network of law schools in the host countries usually plays an important role in diffusion and implementation. In particular, NYLS played an essential role in promoting the PTP project to the international community and in assisting the host countries in setting up their PTP system. The law department at Queensland University of Technology also served as an important bridge between the US PTP and Australia PTP. These law schools serve an important role in information dissemination.

6.2. International organizations

The World Intellectual Property Organization functions as a "global forum for intellectual property services, policy, information and cooperation" [34]. WIPO conducts annual conferences and produces the Global Innovation Index based on patent applications and several other indicators from each country. This organization plays a key role in producing international standards on patent-related policies and issues.

6.3. Global corporations

The analysis reveals that major technological companies served on the consultative committees in the United States, UK, Australian, and Japanese PTPs. Among the prominent companies represented as advisors on the PTP boards have been GE, Red Hat, Open Invention Network, Article One Partners, Hewlett-Packard, IBM, and Microsoft. Furthermore, IBM has been an essential actor in influencing and funding PTP projects in the United States, Japan, and the UK.

6.4. Institutionalized networks

Multiple international conferences on PTP were conducted for information dissemination. For instance, on October 14–15, 2010, the WIPO office in Geneva, Switzerland, organized an international meeting on open patent review, with United States, Australia, Japanese, Korean, WIPO, and other staff members attending, to discuss the implementation of and lessons from PTP [30]. The Korean IPO learned about the trend at this conference and subsequently decided to create its own CPR system.

6.5. Peer-to-peer networks

As mentioned earlier, PTP was driven largely by the law school community in the United States, and some law students were mobilized to act as fellows [1]. Students from multiple major law schools in the United States also participated in the UK, Australia, and Japan PTP reviews, since those three platforms shared the same PTP web portal and design. Furthermore, Beth Noveck, an NYLS law professor and the original developer of the PTP, was the key person who disseminated information to the other countries through her two popular books, *Wiki Government* and *Smart Citizens, Smarter State*. Also, Noveck's position as Deputy CTO at the White House was a strong indicator of the importance of the initiative and enhanced the flow of postdecision information. Through Noveck's networks with law professors in the other countries, frequent visits to disseminate the USPTO's implementation experiences took place, allowing law professors to bring back evidence for policymakers in their home nations. For instance, Professor Brian Fitzgerald, who

was responsible for the Australian PTP, was a law professor as well. Also, Prof. Noveck worked for the UK government on implementation of its pilot for several years before its launch.

6.6. Technology

The PTP website was on an open-source basis under the Linux operating system in the United States. Thus, the Open Invention Network, an organization that promotes the use of Linux and open-source systems, was involved in multiple countries' committees.

6.7. Other mediating factors

The activity of the Open Government Partnership (OGP), a multilateral initiative founded in 2011, has also mediated the diffusion of the PTP model. The OGP had eight founding governments: Brazil, Indonesia, Mexico, Norway, the Philippines, South Africa, the United Kingdom, and the United States [35]. It aims to promote transparency and citizen empowerment, oppose corruption, and leverage new technologies to strengthen governance across countries. By 2017, 75 countries and 15 subnational governments had formed committees to make their governments more open and accountable through the OGP [35]. The five countries covered in this study were all OGP members. The goals of the PTP initiatives conducted through national patent offices were aligned with open government initiatives and were recognized as a best practice among federal agencies. Thus, the diffusion of the OGP also mediated diffusion of the PTP model.

7. Discussion

7.1. The informational network influences PTP adoption decisions

From our interviews with the managers in charge of the PTP in five different countries, the responses confirm the establishment of an informational network composed of cross-national communities (law school networks), international organizations (WIPO), global corporations (e.g., IBM), institutionalized networks (international conferences), peer-to-peer networks (with Beth Noveck as the central node), technology (open-source), and mediating factors (such as the OGP). The existence

of this informational network allows information on and experiences of PTP to be exchanged through various formal and informal channels. Figure 4 illustrates the timeline for the adoption and implementation of the PTP in each country.

Information and experiences exchanged through these channels play important roles in guiding the adoption decisions made by patent offices in different countries. For instance, our interviewees reported that Prof. Ben McEniery from Queensland University of Technology (QUT) met with NYLS professors at several law conferences, where they exchanged information on the US PTP's progress. Eventually, these informal exchanges resulted in the decision to adopt PTP in Australia, and QUT partnered with Australian government agencies in launching it in 2009. Similarly, through the WIPO meeting, KIPO took notice of the PTP trend as a way of responding to the fast-changing technology world, and it decided to experiment with a similar initiative at its own agency. Our analysis of and interviews with the stakeholders of each PTP project confirm the influence of the informational network on PTP adoption decisions.
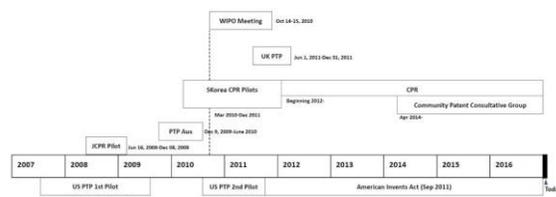

Figure 4. Timeline of Peer to Patent adoption and implementation across countries.

Figure 4 shows the order of adoption and the evolution of the diffusion process across the five countries. We use the US PTP as the baseline, as shown in the column below the timeline, and show the evolution of the PTP diffusion process across Japan (JCPR Pilot), Australia (PTP Aus), South Korea (SKorea CPR Pilots), and the UK (UK PTP) in turn.

From an informational network perspective, the diffusion process followed by policy choosers involves obtaining information from information producers on (1) the decision process, (2) the decision to adopt, and (3) project outcomes from information producers [10]. Figure 4 illustrates the types of information that each set of policy choosers might have had available when making their decision.

For instance, Japan CPR adopted PTP before it had learned about the outcomes of PTP adoption. South Korea changed its CPR pilot and institutionalized a community patent consultative group after learning about the outcomes from the other three PTP countries. In these changes, South Korea decided to admit reviewers by invitation only, rather than offering a completely open review process. The US PTP has institutionalized the PTP review process through the America Invents Act of 2011, which requires all patents to be reviewed publicly.

7.2. Patent legal frameworks influence the implementation of PTP systems

Meanwhile, our analysis shows variations among the implementation of PTP, mainly due to differences in the legal structure of the patent laws in different countries. Table 2 illustrates the outcomes and implementation of PTP in the five studied countries. For instance, we observed that South Korea and Japan chose stricter reviewer selection criteria due to their existing patent review laws.

Also, there was a notably higher participation rate in the United States because a third-party observation law had not yet been implemented in the United States at that time, with the result that the PTP stood out as an open channel for public review. On the other hand, because the UK had an existing third-party observation law, its PTP adoption was intended only to improve the efficiency of public observation [36]. The US PTP has been internalized into the formal patent review process on the EFS-Web through the passing of the America Invents Act, section 8 of which incorporates a PTP-type system that waives fees for third-party submissions of prior art and allows public participation in the examination process [37].

8. Conclusions and implications

Building on policy diffusion theory as applied to an informational network perspective, our five case studies illustrate how information about governmental innovation is communicated through social networks among policymakers or relevant actors. These findings help to confirm the role of information networks in cross-country policy diffusion as proposed by Lazer (2005).

Our study further reveals how an informational network including professional communities, international organizations, global corporations, peer-

to-peer networks, and technology influences PTP adoption decisions whereas patent law regulations influence the implementation of PTP systems. Environmental factors, such as industry demands for a more efficient patent review service and an agency's need to resolve an overload of patent applications, also play an important role in facilitating adoption of the innovation. From this complex network of PTP diffusion, we can learn several important lessons about transnational communication and exchange.

First and most specifically, understanding this complex network reveals how different roles within a transnational communication and exchange system might alter the way in which innovation policy is transferred. As mentioned earlier, different types of network actors might be associated with different components of the innovation transfer process. Although the same policy goals were shared and transferred by all five countries, some program components were adopted differently. For instance, Japan, Australia, and the UK have adopted the structure and content of the US PTP, but with different institutional designs. Even though South Korea has similar policy goals for its PTP program, it has adopted a modified structure and content with different ideas, attitudes, and concepts, less transparency in the reviewing process, and different policy instruments and administrative techniques; for example, South Korea's reviewers are selected by invitation only.

The differences in PTP adoption across the five countries also reveal the different functions of relationships. For instance, personal relationships enhance trust and facilitate policy transfer with high inclusion of similar components, whereas institutional relationships, such as joint membership in an association, provide only information and experiences to guide decision making.

Furthermore, the communication and exchange are two-way. The United States was the PTP pioneer, but it has since made changes in its patent review process through learning from other countries and their experience with CPR legislation. There is little concern for free rider issues [10] as long as the communication among countries is open and fluent. The roles of policy choosers and information receivers changed when robust cross-national information exchange took place.

Finally, the formation of this transitional network on improving the patent review process, including governments, academics, and the private sector, became a brainstorming group that also discussed

how to move patent law and review procedures forward through legislation and better governance. Different options of formalizing this transnational network were discussed, such as moving the PTP in-house within the IP office or establishing a global platform. This development of a transnational network consisting of the five initial PTP adopting countries shows that understanding the diffusion process as a network is essential and can capture the substance of policy construction and dissemination as a whole.

9. References

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