The possibilities of Open Science for knowledge transfer in the science-policy interface

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Abstract

This paper explores the possible role of Open Science in the knowledge transfer between research and policy, focusing on its potential use by scientific councillors at Estonian ministries. Qualitative interviews with scientific councillors show that they perceive their role as intermediaries between research and policy and focus their work on improving the quality of research commissioned by their ministry. This process, for them, involves using existing academic articles and datasets to which, however, they lack official access. We show that Open Science can contribute to knowledge transfer if there are knowledge brokers in public sector organizations.

Introduction

Evidence-based policy is the notion that (scientific) evidence can and should inform the development and implementation of policy. The relationship between research and policy is often described in terms of a 'gap' [Cairney and Oliver, 2017; van Kammen, de Savigny and Sewankambo, 2006; von Winterfeldt, 2013], highlighting the practical difficulties as well as different values and practices of both sides that stand in the way of using scientific evidence for policy-making [Davies, 2004; Head, 2010; Holmes and Clark, 2008; Mitton et al., 2007; Williams, 2010]. To bridge the gap, many countries have created advisory bodies or positions to support and facilitate the knowledge transfer process [for an international overview, see Wilsdon, Allen and Paulavets, 2014]. Scholars also highlight the role of mutual understanding and interaction between policy-makers and scientists [Mitton et al., 2007] or special knowledge brokers that facilitate the process [Jacobs, Garfin and Lenart, 2005; Lavis et al., 2003; van Kammen, de Savigny and Sewankambo, 2006]. Recently, the use of publicly accessible scientific results and data by non-academic stakeholders, including policymakers, has been claimed as one of the benefits of Open Science [e.g. Pilat and Fukasaku, 2007; Tennant et al., 2016; The Royal Society,

& The Academy of Medical Sciences, 2018]. This claim, however, has so far been subject to little empirical testing.

In this paper, we will use the Estonian example to investigate the possible uses of Open Science for evidence-based policymaking. We consider the setting of Estonia to be informative for two reasons: first, similarly to many other EU countries, it has recently started a debate on the adoption of Open Science principles, and, second, since 2016, as part of a centrally-coordinated programme, most government ministries established the position of scientific councillors to improve the quality of public evidence-based policymaking. This provides us with a clear institutional setting of the science-policy interface — the scientific councillors — which allows us to investigate the use of Open Science in a policy-making context. The paper will also take a closer look on the institution of scientific councillors to analyse their role and effectiveness for improving the use of scientific results in general, not just in connection with Open Science.

Models of knowledge transfer

According to Sanderson [2002], evidence-based policy maintains its influence despite the critique it has received for its conceptualizations of knowledge and evidence [see Head, 2010, for a summary] and the simplistic relationship between science and policy [e.g. Nutley and Webb, 2000]. This means that despite the variety of academic approaches to the interactions within the science-policy interface and the roles of scientists as advisors on complex issues [Spruijt et al., 2014, provide a good map of approaches], the stakeholders themselves often perceive the process as a simple matter of knowledge transfer, i.e. "the process of getting knowledge used by stakeholders" [Graham et al., 2006, p. 16].

Graham et al. [2006] have mapped the various terms used for this process and conclude that there is a lack of consensus on terms and definitions. When describing the process of using expert knowledge or scientific results, some authors talk about knowledge to action, knowledge translation or research utilisation, others might talk more generally about using research or 'bridging the gap'. The suggestion of unidirectionality [Graham et al., 2006] that is sometimes interpreted to underlie the term of knowledge transfer is even appropriate in the context of Open Science, which assumes the use of publicly accessible research papers and data without the involvement of knowledge producers.

Weiss [1979] has defined the main models of knowledge transfer, listing the problem-solving model as the most common. This model involves either a "search for information from pre-existing research" or "purposeful commissioning of /. . . / research and analysis to fill the knowledge gap" [Weiss, 1979, p. 428]. In many countries, the main instrument for knowledge transfer has been scientific advisory committees which are often designed to purely inform government on the "state of scientific knowledge" [Bijker, Bal and Hendriks, 2009, p. 26]. Their frequent use has led Jasanoff [1990] to even label them the 'fifth branch of government'. However, Weiss argues that despite being common, the problem-solving approach often leads to disillusionment since research rarely provides clear-cut, unambiguous answers to policy problems. Similarly disillusioning can be the political model of knowledge transfer in which decision-makers look for evidence that support a predetermined position [Weiss, 1979].

Weiss [1979] defined a third model — the interactive model — as one that engages various types of actors and leads to a decision after mutual consultations. Much of subsequent literature on knowledge transfer (or similar concepts) has concluded that most effective knowledge transfer processes require an interactional aspect [Lavis et al., 2003]. The interactive model also provides pathways to deal with policy advice in situations related to complex problems, situations where knowledge is uncertain, or where co-creation and reflexivity are necessary [Siew, 2008; Spruijt et al., 2014; Wilsdon, Allen and Paulavets, 2014]

One barrier to interaction is often seen in the fact that researchers and policy-makers belong to different 'epistemic communities' with a "dramatic gap in the knowledge, the aims and the way of thinking" [Siew, 2008, pp. 914–915]. Therefore, either an alignment of everyday actions is required [Holmes and Clark, 2008] or an intermediary that helps to 'translate' or 'broker' the knowledge. In fact, several authors point out that brokering means much more than just translating the knowledge. Rather they talk about translating perspectives [Wenger, 1998; cited from Meyer, 2010], translating "the opportunities, constraints and findings from one setting to the other" [Lomas, 1997, p. 440] or facilitating and channelling interaction [Sverrisson, 2001].

New institutions and actors have emerged to fulfil this role of brokering between science and various audiences, for example professional science communicators or university technology transfer offices [Meyer, 2010]. On the policy arena, the current landscape includes various more or less formal structures, from advisory councils and committees to the position of Chief Scientific Advisor [Hutchings and Stenseth, 2016; Wilsdon, Allen and Paulavets, 2014]. Hutchings and Stenseth [2016] detail the strengths and weaknesses of each, Jasanoff [1990] provides a more detailed analysis of science advisory committees, and Wilsdon, Allen and Paulavets [2014] of EU-level science advice. Looking at the position of the U.S. science advisor, Pielke and Klein [2009] have shown that despite the expectations of the science advisor to shape presidential policies, in reality this position mostly acts as a coordinator of budgets and programs. Wilsdon, Allen and Paulavets [2014] summarize that since no structure is perfect, governments typically rely on a combination of them to create a broad ecosystem of expertise around policy processes.

While evidence-based decision making exists in the Estonian public administration, it remains under-developed and under-utilised, according to an OECD evaluation [Organisation for Economic Cooperation and Development, 2011]. Previous studies on science advice in Estonia have regarded studies commissioned by ministries as the main vehicle of knowledge transfer from research to policy. Their critique has pointed out that the commissioned studies are left unused in the policy process and their results are not publicly available [Kasemets, 2002]. Their research questions also tend to be poorly formulated and there is little coordination between ministries and agencies about what studies to commission [Loom, Paulus and Nestor, 2015].

The participation of scientists (along with other stakeholder groups) is common in the preparation of various policy strategies and development plans. These strategy documents, however, tend to be poorly aligned with each other [Eesti Keskkonnaministeerium, 2005] and rarely end up being fully implemented

[Organisation for Economic Cooperation and Development, 2011; Rahandusministeerium, 2006], meaning that the strategies are not an efficient tool to transform expert knowledge into policy.

Neither does Estonia have a strong tradition of scientific advisory committees that have had a major influence in some Western countries [Jasanoff, 1990] and even initiated discussions about the scientification of politics [Weingart, 1999]. A few committees exist for technical questions such as groundwater management. The Government Office hosts two permanent advisory councils, consisting of researchers, other experts, stakeholder representatives and ministers: the Research and Development Council focuses on the research and development and innovation policy, and the E-Estonia Council directs the development of Estonian digital society and e-governance. This fact identifies ICT innovation as the one specific area where the government is interested in expert-level policy advice.

The Estonian science policy emphasizes scientific excellence and science's contribution to economy as its main goals, according to the current science policy strategic document [Haridus- ja Teadusministeerium, 2014]. The same document admits that Estonian science has been modest in its contribution to the society and recommends strengthening ministries' capabilities in managing the research and development activities in their field [Haridus- ja Teadusministeerium, 2014]. The establishment of the scientific councillor position in Estonia, initiated by the Estonian Research Council and enabled by EU financial support, has been the first major step in recent years to support this strategic goal.

Open Science

Open Science, in the context of this paper, incorporates two main principles: open access to published scientific articles, and open data, meaning access to research data that has been produced by public funding.

Considering the strong focus on interaction for efficient knowledge transfer, it is fair to ask: why do we want to investigate the role of Open Science in knowledge transfer from research to policy?

First, claims about the positive impact of Open Science on knowledge transfer are being brought forward both in policy and vision documents [e.g. Pilat and Fukasaku, 2007; European Commission, 2016; Boulton et al., 2012; Look and Marsh, 2012; The Royal Society, & The Academy of Medical Sciences, 2018] and in academic papers [Davis and Walters, 2011; ElSabry, 2017; Sá and Grieco, 2016]. The European Union and many national research funding organizations are incorporating the principles of Open Science into their funding requirements and Estonia is currently considering its Open Science policy.

The consideration of access by non-academic stakeholders plays a role in these discussions. Fecher and Friesike [2014] have mapped the discussions around Open Science and among the five schools of Open Science thinking they identified, is also the 'democratic' school which focuses on free availability of knowledge. This school of thinking is illustrated by the following quote:

> *"[I]ncreased access to scholarly outputs might help foster a culture of greater scientific education and literacy, which in turn could have a direct impact on public policy, particularly in domains such as climate change and global health, as well as increasing public engagement in scientific research."* [Tennant et al., 2016]

However, these claims have so far received little empirical testing (notable exceptions being Willinsky [2004] and Zuccala [2010]).

The second gap in our knowledge regarding the role of Open Science in knowledge transfer concerns its possible interaction with knowledge brokering mechanisms. Previous studies [e.g. Holmes and Clark, 2008; Jacobs, 2002] have shown that the question of accessibility is relevant for using scientific knowledge in policy-making. Whereas other concerns such as assessing the trustworthiness of information or being compatible with a specific decision-making process also play an important role, the change that could be created by the prevalence of Open Science is worth to be investigated.

Guided by these considerations we pose the following research questions for our study: *(1) what is the role of scientific councillors at Estonian ministries related to knowledge transfer between research and policy,* and *(2) how do the scientific councillors see the role of Open Science in the knowledge transfer between research and policy?*

These questions grew out of a previous study [Toom et al., 2017] where we investigated the stakeholders' views about Open Science. This study showed that while scientists consider the principles of Open Science important, they see many practical barriers for their actual implementation. They also do not feel there is significant motivation for science to adopt the principles of Open Science, including the lack of potential users of Open Science outside academic circles. While many interviewed scientists believe their results would be interesting for societal groups (e.g. decision-makers, journalists, NGOs), they are not convinced these groups would be able to comprehend scientific articles and data.

Methods

For this study we conducted qualitative interviews with scientific councillors working at Estonian ministries. A qualitative approach was chosen since it allows researchers to address the meanings that individuals or groups ascribe to a social or human problem [Creswell, 2014, p. 44]. We used purposeful (also known as purposive) sampling, i.e. selecting individuals who can purposefully inform about their understanding of the central phenomenon of the study [Creswell, 2014, p. 156]. More precisely, we used the criterion sampling strategy [Schreier, 2018].

We considered the scientific councillors at Estonian ministries to be the most informative group for the purpose of investigating the role of Open Science in knowledge transfer. At the time of study eight out of the 11 Estonian ministries had employed a scientific councillor (see Table 1). Altogether, nine people worked as a scientific councillor at the time of the study (the Ministry of Social Affairs has two scientific councillors) and they were all included in our sample. Prior to contacting the scientific councillors, we conducted an interview with the co-ordinator of the programme from the Estonian Research Council. This interview helped us to understand the goals and practical details of the programme.

Table 1. List of interviewees.

Organization	Gender	PhD
Ministry of Rural Affairs	F	
Ministry of the Environment	M	Yes
Ministry of Defence	F	
Ministry of Education and Research	F	Yes
Ministry of Economic Affairs and Communications	M	
Ministry of the Interior	F	
Ministry of Culture	M	
Ministry of Social Affairs	F	Yes
Ministry of Social Affairs	F	Yes
Estonian Research Council	F	Yes

All members of the sample were invited to participate and received the letter of informed consent via e-mail. All of them agreed to participate. Personal in-depth interviews were made by two researchers in May 2018 and lasted between 45 minutes and 1,5 hours. A personal interview was chosen because in comparison with a group discussion or a focus-group interview, it allows much deeper focus on each respondent's experience and opinions [Guest, Namey and Mitchell, 2013].

A semi-structured interview plan guided the interviews and covered the following topics: 1) the tasks and roles of the scientific councillor, 2) the need of and access to scientific articles, 3) open datasets and their use, 4) evidence-based policymaking and the impact of Open Science.

The recordings were transcribed. References to organizations were preserved in the transcriptions when it was necessary for context purposes but personal references to the respondents were deleted.

We used a concept-driven approach, preparing a thematic categorization for analysis where categories represent the topics in the interview schedule [Gibbs, 2007]. First, the authors coded the text independently. In the second phase, the codes were compared, discussed and meaningful ones selected. The results were interpreted similarly to the previous study [Toom et al., 2017] which analysed the attitudes towards Open Science among stakeholders. That study included a web survey among Estonian scientists (n=671) and focus-group and individual interviews with Open Science stakeholders (scientists, representatives of libraries, universities, funding agencies, ministries; in total 38 people).

Results

The position and role of scientific councillors

The creation of the positions of scientific councillors (SC)[1] at Estonian ministries is a centrally co-ordinated programme and is therefore well-documented. The scheme is part of the RITA programme[2] co-ordinated by the Estonian Research

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[1]'Scientific counsillors' is the translation provided by the Estonian Research Council. On their web pages, ministries describe their position usually simply as 'adviser'.

[2]http://www.etag.ee/en/funding/programmes/rita/.

Council (and funded by the European Regional Development Fund). The wider aim of the programme is to increase the role of the state in the strategic managing of research. The positions of SCs are meant to improve the ministries' capabilities on research and development (R&D) matters.

The scientific councillor's position in the ministry is one of a civil servant. The first SCs started work in 2016, and by June 2018, eight out of the 11 Estonian ministries have employed a SC (or even two, as is the case for one ministry). The scientific background of the councillors was considered essential: a PhD or a master degree and at least four years of research experience in a relevant field were required from the applicants. Half of the current SCs have a PhD degree.

The programme co-ordinator (who herself has two PhD degrees, in ecology and religious studies, and has worked as scientific councillor in the Ministry of Environment as part of a pilot scheme) explains:

> *"According to our experience, if a person has not done any research him/herself then he/she might not sense what science is. The research task descriptions that such people prepare are substantially poorer than by those who have been active researchers themselves."* (Interview: programme co-ordinator)

The central co-ordinator also provided a sample job description which lists four main tasks for the scientific councillor:

1. Advising the ministry on R&D matters;

2. Planning and managing international and national R&D collaborations;

3. Developing a research programme for the field and putting it into practice with various partners;

4. Representing Estonia in various international R&D initiatives.

At the same time, all ministries were free to adjust the job description and find a place for the SC in their organizational structure. As a result, all SCs are placed differently in the organizational hierarchy and have somewhat different tasks and responsibilities. The programme co-ordinator admits they had hoped for a more influential position for the SCs:

> *"Our strong recommendation was that the scientific councillor would be placed as close to the Secretary General as possible. But in reality, they are mid-level civil servants at some department, meaning that above him/her are the Head of Department, the Deputy Secretary General and only then the Secretary General and the Minister. . . . In some ministry [the SC] has direct contact with the decision makers, in some cases the contact goes through the Head of Department. This also matters a lot to how much the person's voice is being heard."* (Interview: programme co-ordinator)

When reflecting on their role, the SCs themselves also point out that they would like to take a more strategic role in the organization but not necessarily in terms of being placed higher in the hierarchy. Rather, they wish to devote more time to

working on the "big picture", meaning mapping the existing knowledge and identifying future research needs. "There are overlaps, duplications and gaps in terms of how all the [governmental] subject areas are covered with scientific knowledge," one SC said (Interview 7).

In reality much of their time is taken away by everyday administrative work, mostly related to two tasks: co-ordinating ministry R&D collaborations and managing the research programme. Depending on the ministry's profile and research activities the proportions between those two might be different.

Commissioning research for the ministry is seen by the SCs as the main activity through which they can contribute to the quality of evidence-based decision making in the organization. The SCs are heavily involved in that process: they collect the requests coming from different departments, participate in deciding the ministry's research programme, assist in (or take care of) preparing the research task description, commission it from researchers, manage the process until receiving the results and help to disseminate the results in the ministry. In some rare cases they have also been part of the study team.

The instalment of the SC scheme to ministries has improved the process in two main aspects, according to the SCs themselves. First, it has improved collaboration between ministries, including launching joint projects and increasing information exchange. Since the SCs meet regularly and discuss upcoming calls, "someone often says a similar study has already been done or is being done," a SC said (Interview 6). As a result, the SCs feel that more relevant studies are being commissioned and duplications avoided.

Second, it has improved the quality of the research task descriptions since the scientific background of the SCs helps them better translate policy problems into research requirements. Several respondents described part of their role as being the intermediary between science and policy. This mediation, however, seems to be more focused on translating policy expectations for science and less on translating science for policy-makers. Whereas one of the original expectations to the SC scheme was that "they could be the ones who transmit the information from scientists to the management" (Interview: programme co-ordinator), this role was rarely mentioned in the interviews in connection with the top management of the ministry. This is likely the result of their place in the ministerial structure and the type of tasks assigned to them. With other colleagues (e.g. departmental specialists), some advising does take place but is still mostly connected to the preparatory phase of research commissioning. This might include searching for relevant journal papers and datasets, and explaining the specifics of science, including researcher routines and the limitations of scientific results.

Some SCs also mention a third, more general benefit. They perceive a change of culture in their organization towards considering scientific evidence. They report that in policy discussions, top officials now more often ask for evidence and have higher expectations to the studies the ministry commissions. According to the interviews, this change is partly driven by a more goal-oriented management culture on the (Deputy) Secretary General level, and partly by the creation of the SC position and their activities in the organization. This, they report, has led to an increased importance of the commissioned studies: the organization puts more

effort into making sure a study addresses a knowledge gap and provides results that can be implemented. As a result, the studies tend to "address topical issues that require speedy intervention, with the supported research being prompted by preparations for a specific intervention" [Estonian Research Council, 2017].

While most SCs agreed in the interviews that the decision-making in their ministry is evidence-based and that their voice can be heard, this mostly seems to concern the more technical level of governance, judging on the examples they gave about successful cases of uses of scientific knowledge. Several SCs mentioned disconnectedness with the political level, especially regarding topics that are introduced to the agenda by political actors. "No-one says directly that we don't need science but sometimes you can see that there is no faith in it," one SC says (Interview 5). The same interviewee says that sometimes "bad decisions can be avoided" thanks to finding existing studies that do not support the proposed policy. However, often they rather feel that political actors expect studies to support an already selected policy option and provide ready-made policy solutions; policy-makers are also often dissatisfied with the slow speed of research and tend to prefer political interests to scientific claims.

The most important actors for the SCs to support their role in the ministry are the departmental specialists (mid-level civil servants who are specialized on specific topics), Heads of Department and Deputy Secretary Generals. The latter two are mentioned as most important partners for the implementation of evidence-based policy: they will represent the evidence and study conclusions in the higher-level discussions. The first group, the specialists are important partners in the earlier phase: they usually initiate the study proposal and, ideally, are expected by the SCs to keep themselves up-to-date with the latest research taking place in the specific field. According to the SCs, the barriers for that are rather the lack of time and access than the lack of skills of understanding science. Nevertheless, the SCs still mentioned the need for some kind of intermediaries for the top-level civil servants and political actors. These would help to translate science for the policy-makers and interpret the results also from the policy perspective. Some SCs see that this knowledge broker could be them (but currently they just do not have time for this), some believe the departmental specialists could develop into that role, others point that researchers themselves could also do a better job in presenting their results to policy-makers.

The full impact of the SC-scheme for policy-making can only be evaluated in the following years. The ministries are required to keep funding the SCs position for two years after the RITA program ends in 2022 after which they are free to reconsider whether they need such a position in their organization. "Our expectation is that the collaboration [between the SCs] will continue after the end of the program but, of course, we do not know what will happen if there are no extra resources and no-one co-ordinates," the program co-ordinator says.

The contribution of Open Science

In the context of the work of the SCs, Open Science is relevant in two aspects: using Open Science in the policy-making process and providing access to the results and data of the commissioned studies.

The interviews reveal that lack of access to scientific results is perceived as a major issue by many of the SCs. It is mentioned most often in the context of preparing the commissioning of new studies: getting an overview of previous research and identifying knowledge gaps is considered a vital part of the process. Frequently, this part is the responsibility of the SC and they call lack of access to scientific papers a real frustration. They also report being sometimes asked by their colleagues (mostly departmental specialists) about whether they have scientific information about a certain topic.

Many SCs say that they wish to have access to scientific databases to search for and read scientific papers. Officially, these databases are not available to them and requests to arrange access have been turned down because of the licence costs. Therefore, the SCs report frequently using alternative options, most often using their own or someone else's university affiliation to gain access to the journals. Also, they sometimes contact the study authors directly and ask for the manuscript.

The SCs especially mentioned the interest to access scientific databases for purposes of easier search options that are not available with alternative open access options such as ResearchGate.Some of the SCs believe that better access to scientific knowledge combined with their role of promoting evidence-based decision-making could make more actors in their ministry, for example departmental specialists and advisors to the Minister, to read and use academic papers in their work. Especially the departmental specialists, the SCs believe, could follow the latest scientific development of one's field and determine their possible use for policy-making. Currently, this task is often delegated to researchers:

> *"There is currently the expectation that the academia of our field keeps an eye [on the latest research] and provide us an overview once a year with a discussion what of that could be used for policy-making or for policy implementation."* (Interview 1)

Interviews with researchers, conducted as part of the study of Open Science stakeholders in Estonia [Toom et al., 2017], described a similar relationship with decision-makers: researchers reported being asked to provide reviews of recent literature on their field, i.e. to take the role of translators of scientific results. The researchers tended to express the belief that the main barrier for policy-makers for using scientific results is not access to journals but capability to read and understand the academic papers. The personal experiences that the researchers shared in the interviews rather discussed problems they had felt in interaction with ministry representatives, not success stories of transfer knowledge. However, none of the researchers had experience with the SCs, as the scheme was still novel.

Whereas access to scientific papers is considered necessary by most SCs, the responses are more mixed regarding scientific data. On the one hand, several SCs say that data are valuable and should be used more by their ministry. They agree that for many problems a lot of relevant data already exists and should be used better instead of commissioning another study. On the other hand, there are doubts whether scientific Open Data could significantly contribute to policy-making. The interviews indicate that the needs of the ministries are mainly covered by state-collected data and commissioned research, while the main barriers for using science data are related to resources and relevance.

The SCs do not see that, mostly due to time constraints, they personally could deal much with data, more than identifying existing datasets as part of knowledge-mapping. Capabilities for data analysis exist in some ministries but could be extended, according to the SCs, to also include analysis of available science data. However, the SCs point out that the need for science data differs between ministries. In some fields (e.g. population, health, education), the state has much better, newer and more encompassing data than scientists would be able to collect. In some cases, the value of science data can be limited, whether for reasons of methodological compatibility or relevance to the local context. In fields that do have abundant data available (e.g. environment), the SCs would prefer not just access to data but already tools that allow to visualize the data or combine different datasets.

In terms of access to the studies that the ministries have commissioned, the SCs agree that this could be significantly improved. The study reports are required to be publicly available; this is usually done via a section on the ministry web site. While technically available, the SCs admit that these reports are not easy to find and the search options within the studies are limited. Also, every ministry manages their study reports independently, there is no common policy or database for these studies. The SCs feel that this limits the visibility and use of the results.

Neither is there a policy about data. Not all ministries request data to be handed over after the end of the study and none publishes them along with the study reports (although they have made it available to researchers when requested). The SCs support an active position on data: the ministries should get the study data so that they can perform additional analysis and are able use them again for future studies. Most of them see value in making the data available: if not fully then, at least, the metadata.

When discussing data in the preceding study [Toom et al., 2017] the researchers more often highlighted issues with state-owned data than science data. They perceived that better access (of researchers) to data collected and commissioned by the state would produce much more value than improving access to science data (for policy-makers). In addition, researchers felt less need for Open Data policies in science since data sharing via informal networks, also with groups outside academia when they request it, is common.

Discussion

The scientific councillors program at Estonian ministries was initiated to support knowledge transfer from research to policymaking and the SCs are expected to some extent to function as knowledge brokers. The desired design of the SC position can be seen as a response to the criticism towards the state's research management [Kasemets, 2002; Loom, Paulus and Nestor, 2015; Organisation for Economic Cooperation and Development, 2011].

The actual implementation of the programme, however, has not quite followed these expectations: the position that the SCs have received at the ministries and their actual tasks do not support knowledge transfer models which can have a strong impact on policy.

There is an internal diversity among the SCs regarding their tasks and position but, in large, the main part of their work consists of administrative duties regarding

collaborative activities and the work on commissioning research. The latter, a classical example of problem-solving model of knowledge transfer [Weiss, 1979], is the main channel through which they interpret their role as a knowledge broker and as a contributor to evidence-based policy.

The SCs emphasize two stages where they feel they have improved the study commissioning process: identifying the knowledge gaps more efficiently, e.g. by working with existing scientific literature or co-ordinating with other SCs, and preparing the study task description, i.e. translating the policy needs into research perspective.

The SCs describe their role as intermediaries primarily as the ones translating p between the perspectives of policy and research [Wenger, 1998; cited from Meyer, 2010] rather than translating scientific results or findings. Partly this might be because the focus of the SCs has been on the commissioning process and not yet on the dissemination or implementation of results, since only a few studies have been competed during the time the positions of SCs have existed. At the same time, the SCs are convinced that the level in the ministry with whom they commonly interact (departmental specialists, Heads of Department, Deputy Secretary Generals) are capable of understanding scientific results of their specific field without much translation.

When discussing the use of scientific knowledge by the higher-level representatives in the organization (the Minister or Secretary General), the SCs encounter many of the problems mentioned in the literature [e.g. Holmes and Clark, 2008; Mitton et al., 2007] regarding knowledge transfer to policymakers, whether via the problem-solving model or in general. The possibilities to influence the political level are considered limited by the SCs but to some extent possible if they find leverage in the organization (e.g. the Secretary Generals) who are able to influence highest level decision making, and if they provide high-quality studies. "We could influence with the wisdom to commission right studies and analyses," one SC said (Interview 2).

This focus on commissioning studies as the primary process of knowledge transfer was very strong in all interviews; the SCs interpreted all questions in the context the problem-solving model and rarely considered other knowledge transfer models. This focus determines many characteristics of the potential knowledge transfer in the SC system. First, the research problems or knowledge gaps are defined on the level of ministry specialists, i.e. they tend to address specific rather than strategic questions. This might mean that the questions are not well aligned with the issues that are currently on the political agenda or considered central by researchers of the field. As a result, knowledge transfer tends to concern the rather technical issues (e.g. regulations, specific measures) and not the major and visible political decisions.

Second, the main role of the SC in the process is to assure the quality of the study. They express the assumption that if the organization has decided to spend resources on a study and the results are of sufficient quality, these will be used by the organization. The SCs can support the knowledge-to-action process either by presentations of the results in the ministry or by winning the support of top officials who will represent the scientific results in the high-level discussions. However, the SCs themselves are not involved in the official policy decision-making process.

Still, they see the improvement in the quality of study commissioning and better collaboration within the public sector as an indicator for the overall success of the SCs scheme. At the same time, better access to scientific papers is mentioned as the main element that would further improve the capabilities of the SCs to fulfil their roles. The SCs perceive the work with scientific articles a crucial part of the study commissioning process, for example to evaluate whether a new study is necessary, what is the knowledge gap or what theoretical frameworks or methods are available. Since they lack official access to scientific publications, many try to use alternative, but individual and less convenient options, e.g. their old university affiliation or personal correspondence. Open access to more articles would therefore likely increase their use by the SCs and, so several SCs believe, in the organization in general. In contrast, open science data was less likely to be believed to be useful, for several reasons.

The finding that open access would increase knowledge transfer to policy provides counterevidence to the scepticism Estonian scientists expressed about the users of Open Science [Toom et al., 2017]. That study brought out the belief by the scientists that the scientific articles and data would be too difficult for the potential users outside academia to comprehend, reducing the motivation of researchers to adopt the practices of Open Science. Examples of actual use and impact of scientific papers on the policy process, however, might increase researchers' readiness and interest to publish open-access. Also, as one SC pointed out, the understanding that there is an equal partner in the public sector could make researchers more open towards collaboration with the public sector and help to develop a more interactional model of knowledge transfer.

Another aspect that our previous study [Toom et al., 2017] revealed was the scientists' expectation that the government should set an example in adopting the principles of Open Science, especially regarding making data publicly available. The current public sector study publishing system does not follow these principles and could be significantly improved, the SCs admitted.

This paper demonstrates that if there are knowledge brokers in the public sector organizations, Open Science can contribute to knowledge transfer from research to policymaking. The Estonian SC system shows that communication from science to policy can to some extent take place via open-access publications. The system, however, represents a version of the classical problem-solving model with all its limitations, including the focus on technical policy questions. The quest is on for knowledge transfer models that support major political discussion and decisions. In this context it would be relevant to investigate if and how Open Science is able to empower the stakeholders of political debates.

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