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research article

How well do the UK government's 'areas of research interest' work as boundary objects to facilitate the use of research in policymaking?

Annette Boaz, Annette.Boaz@lshtm.ac.uk
Kathryn Oliver, Kathryn.Oliver@lshtm.ac.uk
London School of Hygiene and Tropical Medicine, UK

Articulating the research priorities of government is one mechanism for promoting the production of relevant research to inform policy. This study focuses on the Areas of Research Interest (ARIs) produced and published by government departments in the UK. Through a qualitative study consisting of interviews with 25 researchers, civil servants, intermediaries and research funders, the authors explored the role of ARIs. Using the concept of boundary objects, the paper considers the ways in which ARIs are used and how they are supported by boundary practices and boundary workers, including through engagement opportunities. The paper addresses the following questions: What boundaries do ARIs cross, intended and otherwise? What characteristics of ARIs enable or hinder this boundary-crossing? and What resources, skills, work or conditions are required for this boundary-crossing to work well? We see the ARIs being used as a boundary object across multiple boundaries, with implications for the ways in which the ARIs are crafted and shared. In the application of ARIs in the UK policy context, we see a constant interplay between boundary objects, practices and people all operating within the confines of existing systems and processes. For example, understanding what was meant by a particular ARI sometimes involved 'decoding' work as part of the academic-policy engagement process. While ARIs have an important role to play they are no magic bullet. Nor do they tell the whole story of governmental research interests. Optimizing the use of research in policy making requires the galvanisation of a range of mechanisms, including ARIs.

Key words boundary objects • boundary spanning • use of research • policy • universities • funders • engagement • intermediaries

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Background and introduction

Finding ways for research to make a meaningful contribution to policy has been an ongoing concern for the research community (Nutley et al, 2007) and from a policy perspective (Government Office for Science, 2019). There has been a shift away from conceptualising the solution as the need for more 'evidence-based policy', to a recognition of the complex, non-linear relationship between research and policy and the role of politics (French, 2019; Simons and Schniedermann, 2021) – often termed 'evidence-informed policy'. The so-called translational gap between research and policy has been the subject of academic investigation across policy contexts and countries (Boaz et al, 2019), yet 'solutions' to the 'problem' of this gap are often targeted at individual researchers, rather than at the cultural or systemic level at which these complex, political dynamics play out. For example, in the 1970s, Nathan Caplan introduced the notion of two communities to explore how the differences between those who produce and those who consume research might influence the use of research (Caplan, 1979).

Most activity designed to support research use focuses on this boundary between research and policy communities, with a wide range of – often relational – interventions including fellowships and training (Oliver et al, 2022). Scholars in science and innovation policy have described other interventions aiming to maximise the impact of research, such as training through universities and apprenticeships, or providing mission-oriented research funding to incentivise research on particular topics (Georghiou and Harper, 2011), although most interventions are researcher-led and -focused. Although often poorly theorised, and rarely based on a robust evidence base about what works, these interventions are rapidly increasing in number and volume (Hopkins et al, 2021). In part, this is due to increasing scrutiny of governmental R&D spend, and funders and researchers being required to demonstrate narratives of success and mechanisms of accountability. Knowledge mobilisation interventions – even when not demonstrably effective – support the production of these narratives.

Government and funders are also developing ways to improve evidence use. In the UK, a 2015 review of the public research funding councils led by Sir Paul Nurse (Nurse, 2015) recommended that the research councils could do more to address the complex problems which governments try to address, particularly around cross-cutting, or strategically important issues. To address this, the report highlighted the need for better engagement between the research community and government, recommending 'a more systematic expression of Government's own research needs and mechanisms for engagement between Councils and Government departments' (Nurse, 2015: 25).

In response, areas of research interest (ARIs) have been produced by all government departments (and increasingly other bodies) and now take the form of published, regularly updated lists of priority research topics. ARIs are intended to act as a bridge between the worlds of research and policy, making it easier for researchers to produce and share research of relevance to policymakers. ARIs sit within a developing UK government science system that includes other elements such as monitoring of science spending and capacity building in government to support the use of research to inform policy (Government Office for Science, 2019). In this respect, they resemble the Learning Agendas mandated by the 2018 Foundations for Evidence-Based Policymaking Act (Evidence Act) signed into law by the Trump Administration (OMB, 2021). This Act requires federal agencies and subagencies to publish their evaluation and evidence practices and activities, including lists of 'key questions and priorities for future studies that would be relevant and useful

to the agency and other stakeholders'. Like the UK's ARIs, the Learning Agendas seek to surface knowledge priorities, but unlike most UK government departments, there is often an internal R&D budget to be guided by these priorities (Irwin and Nightingale, 2022). The UK's ARIs have a more externally-facing role which is to explicitly link parts of the science-policy system together, acting as a tool to support communication and exchange.

As of Winter 2022, all UK government departments have published their ARIs, with around 1/3 updating these at least once. ARIs are typically compiled by analytical teams or science teams within government departments, usually in consultation with policy teams. In total over 1800 topics have been identified, varying from the high-level and strategic to the detailed and technical (Oliver et al, 2022). At present, there is no dedicated funding stream to support new research relevant to these questions. However, an ongoing initiative hosted by the Government Office for Science (the office within the UK government responsible for science capability and advice across government), and funded by the Economic and Social Research Council has found that for many, if not most ARIs, there is already a significant body of existing evidence (Oliver et al, 2022). In the UK then, the current state of play is a general willingness to engage across the research-policy boundary and there is a tool to enable this (the ARIs), but a limited understanding of what it takes to make the ARIs – as with other knowledge exchange interventions – functional and productive.

In this article we draw on interviews with stakeholders who were involved in a programme of work using the ARIs. Using conceptual contributions from the literature on boundary objects, including its previous application in studies of research use (Wehrens et al, 2012; Smith and Ward, 2015) the article explores the interplay between boundary objects, boundary workers and existing organisational structures and processes needed to make best use of ARIs as documents working across multiple boundaries. In the next section, we set out how the evidence use field has used boundaries between communities to talk about the evidence-policy gap, how boundary objects have been conceptualised and used, and explain why this is a useful framing to understand how ARIs operate within the science-policy system.

Evidence use: boundaries between communities

There has been a long tradition of examining the shortcomings of academic-policy engagement through the lens of the two-communities theory (Caplan, 1979). The boundary between the academic and the policy worlds has been conceptualised as a critical gulf contributing to the limited use of research in policy (Carden, 2004). The differences between research and policy in terms of organisational cultures and systems have been highlighted, particularly in terms of the very different incentives and timelines of academic and policy communities (Locock and Boaz, 2011). However, others have critiqued the characterisation of two distinct and separated communities. They have described both the heterogeneity within each community and the multiple interactions that occur across multiple boundaries (Bogensneider and Corbett, 2010; Newman et al, 2015). For example, Newman et al (2015) highlight the differences within academia between those from different disciplines and in government between those with administrative and those with political appointments. Bogensneider and Corbett (2010) move away from a conceptualisation of two communities to propose the idea of archipelagos. Here the communities are multiple and often in close proximity, but nonetheless frequently separated by deep waters that discourage travel.

Studies highlighting the heterogeneity within the different spaces and the multiple boundaries that exist reinforce the importance of boundary work. They also signal a shift in the work that needs to be done, away from contributing a bridge between two places to cultivating a complex web of interconnections between diverse actors. There is a growing body of individuals and organisations working at the boundaries, albeit described using different terms including knowledge brokers, boundary spanners and intermediaries (MacKillop et al, 2020). In addition to the role of skilled boundary workers, Newman et al (2015) and Melville Richards et al (2020) also emphasise the role of bridging instruments that support closer academic–policy engagement. These instruments or objects (or sometimes ideas) can play a valuable role in the work of intermediaries seeking to support research use.

While there is a substantial and growing literature on bridging work undertaken by intermediaries, brokers and spanners (Bednarek et al, 2018), there is less literature on ‘bridging instruments’ for those working to support research use in policy. This is in sharp contrast to the evidence to *practice* literature and, more recently, implementation science, where the focus is often on instruments such as guidelines and toolkits, typically at the expense of the relational work required in supporting their use (Metz et al, 2022). The growing literature on co-production, for instance, illustrates the multitude of toolkits and tools which are used to support effective collaborative working. One way to understand these instruments is by using the concept of ‘boundary objects’.

Boundary objects

The concept of boundary objects has roots in the Science and Technology Studies literature (Star and Griesemer, 1989). Fox describes boundary objects as ‘entities that enhance the capacity of an idea, theory or practice to translate across culturally defined boundaries, for instance between communities of knowledge or practice’ (Fox, 2011). A review identified a range of different types of boundary object serving key functions in ‘promoting knowledge sharing and transfer within and across social boundaries’ (Kanwal et al, 2019: 100), including development of shared understanding, innovative thinking and knowledge creation. Boundary objects can take on many different forms, such as a policy document, a guideline or even a metaphor. Star (1989) identified four types of boundary object: repositories, ideal types, coincident boundaries and standardised forms. Repositories see information organised as objects in the form of databases, collections and libraries. Ideal types offer a visualisation such as an architectural drawing. Objects with coincident boundaries share a common space or shape but might have very different content. Finally standardised forms are typically objects with shared format, containing the same types of information. What these types share is that they explicitly operate, or are designed to operate across different settings, contexts or cultures. The literature highlights that for boundary objects to be effective they need to be recognised as such, supported by working practices (and by skilled individuals) and they need to be able to work with existing organisational processes and structures.

Situating boundary objects explicitly optimises their value, by helping with their sense-making role and laying the ground for their use in policy deliberation. McLeish and Moon (2021) describe the importance of ‘the allegation of use’. This is the understanding of how the boundary object will be used in practice. One implication of this is preparing boundary objects with use and users in mind. This

explicit role is also useful for thinking about training and practice to support the writing of documents and their subsequent use by different stakeholders (which is likely to be different in different contexts). There is also consideration in the literature of the roles of boundary workers in designing and supporting the use of boundary objects. Kimble et al (2010) remind us that sharing knowledge can be difficult. They challenge the notion that identifying or developing boundary objects is an entirely technical process, highlighting the potential political work that might be undertaken in identifying and using boundary objects.

Boundary objects have been used in studies of evidence use in practice (Smith and Ward, 2015; Melville Richards et al, 2020). Melville Richards (2015) argues that the concept of boundary objects has gained currency in areas such as knowledge mobilisation where collaboration is an important feature. Here, effective boundary spanners demonstrate boundary competencies which she describes as the ability to identify, improvise and deploy boundary objects using tactical knowledge of areas in which the different communities share priorities, values and customs. She also identifies the role of boundary spanners in making visible and promoting the boundary object.

Smith and Ward (2015) looked at how documents were used as boundary objects between academic and healthcare organisations. In particular they highlight how the documents helped individuals to get a 'better feel for the game and a clearer perception of the stakes'. Melville Richards et al (2020) go further and argue that to be useful boundary objects might benefit from being co-produced with users from across the system. They describe how this process can help to make boundary object meaningful to different audiences. Again, their function is described explicitly in terms of developing a shared understanding or knowledge base.

Authors have highlighted the importance of supporting boundary objects with boundary practices, delivered by boundary spanners (Farrell et al, 2022). Boundary practices vary in different contexts but might include raising awareness of the boundary objects and helping different communities to access and engage with the objects. Beyond this work at the boundary, successful boundary objects connect to and work with existing systems and infrastructure is highlighted by one of the originators of the concept of boundary objects. Leigh Star (2010) describes the ways in which boundary objects need to be aligned with existing infrastructure. She highlights a number of elements of systems infrastructure including existing conventions of practice and routines, standards and procedures, and staff induction and training. The interplay of boundary objects with the work at the boundary, but also the underlying organisational systems and structures in the various stakeholder organisations chimes with the wider literature on the importance of addressing systemic barriers to evidence use (Best and Holmes, 2010).

Research questions

In summary, boundary objects have been conceptualised as making visible epistemic differences between organisations, enabling users to generate shared understanding and knowledge, surfacing the work and competencies required to move knowledge across boundaries. We recognise that these are only a few aspects of boundary objects and boundary work which could be investigated. In this article, we are not seeking to develop this concept, but rather to apply selected characteristics of boundary

objects and boundary work to help us understand the ARIs. Doing so allows us to ask questions about what forms the ARIs take, what work is required to optimise their value, and the uses to which they are put. Understanding how the ARIs operate and can be optimised in turn lets us throw light on how the broader science–policy system works and can be better supported.

In this article, therefore, we use the concepts of boundary objects and boundary work to explore how ARIs are used and perceived by actors across the science–policy system. In particular, we ask:

- what boundaries do ARIs cross, intended and otherwise?
- what characteristics of ARIs enable or hinder this boundary-crossing?
- what resources, skills, work or conditions are required for this boundary-crossing to work well?

Methods

The authors are both social scientists with an interest in understanding how evidence is made, mobilised and used in policy and practice. Since 2019, we have been working as secondees to the Government Office for Science (GOS) to improve the production of ARIs, and to support greater understanding of the work it might take for external stakeholders to respond to these effectively. This raises questions about our positionality for this work. Between March and December 2020 we worked with GOS to facilitate a large-scale knowledge mobilisation exercise to draw together existing evidence relevant to ARIs, with the goal of supporting the UK governmental response to the COVID-19 pandemic (Rebuilding a Resilient Britain). Participants in this study were drawn from the large group of people ($n > 250$) who took part in Rebuilding a Resilient Britain (Government Office for Science, 2021). The shared experience of engagement in this exercise was particularly helpful in the interviews in providing a substantive example for exploration. The authors acknowledge that this involvement will have had an impact on the responses of the interviewees. However, they also recognise that the insider experience facilitated a nuanced exploration of the issues in the interviews and understanding of the context of the observations gathered through the data collection (Duncan et al, 2020).

Twenty-five interviews were conducted with academic researchers, research funders, government analysts/science advisors and intermediaries working at the interface between research and policy in the UK. Interviewees were identified using a purposive sampling approach, aiming to reflect the diversity of the participants in the Rebuilding a Resilient Britain work in terms of gender, ethnicity, career stage, geographical location and role (see Table 1). They were sent an invitation to participate via email. Ethical approval for the study was sought and obtained from the university ethics committee.

To gauge the optimal number of interviewees, the authors monitored the extent to which new interviews produced substantively novel themes or concepts (Guest et al, 2006). Data were collected via in-depth, semi-structured interviews and took place between March and September 2021. Interviews were on average 60 minutes in duration. The Zoom platform was used to engage with the majority of participants and record interviews. Three interviews were conducted using Microsoft Teams where this was the preference of the interviewee. The topic

Table 1: ARI interviewee characteristics

Interview number	Type of interviewee	Gender	Location
Interview 1	academic (established)	male	London
Interview 2	academic (established)	female	Bradford
Interview 3	academic (established)	male	Southampton
Interview 4	academic (early career)	male	Manchester
Interview 5	academic (early career)	female	Leeds
Interview 6	academic (mid-career)	female	Cambridge
Interview 7	academic (mid-career)	female	Northern Ireland
Interview 8	government analyst	male	London
Interview 9	academic (established)	female	London
Interview 10	academic (established)	female	Durham
Interview 11	government analyst	male	London
Interview 12	government analyst	male	Leeds
Interview 13	knowledge mobiliser	female	London
Interview 14	research funder	female	Swindon
Interview 15	government scientific advisor	male	London
Interview 16	knowledge mobiliser	female	London
Interview 17	research funder	male	Swindon
Interview 18	government science official	male	London
Interview 19	research funder	male	Swindon
Interview 20	knowledge mobiliser	female	London
Interview 21	knowledge mobiliser	male	London
Interview 22	research funder	male	London
Interview 23	knowledge mobiliser	female	London
Interview 24	academic (established)	male	London
Interview 25	knowledge mobiliser	male	London

guide for the interviews was generated through online roundtable discussions with funders, researchers, civil servants (who were predominantly government analysts/scientific advisors) and intermediaries. The topic guides (tailored for each group of interviewees) are available on the project webpage.¹ Interviewees were sent the interview guide prior to the interview to provide an opportunity for familiarisation and preparation. Audio recordings from each interview were transcribed verbatim, in preparation for analysis. All interviews were conducted by Boaz.

Both authors reviewed the transcripts and conducted the analysis; they coded the transcripts separately. The authors used Framework Analysis to analyse the data (Ritchie and Lewis, 2003). Framework Analysis provides a structured approach to qualitative data analysis. It begins with a process of familiarisation with the data. From this process an initial set of broad themes are identified. In this study, one initial theme was the role of ARIs at boundaries. With this (and other) themes in mind as broad categories, we returned to the data to code in more detail for each participant. From the codes we developed an analysis of the role of ARIs as boundary objects and returned to the literature to seek insights to help us understand and interpret the emerging findings.

Findings

Although our interviews did not explicitly ask about boundary objects, all participants discussed how ARIs enabled discussions and work across multiple boundaries – between government and academia, between departments within government, between government and funders. Interviewees raised the issue of resources, skills and capacity to use ARIs effectively as boundary objects, and the need for this work to use, rather than seek to replace existing structures and processes.

The role of ARIs at the academic–policy boundary

Interviewees shared plenty of examples of ARIs having the potential to be used across the anticipated boundary between academia and policy.

The gold standard of all of this is when academics are thinking about their research priorities, either they're being cognisant of whether they line up well within areas of research interest questions, or I think even at a much more fundamental level, are they asking themselves what is the policy implications or the policy relevance of this, and how does that fit with what government wants to know. So I think that's part of it. I think the other thing is really about the kind of network and the transfer of knowledge. (Interview 11, male, government analyst, London)

Here ARIs are providing a mechanism for government departments to share their research interests with researchers. The interviewee hoped that this would be useful in considering the policy relevance of research undertaken. ARIs were also seen as a potential mechanism for making connections, something that government departments had taken forward by hosting events with universities to discuss their ARIs and to hear about relevant research being undertaken. From a researcher perspective, the insight into government priorities and practices was considered valuable, although this was discussed more in the context of the supporting boundary practices and, in particular, the engagement activities where researchers, funders and analysts came together. One interviewee talked about how his research on energy had been influenced by considering the ARIs, but also by discussing them with colleagues from other disciplines (who were asking different questions).

Working across multiple boundaries

While ARIs were introduced as a mechanism for connecting academics with policy, we also observed the use of ARIs at a number of other boundaries. For example, interviewees highlighted the ways in which ARIs had been useful in helping to make connections between different government departments. It helped them to see shared research priorities and also to share learning about how to reach out to the academic community. This felt particularly important given the tendency of departments to focus on their 'own thing'.

Even just purely on the policy level, to get to know the ARIs and perhaps to see some of these previously unconnected areas that you can start to

connect the dots... I guess I've always sensed this with the government and they have so many different offices, even within the same department, you know. They perhaps may not know what other people are working on. So it's quite useful to start to see the connection between different ARIs. (Interview 5, female, academic, Leeds)

Here we see the potential boundary spanning role for ARIs not only between but also *within* government departments, in supporting analysts and policymakers (and indeed different policy teams) in negotiating departmental research priorities. The requirement to place departmental ARIs in the public domain means that the process of producing ARIs is influenced by political factors, as signalled by the need for ministerial sign-off in most cases. Contentious and sensitive areas may be omitted from the ARI documents or presented in vague or unclear questions and topics. This manifests itself in a form of encoding on some topics. For example, one interviewee reflected on the challenge he had experienced dealing with very vague ARIs in a sensitive policy area. He had tried to work with one ARI that just contained a single word 'drugs' and explained that this could mean so many very different things, ranging from school-based prevention programmes to legalisation. The political nature of the ARI formulation process varied between government departments, with departments dealing with sensitive or contentious policy topics such as crime seemingly experiencing more challenges in developing the ARI document and getting it through to publication. As a result, for some departments the ARIs do not present the complete picture of their research interests, and for all departments, political priorities are reflected in the ARI content and presentation.

ARIs also had a role in highlighting departmental research interests to research funders. Participants could see the instrumental potential – and challenges – of ARIs in taking government research priorities across this boundary and into funder research prioritisation processes and strategic decision making. In particular, the practical ways in which funding portfolios might be navigated to access existing or ongoing research was considered to be limited. The gap between government and research funders was highlighted as one which would require further support in order to optimise the potential of ARIs as a mechanism for influencing research funding priorities. In this example, the interviewee reflects on the need for collaborative working to address research topics that cut across a number of different funders:

What's quite refreshing if you look at some of the things that [research] council members were talking about, they were looking at inter- and intra-collaborations or disciplinarity, inter-disciplinarity, especially when some council chair persons sat between different types of ARI... Yes, we have sometimes [research funders] jointly put out research calls. Okay? But what is missing there is the engagement between policymakers and these research councils. Are the research calls, you know, derivative from what policymakers find wanting, or the gaps in knowledge that policymakers are struggling with? Are they those that inform the research grants that are being called for? We don't know. (Interview 3, male, academic, Southampton)

A final boundary spanning opportunity was identified by an interviewee who worked in a department with strong relationships with front line practitioners. He

suggested that ARIs could be a mechanism for expressing what matters in service delivery and the implications for future research to support service innovation and improvement.

Implicit in the ARIs is the ARIs flow to policy that flows to practice. Actually, the flow should be the other way. And that's what we're trying to do with the [departmental] ARIs, that we're going to, we're funding people to go out to practice who will then inform it. Do you know what I mean? So it flows upwards.' (Interview 15, male, government scientist, London)

Practitioners (and indeed users of services and the public) do not tend to be conceptualised as stakeholders when government analysts talk about the development and use of ARIs.

ARIs were not always considered to travel well across boundaries. Interviewees reflected on how it felt to see the ARIs and feel the challenge of understanding and interpreting them. One interviewee talked about how the ARIs needed to be 'digestible' both internally and externally. Often researchers were looking at the ARIs and trying to determine whether they were researchable questions.

An interviewee described the feeling of having questions thrown at you that you didn't understand or have any information about where the questions had come from. She suggested that it would be helpful to have a talk to the people who were posing the questions to have an opportunity to discuss them and to 'get to the bottom of them'.

Working at the boundaries

Interviewees consistently identified the work that was required to ensure that ARI documents fulfilled their role as boundary objects to support better evidence for policy, from development of the documents through to practical engagement with stakeholders. ARI documents are considered to be evolving and improving with experience of production, engagement and use. One interviewee talked about working to make their ARI document more 'digestible' for both internal and external audiences to improve its effectiveness as a device for communicating research needs. However, in addition to improving the ARI documents, interviewees highlighted the additional boundary work required to understand what the ARIs meant and how they could be used.

The need identified earlier for 'really good discussion' with those who had developed the ARIs was considered critical. These individuals were often analysts who themselves inhabited intermediary roles between their policy colleagues and the academic community. Interviewees highlighted the work of a range of actors in enabling the ARIs to be useful. These included individuals with explicit roles in supporting the science system in government including analysts and science policy officials. It also included individuals outside of government with explicit knowledge mobilising roles. These individuals sat in a range of organisations including learned societies and UK What Works Centres (supporting research use on specific policy topics):

Some of the knowledge exchange or these engagement professionals... they also can help interpret some of the ARIs for the academics, and they help make the connections. Sometimes if you see one of the ARIs, you're like,

‘Oh, I don’t think that’s immediately relevant to me.’ But then these people who act as knowledge brokers, they come to you and they say, ‘Well, actually, I think what you’re doing, looking at the adoption of digital technology is exactly what [the government department] is looking for’... and you have to see this from their perspective, and maybe also you just have to shift your interest or your attention from this particular knowledge to the other one. (Interview 5, female, academic, Leeds)

At other times interviewees referred to other professionals who supported the use of the ARIs by organising meetings, tracking the production of new ARIs, providing administrative support, and skilled facilitation and chairing of knowledge exchange events. Interviewees stressed the importance of support staff who were ‘on the ball’, keeping meetings on track, making sure events went well, following up with attendees and maintaining relationships with stakeholders. Where the facilitation of academic engagement worked less well, participants highlighted some of the implications for their ability to engage with the work:

In those meetings I found myself really out of my depth. There were a lot of people talking about using terminology that would be familiar to people who work in policy on the inside. And I didn’t really understand quite a lot of it in all honesty, and struggled to see how my work fitted in. (Interview 21, male, knowledge mobiliser, London)

The research priorities in the ARIs tend to require a response from across academic disciplines, but this needed skilled facilitation and in particular, establishing a shared language for cross disciplinary discussions. Here the interviewee highlights some of the challenges for academic policy engagement in terms of supporting people to understand their potential contribution and to take an active role, as well as supporting communication across disciplinary boundaries and between government and academia.

While the importance of this work to mobilise the boundary objects was acknowledged for all the ARIs, interviewees also highlighted the extra work needed to decode ARIs relating to more sensitive or contentious issues:

But there is information too sensitive to ask. That’s something you see with the ARIs as well. You might have a question that’s asking exactly what you want, and then it might actually go through to your comms team, and they say, ‘We can’t ask that. We can’t be seen to be not knowing the answer to that or whatever.’ Maybe a sort of clearance, I don’t know, clearance might even be in there. How might people get clearance so they can look at these sorts of things alongside us? (Interview 18, male, government science official, London)

In these cases, significant additional work was required by multiple actors. For example, for one group working on ARIs in a sensitive area of policy, the working group leads set up a meeting with the civil servants responsible for producing ARIs within government to understand better what the underlying research questions and priorities were. This meeting was perhaps only possible because the group lead had existing trusting relationships with key individuals in the department. Only through additional dialogue was it possible to really understand what the departmental research needs were.

[Drugs as an ARI] could have meant, you know, the legal basis of them as in, should we declassify some of them? It could have meant stopping county lines, or it could have meant prevention within schools. I mean, very, very different topics. I don't know whether that's because the ARIs are not that mature, or because the teams in the [government department] weren't able to engage. I don't know what the reason was. But I think they would have got a much better product, well, I think they did get a fairly good product, but only because [the academic group lead] went and spoke to about half a dozen of them for an hour and said, 'What is it you would find useful?' If we hadn't done that, I think they would have, who knows how useful it would have been to them. (Interview 15, male, government scientific advisor, London)

In this case for the ARIs to be useful as a boundary object it needed this skilled work between trusted individuals to decode them before working out how best to respond with research evidence.

Working with existing systems and structures

For civil servants, ARIs were considered to be most effective as a boundary object where they aligned with departmental strategies, processes and structures. In particular, the steer to align the ARIs with departmental science plans had opened discussions about how the ARIs might be useful to a department and support it in achieving its science priorities. Science plans articulate the role and purpose of science within each department. Where connections were made with other elements of the departmental science advice system such as science plans and external scientific advisory committees, policy colleagues and analytical functions this was also considered advantageous.

There was considered to be a job to be done in supporting understanding not only in communicating research priorities, but also in understanding the different worlds academics and policymakers inhabit:

The two parties are operating in very different spheres, aren't they? And it's not a kind of lack of interest on either part, at least. That's certainly the way I personally feel. It's not that what I'm doing is they see it as stupid or what they're doing I see it as irrelevant. It's just sort of trying to bring those two a bit closer together, isn't it? So, something that perhaps sends better signals outwards so that the academic might understand where an aspect of their research kind of would be really helpful for government, and then likewise people in government understanding the real benefits of going out to draw in external expertise. (Interview 18, male, government science official, London)

Interviewees pointed to the value of formal and informal training in supporting this mutual understanding. Fellowship opportunities were highlighted as another way academics learn more about how government works to support their future research and academic engagement activity. Academic interviewees highlighted some of the systemic constraints on their engagement with government, particularly in terms of incentives and rewards.

I think what was so exciting about that was the initial questions that came with the ARI initiatives, you know. That really opened up our eyes. We say, 'Oh, okay. This is how policymakers think.' But this is not how we would think about these issues and this problem. For example, most of my colleagues and people in our team were saying, 'Look, the issue now is not coming up with this policy and that. The issue now is how do we implement these range of policies, some of them that we put out in the past and the others that are still being formulated. Do we have the capacity to deliver in terms of implementation? Are the right incentives in place?' (Interview 2, female, academic, Bradford)

They also highlighted the need for feedback on the impact of their engagement. This related to the significant time commitment and the need to demonstrate and evidence their own impact and the importance of feedback in maintaining good will for future engagement opportunities.

Yes, it's very time consuming. It's fairly thankless, and it takes your time away from other things, which you should be doing. And the impact that you can have is very uncertain. I mean, I don't know, we did all that work last summer, and I haven't got the faintest idea what's happened to it. I don't know where it's gone, what's happened to it. I know it's been published, but has anything actually been done with it? I don't know. (Interview 9, female, academic, London)

The revealing phrase 'should be doing' echoes comments in other interviews about academic policy engagement work. It was often described as extra work academic interviewees had taken on, on top of their 'day jobs'. They highlighted the limited organisational incentives to spend time promoting the use of research, describing it as work they personally considered important as opposed to an organisational priority. Universities in particular were felt to be poor at recognising the value of this work, and failed to reward or incentivise researchers interested in engaging with policy and practice.

It also, however, highlighted an interest in how research fed into the policy process.

But where else are those key messages meant to be going? Where is the strategy to get them into...? I mean, is the chief scientist at [the government department] putting those through? Are they doing it? I don't know. That's the key issue. Because if people turn up and do this and then they, what they said was forgotten about, they're not going to bother again. (Interview 22, male, research funder, Swindon)

Discussion

Do ARIs matter in policymaking? As boundary objects, ARIs comprise published documents which surface policymakers' research needs, enabling external (and internal) stakeholders to better understand how departments think about problems and how they might contribute to solving those problems. ARIs give a range of actors in the evidence-policy landscape something to work with. We found that

they were at their most useful when supported with boundary practices; for example, where boundary work focused on extracting individual ARIs from each government department document and grouping them thematically to support cross-departmental and interdisciplinary discussions.

Where used effectively as a boundary object they gave different stakeholders (both external and internal to government) an insight into the research priorities of individual government departments. Where this worked well, typically in combination with knowledge exchange activities, ARIs contributed to work to create what [Calabrese Barton and Tan \(2018\)](#) describe as a more 'porous' boundary between research and policy, improving the flow of ideas, people and resources. Furthermore, ARIs are living and evolving documents. They are regularly updated and, as such, can be refined with each iteration to seek to optimise their work as a boundary object.

A lot of work, however, was needed to support the use of ARIs across multiple boundaries, some of which had been envisaged and others that were not anticipated. This had implications for production of the object itself as the ARI documents needed to communicate to lots of different audiences with different agendas and ideas of what a statement of a research interest might look like. This proved challenging even when focusing on the one, primary type of boundary (those that exist between research and policy). Academics typically expected government ARIs to be expressed as researchable questions, whereas this was often not how government analysts understood their purpose. The extent to which different stakeholder groups were engaged in the production of the ARIs varied across government departments, which again affected the heterogeneity of their expressed functions.

A further complication was the nature of the ARI as a published document. This had implications for how departments articulated research interests, particularly around sensitive or contentious topics. This included areas where government departments were reticent about stating what they 'didn't know' about a particular topic, for a range of reasons. As a result, as Fox concludes: 'It is evident that they [boundary objects] did not adhere to an essentialist explanatory model, but considered that it was the active work of participants in the differing communities that made a boundary object effective' ([Fox, 2011](#): 74)

Boundary organisations and also boundary workers within government departments and universities were required to support mobilisation of ARIs. They were able to achieve this through their networks and also through their knowledge of government agendas and priorities. An assumption by academic participants was that government departments struggled to articulate clear research questions; whereas this was a misunderstanding on their part of the role of ARIs. Rather, the necessarily ambiguous nature of some ARIs signalled another area where boundary spanners were required to help these misunderstandings to be overcome. Academic interviewees highlighted the value of conversations with government colleagues to understand and decode some individual ARIs. It is clear, in line with previous studies, that there is significant work to be done to support the use of ARIs as boundary objects ([Smith and Ward, 2015](#)). Without this work there is a danger that some ARIs could end up amplifying rather than bridging gaps between different communities.

Where ARIs had been connected into existing processes and systems they seemed to hold more value and have more potential to be effective. For example, the inclusion of ARIs within the government Science Capability Review ([Government Office for Science, 2019](#)) provided a framework for connecting ARIs

with other aspects of the science system within government departments, such as departmental science plans. This helped to connect the articulation of research interests with other activities designed to promote the use of science within each department. Outside of government there is also scope for the ARIs to be more useful within, for example, research prioritisation processes for research funding. Many departments have closely-related or overlapping ARIs, but limitations of the data management systems make these hard to identify. ARIs are currently only searchable by departmental document, not by topic or theme. Finally, many barriers were identified in academic research systems, with seemingly limited incentives for academics to engage with ARIs and a worrying level of engagement activity happening ‘after hours’. We also saw significant competition between ARI-related engagement led by researchers and universities, with multiple overlapping initiatives proposed by universities. This was costly for government in terms of staff time, and indicates that greater information about how the wider science system operates would help promote complementarity and efficiency.

Conclusions

Fox (2011) argues that the concept of boundary objects has remained under-theorised, with a limited literature on how boundary objects work and what role human agency plays in how they function. In recent years the concept has been applied in studies of research mobilisation in public sector service delivery (for example Smith and Ward, 2015). Many of the boundary objects studied (such as graphics and guidelines) have been produced by the research community to support research use (López-Rodríguez, 2015). Here, we offer an exploration of boundary objects produced within the policy context, to cross the policy–research boundary. This study provided an opportunity to study ARIs as a boundary object produced by government to work at the interface between research and policy. It also allowed for an exploration of the boundary work undertaken by staff within government departments.

Our first observation is that despite their intended purpose to work at the boundary between research and policy, we have observed ARIs being used as a boundary object across not one, but multiple boundaries. This more complex picture has implications for the ways in which the ARIs are crafted and shared. As Wehrens et al (2012) observed, many interventions are designed with the two-communities theory in mind, with a focus on bridging a specific gap between research and policy rather than recognising and working with the web of interconnections and relationships between multiple policy actors and organisations. In particular, the complex interconnections signal scope for more stakeholder engagement in the production of ARIs to ensure that they can speak across these different boundaries (Melville Richards et al, 2020). ARIs are not static objects. They are regularly refreshed and as such have scope to evolve based on ongoing interactions between stakeholders.

Our second observation is that boundary objects are only effective if they are supported by boundary work and people. While this is a consistent finding with previous studies, we were struck by the volume of work required by a wide range of different boundary workers to make the most of the ARIs, in the space between government and academia and also on the edges of both. As others have noted, this is skilled interdisciplinary work often undertaken without specific training and development (Duncan et al, 2020). This work has other long-term benefits as it creates

a more porous boundary with people, ideas and even occasionally resources moving across boundaries and learning how the different organisations work. However, it is also precarious work, with implications for workforce training, support and retention.

Finally, the organisational conditions to support work at the boundaries is critical. Where interviewees saw alignment with science plans in government departments we observed the ARIs playing a more central role. We saw less alignment of ARIs (and of the need for boundary work) in academic institutions. While there is growing support for knowledge mobilisation in UK universities, individual academics talked about their knowledge mobilisation work as something they did in their own time. Academic interviewees described the continuing lack of incentives to participate in often time-consuming government engagement work. The most striking gap was in our interviews with research funders who saw the potential for connecting ARIs, with scope for closer working between funders and government.

It is important to note that ARIs are not able to provide a complete picture of the research interests of government departments. The process of taking departmental research interests and crafting them into documents that can be signed off by senior civil servants and sometimes Ministers, published and shared as boundary objects results in some omissions and some careful wording. It was possible to address the latter through boundary work to engage those producing the ARIs documents with academics generating relevant research. However, some highly contentious and sensitive research topics will not be shared through ARIs documents.

We have found the concept of boundary objects helpful in understanding the role of ARIs. In the UK policy context, we see an interplay between the ARIs as boundary objects and boundary practices and people all operating within the confines of existing systems and processes. ARIs have the potential to support the production of research of relevance to policy, but they are no magic bullet. Optimising the use of research requires the galvanisation of a wide range of mechanisms, all heaving in the same direction. As Shackley and Wynne observe (1996) there is a value in making them 'a fixture in the landscape' albeit one that is constantly tinkered with. So while boundary objects need to be embedded in the systems and structures in which they operate, they are also evolving over time to ensure that they remain fit for their ambitious and potentially shifting purposes. We see value in further exploration of the ARIs as boundary objects, particularly around the challenges of producing and using these as boundary objects, and understanding their action-based roles and functions in different settings, with different stakeholders. As an example from ongoing work, shared or related ARIs are at present only identifiable by manual comparison between departmental collections. Although this work will be made easier by a forthcoming searchable database, we anticipate that it will support rather than replace the work involved in translating between departmental idioms, understanding departmental history and context, negotiating statements of shared priorities, or in moving from these to useful, interdisciplinary responses from the research and funding communities.

Limitations

As the authors had been involved in the Rebuilding a Resilient Britain academic policy engagement process there was a danger that interviewees would not feel comfortable in sharing their experiences. To mitigate this, the authors spent some

time explaining the measures in place to ensure anonymity and the importance of sharing learning as part of the consent process. The involvement of the authors brought additional advantages as they understood the process the interviewees had been through and could ask questions drawing on their own observations. Studies that ‘get inside’ the policy process are rare and the access provided by the authors’ involvement in the process led to a high level of participation in the interviews from within and outside of government. The study participants from within government were government analysts or scientific advisors who supported the use of research in policy. This reflected the participation in the Rebuilding a Resilient Britain exercise. They were an important group as they were undertaking boundary work between the research community and the departments in which they worked. While the analysts and advisors felt that they had a good understanding of the research needs of their policy colleagues and the system challenges it will be important in future studies to gather the perspectives of policy actors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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