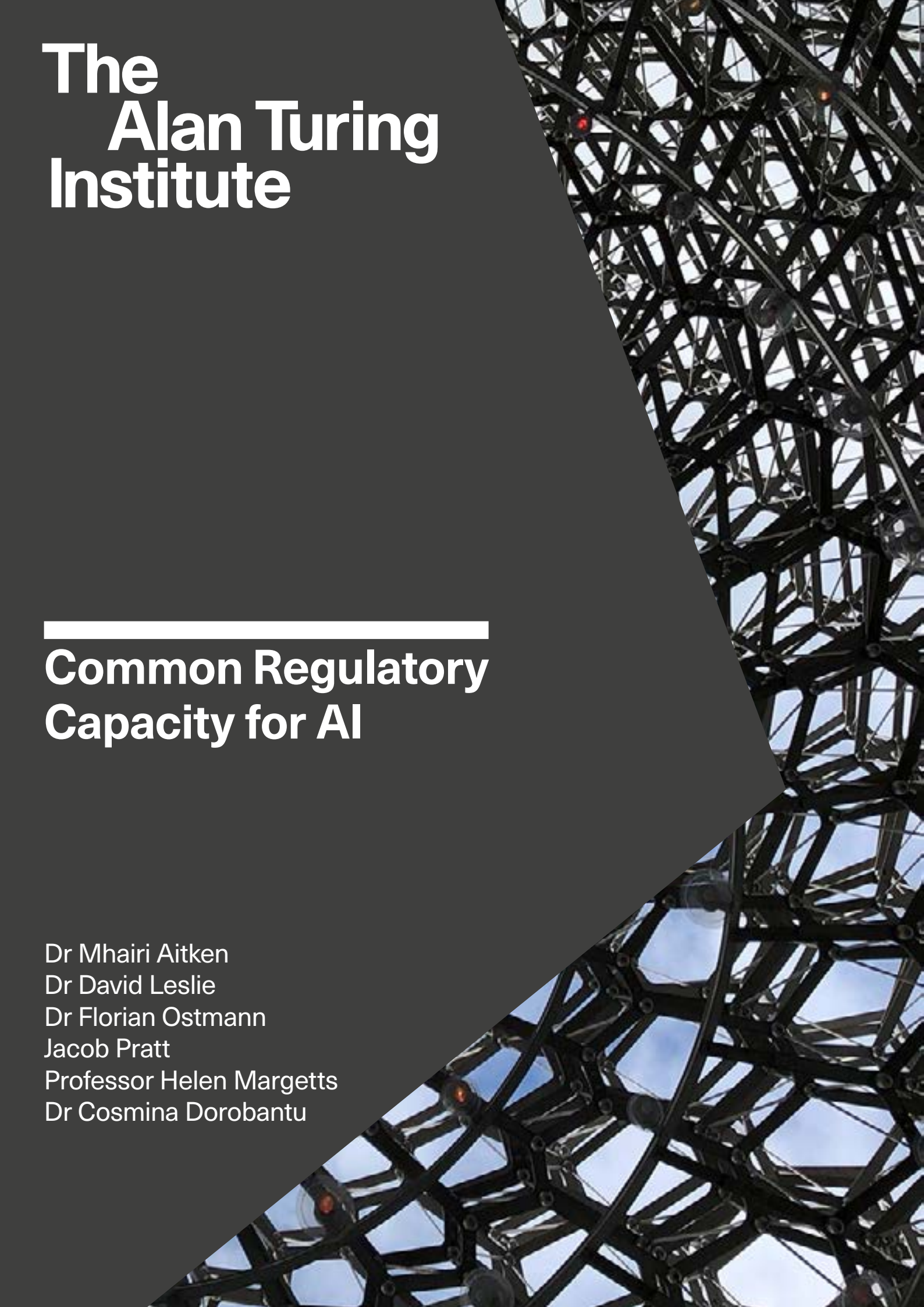
The Alan Turing Institute

Common Regulatory Capacity for AI



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The Alan Turing Institute is the UK's national institute for data science and artificial intelligence. The Institute is named in honour of Alan Turing, whose pioneering work in theoretical and applied mathematics, engineering, and computing is considered to have laid the foundations for modern-day data science and artificial intelligence. The Institute's goals are to undertake world-class research in data science and artificial intelligence, apply its research to real-world problems, driving economic impact and societal good, lead the training of a new generation of scientists, and shape the public conversation around data and algorithms.

The public policy programme was set up in May 2018 with the aim of developing research, tools, and techniques that help governments innovate with data-intensive technologies and improve the quality of people's lives. We work alongside policymakers to explore how data science and artificial intelligence can inform public policy and improve the provision of public services. We believe that governments can reap the benefits of these technologies only if they make considerations of ethics and safety a first priority.

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Executive summary

The use of artificial intelligence (AI) is increasing across all sectors of the economy, which raises important and pressing questions for regulators. This report presents the results of research into how regulators can meet the challenge of regulating activities transformed by AI and maximise the potential of AI for regulatory innovation. The report also investigates whether regulators perceive a need for common capacity in AI — mechanisms and structures that enable coordination, knowledge sharing, and resource pooling — to advance AI readiness across the UK's regulatory landscape.

The study was commissioned by the Office for AI and produced by The Alan Turing Institute's Public Policy Programme. The Regulators and AI Working Group, convened by the Information Commissioner's Office, provided essential input and feedback throughout all stages of the research. The report draws on interviews with staff across regulatory bodies of different sizes and sectoral remits.

Key findings

1. **AI technologies are expanding in scale, scope, and complexity, resulting in a diverse range of applications with relevance to all areas of social and economic life (Section 2). This has major implications for regulators along two dimensions (Section 3):**

    - **The *Regulation of AI.*** Regulators need to understand the nature and implications of AI uses that fall within their regulatory remit and to assess the adequacy of regulatory arrangements in relation to them. Ensuring that regulatory regimes are "fit for AI" is essential to address AI-related risks and to maintain an environment that encourages innovation. Certainty about regulatory expectations, public trust in AI technologies, and the avoidance of undue regulatory obstacles are crucial pre-conditions for the uptake of AI technologies.

    - ***AI for Regulation.*** Regulators might also turn to AI themselves, in order to make their work more innovative, effective, and efficient. International evidence illustrates the large and diverse number of AI-based innovations that can transform the ways in which regulatory bodies pursue their missions.

2. **Interviews with representatives from across the UK's regulatory landscape show that there are significant readiness gaps in both the *Regulation of AI* and *AI for Regulation.* The gaps exist at three levels: system-level readiness, organisational readiness, and participant readiness (Section 4).**

    Despite an increase in AI-related initiatives across the regulatory landscape, many regulatory bodies are at an early stage in their "AI journey" and all face shared difficulties in making progress towards AI readiness. Common obstacles include limitations in knowledge and skills, insufficient coordination between regulators, issues of leadership and management of organisational and attitudinal change, and resource constraints.

3. **The shared nature of obstacles faced by regulators calls for a joined-up approach to increasing AI readiness that enables coordination, knowledge generation and sharing, and resource pooling (Sections 5 and 6).**

   Echoing the Government's recently published National AI Strategy[1] and Plan for Digital Regulation,[2] our interviews revealed an urgent need for increased and sustainable forms of coordination on AI-related questions across the regulatory landscape. Such coordination is essential for ensuring that regulatory regimes and interventions are coherent, effective, proportionate, efficient, and informed by developments at the international level. Our research findings also highlight that joined-up approaches to developing and sharing knowledge and resources can play a transformative role by enabling regulators to learn from each other and increase their collective capacities in ways that leverage synergies and efficiencies.

4. **The research identified common challenges and opportunities presented by AI which show that the areas of *Regulation of AI* and *AI for Regulation* are critically linked (Sections 5, 6). Any strategy to build capacity for regulation and AI should cover both (Section 7).**

   Interviewees stressed the need to capitalise on the synergies between the *Regulation of AI* and *AI for Regulation*. They perceived a need for the development of a shared vocabulary in relation to AI technologies. They outlined the usefulness of a mapping exercise to identify the uses of AI across regulators, the risks posed by the use of AI in different sectors, and any regulatory gaps. They considered that there is a need to determine ways to address regulatory gaps, to anticipate future risks, and to adapt to the speed of technological change. They saw the value of sharing knowledge and best practice in the use and management of AI. They noted the difficulties in attracting and retaining talent, and the usefulness of shared training and skills development programmes as well as AI tools.

5. **The research highlighted the need for access to new sources of shared AI expertise. A common pool of expertise would stimulate and maintain AI readiness across regulators, while avoiding duplication in a crowded landscape (Section 7).**

   Interview participants highlighted the significance of existing relationships and fora for collaboration and exchange between regulators, but also noted their limitations. They cater only to a subset of the needs identified, cover only parts of the UK's regulatory landscape, and are constrained by a lack of robust and sustainable resourcing. The research pointed to the need for new sources of expertise to fill gaps and act as a catalyst for developing regulatory readiness in AI. The solution should avoid unnecessary duplication by capitalising on existing structures. It should involve strong incentives for regulatory bodies to participate but operate on a voluntary basis. It should take account of differences in requirements between larger and smaller regulators and ensure that shared resources are accessible and beneficial to regulators of all sizes and sectors. The solution should be politically independent and facilitated by a neutral, but

[1] Office for AI, 2021

[2] DCMS, 2021.

respected, authoritative, and well-established organisation with recognised expertise in both technical and non-technical dimensions of AI.

6. **The most promising avenue towards building common capacity emerged as the creation of an AI and Regulation Common Capacity Hub (ARCCH), convened by an independent and authoritative body in AI. The Hub would provide a trusted platform for the collaborative pursuit of common capacity while consolidating existing initiatives and avoiding unnecessary additional crowding of the landscape (Sections 7, 8).**

   The proposed ARCCH represents the only approach to developing common capacity that is aligned with all the considerations raised by our interviewees. To act as a trusted partner for regulatory bodies, ARRCH would have its home at a politically independent institution, established as a centre of excellence in AI, drawing on multidisciplinary knowledge and expertise from across the national and international research community.

   The newly created **AI and Regulation Common Capacity Hub** would:

   - Convene, facilitate, and incentivise regulatory collaborations around key AI issues;
   - Cultivate state-of-the-art knowledge on the use of AI by regulated entities;
   - Conduct risk mapping, regulatory gap analysis, and horizon scanning;
   - Provide thought leadership on regulatory solutions and innovations;
   - Develop proofs of concept and build shared AI tools for regulators;
   - Supply training and skills development;
   - Build up and facilitate sharing of human and technical resources across the regulatory landscape;
   - Act as an interface for regulators to interact with relevant stakeholders including industry and civil society.

7. **Realising the full potential of common regulatory capacity for AI requires support and commitment (Section 8).**

   Achieving common capacity will require action from across the regulatory landscape. Government will need to resource and support the establishment of the new hub, as well as other forms of cross-regulator initiatives. Regulatory bodies will need to evaluate, strengthen, and renew regulatory collaborations; commit organisational resources to engaging with ARCCH; promote strategies to increase organisational agility, adaptivity, and ingenuity; and pursue an inclusive and participatory approach that includes civil society.

1. Introduction

Recent years have witnessed an explosion of interest in artificial intelligence . As AI technologies have grown in speed, complexity, and scale, the range of possible uses has expanded rapidly. While some have embroidered this trend, calling AI "the new electricity,"[3] one thing remains clear: the pervasiveness and innovation-spawning character of AI makes it a general-purpose technology[4] that will shape society for generations to come.

Regulators represent a set of organisations for whom advances in AI raise a wide range of important and time-critical questions. These questions comprise two areas:

- **The *Regulation of AI.*** As the adoption of AI accelerates across sectors, regulators need to understand possible uses of AI by regulated entities and to assess the need for change in regulatory regimes. Ensuring that regulatory regimes are "fit for AI" is key to preventing AI-related harms, but also to promoting innovation: regulatory certainty and public trust in relation to AI technologies are important pre-conditions for their uptake.

- ***AI for Regulation.*** There are significant opportunities for regulators to use AI in carrying out their work. These opportunities include the potential of AI tools to make the ways in which regulators pursue their missions more effective and more efficient. They extend to a wide range of activities in areas such as regulatory research and rulemaking, licencing and approval decisions, supervision and surveillance, or investigations and enforcement.

1.1. The problem: what challenges do regulators face?

As AI systems become a prevalent feature of products and services, the remits of regulatory bodies will need to encompass the myriad uses and impacts of AI. Recent developments, such as the Online Safety Bill, the establishment of the Digital Regulation Cooperation Forum (DRCF), and the Digital Markets Taskforce signal recognition of this need and the importance of collaboration among regulators to identify and address emerging cross-sector challenges engendered by the pervasiveness of AI technologies.

Developing an effective and inter-organisationally robust regulatory environment is crucial for mitigating the far-reaching risks associated with AI. It is needed to build confidence across industries and among innovators that the social and legal uncertainties brought about by AI's transformative force are being adequately managed. Establishing regulatory capacity and readiness in relation to AI will be essential to realise the UK's ambition to be a global leader in this area. As set out in the UK's National AI Strategy, regulation has a vital role to play in ensuring the UK's position as an AI "research and innovation powerhouse."[5]

[3] This quote is from Andrew Ng. See Lynch, 2017.

[4] Bresnahan and Trajtenberg, 1995; Bekar et al., 2017.

[5] Office for AI, 2021.

While the EU has proposed harmonised rules for AI regulation, the UK's current approach is to regulate AI technologies and services through existing regulators. This means that more and more vertical regulators are being put under pressure to understand where and how AI is being used within their remits and to anticipate the various consequences and risks associated with this. Such an unprecedented demand for technical know-how and horizontal problem-solving can pose significant difficulties for regulators, particularly those who have not traditionally engaged with new and rapidly evolving technologies. The weight that many regulators understandably give to existing norms of vertical regulatory practice, enduring regulatory cultures, and administrative stability is put under pressure by the momentum of AI innovation and technological change.

Regulators need not only to keep pace with AI innovation, but also to access cutting-edge knowledge about the state-of-the-art in AI. Regulators have to be able to stay ahead of the societal risks effected by accelerating and scaled AI innovation. As recent examples from online algorithmic targeting to AI-enabled biometric surveillance have already shown, when regulators fall behind leading-edge technologies, they become unable to ask timely and critical questions of regulated entities, let alone guard against potentially harmful outcomes.

Furthermore, regulators need to capitalise on the potential of AI technologies as regulatory tools. To be capable of meeting the challenges posed by high-velocity information processing and large volumes of data, regulators need to develop and deploy AI applications themselves. Traditional regulatory mechanisms of auditing, enforcement, and oversight can easily be outmatched by the complexity and speed of AI-enabled behaviour and the sheer amount of data that flows through high-traffic digital platforms. This is particularly evident in areas like AdTech, where AI-driven real-time bidding poses serious issues for data protection compliance, and online harms, where regulation is required to address detrimental uses of AI at scale (e.g. those associated with the automated spread of misinformation or algorithmically enabled micro-targeting).

AI has an important role to play as a regulatory tool in these regions of concern, for example, through automatic detection of harmful online content, automatic fact-checking, and systems to protect children's digital privacy. More generally, AI can also help improve traditional regulatory tasks, that are not driven by the use of AI in regulated entities. For example, regulators can make efficiency and effectiveness gains by automating document analysis using methods such as Natural Language Processing (NLP) and by improving market analysis with data-driven statistical modelling.

These challenges and opportunities generated by AI are relevant to regulatory bodies of all shapes and sizes. Likewise, the general-purpose character of AI innovation means that, while some regulators — especially those directly involved in the governance of information and communication technologies — might be more urgently affected, regulatory bodies across all sectors need to expand their capabilities to manage emerging risks. Companies using AI often function across traditional sectoral boundaries, and uses of AI may have impacts which fall within the remits of more than one regulatory body. Therefore, regulators must collaborate to ensure consistent, complementary, and effective regulation. The establishment of deliberate cross-regulator strategies for confronting the shared challenges that arise both in the *Regulation of AI* and in the use of *AI for regulation* is, at present, of paramount importance.

As stated in the Department of Culture Media and Sport's (DCMS) recent policy paper on Digital Regulation, "digital regulators [must be able] to work effectively together to deliver coherent outcomes for industry and consumers."[6] Indeed, there is a need to create robust and well-coordinated regulatory responses that capitalise on existing resources, synergies, infrastructures, and expertise.

These are the needs that this report tackles.

1.2. Structure of the report

The report is structured as follows:

- Section 2 provides a brief introduction to AI.
- Section 3 presents our mapping of the current UK regulatory landscape and discusses regulators' interest in AI both from a regulation point of view (how to regulate AI) and a usage point of view (how to use AI technologies for regulatory purposes).
- Section 4 introduces the concept of readiness. It describes the three levels of readiness (system-level, organisational, and participant) needed to support the effective integration of AI in regulatory practices. It then explores how certain innovation factors (related to values, needs, and knowledge) influence readiness conditions across these levels. It examines the ways in which interviewees described regulators' needs in relation to readiness and explains what kind of capacity building would be required to improve readiness. Finally, this section reports findings from the "readiness self-assessment tool" (see Section 1.3.3) that we piloted with regulators.
- Section 5 focuses on the *Regulation of AI.* It sets out current challenges regulators face in regulating uses of AI and identifying and addressing AI risks. It sets out various ways in which building capacity can address these challenges and increase the clarity, consistency, and effectiveness of regulatory approaches.
- Section 6 focuses on *AI for Regulation.* It provides a review of potential opportunities for regulatory bodies made possible through the use of AI and sets out current barriers and facilitators for regulators' uptake of AI technologies.
- Section 7 distils the findings from the interviews to examine possibilities for capacity building highlighted in the preceding sections. This section uses these findings to consider potential models to facilitate "shared" or "common" regulatory capacity for AI. It discusses how relationships between regulators should be organised and what arrangements are needed to facilitate common capacity.
- Finally, Section 8 sets out our recommendations for a future model of common regulatory capacity.

[6] DCMS, 2021.

1.3. Methodology

This research was conducted using several key methods:

1. Desk-based research to identify key themes and to map the existing regulatory landscape;

2. Semi-structured interviews with regulators;

3. Development and piloting of a readiness self-assessment tool.

1.3.1. Desk-based research

A review of the relevant literature was undertaken. This encompassed academic literature from varied fields, including organisation science, sociology, implementation science, and science and technology studies, as well as grey literature relating to regulation and policy. Relevant academic literature was located primarily through keyword searches on Google Scholar and finding other relevant papers through citations. Relevant grey literature was identified partly through consultation with the project governance group, which enabled access to up-to-date outputs from regulatory bodies and government departments working across varied sectors. Other grey literature was identified through searching for keywords via search engines and reviewing publications on the websites of regulatory and policy bodies.

Literature was collated using Zotero reference management software, which allowed notes to be recorded and collated for each document. Through this review, insights were gained into current approaches and challenges relating to regulation and AI, as well as both theoretical and empirical discussions of organisational capacities and readiness.

The review of grey literature identified that there was no available single list or overview of existing UK regulatory bodies. This significant gap has created challenges for understanding and navigating the regulatory landscape. Therefore, the first output from this research was the creation of a map of current UK regulatory bodies. The map was informed through our review of grey literature, including government and regulators' websites, and consultation with the project governance group and the ICO-convened Regulators and AI Working Group.

1.3.2 Semi-structured interviews

Semi-structured interviews were conducted to explore regulators' experiences and attitudes relating to current capacities concerning the *Regulation of AI* and *AI for Regulation,* the strengths and limitations of existing approaches, and the needs to be addressed. Interviewees were selected to represent regulators of various sizes (i.e. small, medium, and large organisations) and sectors. From our mapping of the regulatory landscape, we identified several organisations in which to conduct interviews in order to ensure the inclusion of diverse perspectives and interests. Table 1 provides an overview of the organisations we selected.

Table 1: Organisations Represented in Interviews

Sector	Size of Organisation		
	Large	Medium	Small
Horizontal (cross-sector)	2	1	
Communications	1		
Finance	1		
Health	2	1	
Legal and professional services		1	1
Miscellaneous		2	1

Within each organisation, we aimed to interview a number of individuals representing different roles and levels of seniority. In large organisations, we typically interviewed 3 or 4 individuals representing varied roles and levels of seniority, while in medium and small organisations, we interviewed one or two individuals. Initial interviewees were identified through consultation with the project governance group, with further individuals recommended by contacts in each organisation engaged. A total of 28 individuals participated in the interviews. The number of interviewees is summarised in Table 2 below.

Table 2: Number of Interviewees by Sector and Organisation Size

Sector	Size of Organisation		
	Large	Medium	Small
Horizontal (cross-sector)	7	2	
Communications	3		
Finance	2		
Health	3	1	
Legal and professional services		3	1
Miscellaneous		4	2

A topic guide was developed for the interviews based on themes identified through the desk-based research as well as the requirements of the funder. Following a semi-structured approach provided a consistent structure to guide the interviews and allowed for considerable flexibility, so that interviewees could expand on areas of interest or focus on particularly salient dimensions. The main sections of the topic guide related to:

- Level of awareness and engagement with AI;
- Current approaches to the *Regulation of AI;*
- Current data science and AI skills and capacities;
- Uses of *AI for Regulation;*
- Existing collaborations with other regulatory bodies;
- Future needs and regulators' preferences for how the needs are met, including discussion of potential common capacity models.

Interviews were audio-recorded with the consent of participants. Interviews were then transcribed and analysed using NVivo software. Analysis followed an inductive approach drawing out themes from the interviews and identifying key areas of commonality or difference between interviewees' responses, paying particular attention to differences between sectors and sizes of organisations.

The Alan Turing Institute's Ethics Advisory Group (EAG) granted ethical approval for the interviews.

1.3.3. Development and piloting of a readiness self-assessment tool

We developed a readiness self-assessment tool (see Section 10: Annex) to facilitate organisational and participant-level reflection on regulatory readiness. The tool was developed through our analysis of interviews to focus on key components of readiness for regulators, both in relation to the *Regulation of AI* and *AI for Regulation.*

The tool was designed to be used by individuals, teams, or whole organisations as a reflective exercise. It aims to assess current readiness across the organisation and to identify strengths, weaknesses, or gaps. The tool encompasses readiness requirements relating to both the *Regulation of AI* and *AI for Regulation* and engages with organisational values, needs, and knowledge. It is structured around a series of questions under the broad headings of:

- Partnership building;
- Inter-organisational cooperation;
- Absorptive capacity;
- Change readiness;
- Receptivity to change;

- Organisational-level leadership;
- Resource availability;
- Participant attitudes;
- Training and skills development;
- Knowledge of the state-of-the-art;
- Capacity for gap understanding.

Under each of these headings, the tool contains a series of questions to assess the organisation's readiness in relation to key dimensions. Each of the questions has a range of possible answers: completely confident; fairly confident; somewhat confident; not very confident; not confident at all.

The readiness self-assessment tool was piloted with the organisations represented in our interviews. Each of the organisations was asked to complete the self-assessment and to provide feedback on the experience of doing so. The findings of this pilot phase provided further insight into regulators' self-reported readiness and valuable feedback to refine the self-assessment tool.

2. A brief introduction to AI

Section at a glance:

- Provides a brief introduction to AI;
- Introduces three key elements of AI innovation: machine learning (ML), data, and automation

This section sets the background for the discussion in the remainder of the report by providing a brief introduction to AI and related technological concepts.

Artificial intelligence is the "science of making computers do things that require intelligence when done by humans."[7] The term was coined during a summer workshop at Dartmouth College in 1956 and was a foundational moment for AI research. Building on that history, the last two decades have seen a series of ground-breaking research advances. Enabled by a combination of rapid expansions in available computing power, improvements in algorithmic techniques, significant increases in available data, and growing investments in AI development,[8] these advances have led to an explosion of interest in AI and elevated the field from an academic endeavour to a daily fixture of our lives.

Within the field of AI, a broad distinction can be drawn between the ideas of general AI and narrow AI.[9] "General AI" refers to systems that have universal abilities on par with those of human thinking and judgement, including the versatility to learn and perform any intellectual task that humans are capable of. While the idea of "general artificial intelligence" tends to capture the public imagination and is attracting significant research efforts, it remains an elusive goal, with experts disagreeing on whether it will ever be realised.

"Narrow AI," in contrast, refers to systems designed to perform specific predefined tasks and whose abilities are limited to these tasks. Defined in this way, narrow AI systems lack the generalised intelligence exhibited by humans. Still, when it comes to the tasks they are designed to perform, they may nevertheless be on par with or exceed human performance.

Since AI systems ready for adoption today and in the foreseeable future take the form of narrow AI, this report is dedicated to developments in that field. Unless stated otherwise, uses of the term "AI" should be understood accordingly.

Three important elements of innovation can be distinguished when considering the main technological changes that underpin the kinds of AI-enabled tools and systems

[7] Marvin Minsky, quoted in Leslie, 2019.

[8] Brundage, et al., 2018.

[9] Also referred to as Artificial Narrow Intelligence (ANI) and Artificial General Intelligence (AGI).

we currently see being adopted: machine learning, data, and automation. AI systems may use a combination of all three elements or a subset of them.

2.1. Machine learning

ML refers to the development of systems that can perform tasks as a result of a "learning" process that relies on data. It is at the core of recent advances in AI and can be contrasted with approaches that rely primarily on the formal representation of human knowledge and explicitly programmed rules of reasoning.

The field of ML encompasses a diverse and evolving array of methods that draw on concepts from statistics and probability theory and are characterised by varying degrees of complexity. They range from relatively simple methods such as linear and logistic regression, which have a long history of use in statistics and econometrics, to neural networks and other highly complex methods that have become computationally viable more recently.

ML can be employed to solve a wide range of computational and analytical problems. At a high level, three areas of application can be distinguished:

- **Data analysis and modelling tasks involving structured machine-readable data.** Such tasks can take a variety of forms, including prediction and forecasting tasks (estimating the future value of a variable of interest), optimisation tasks (estimating the optimal value of a given variable or range of variables of interest), and detection tasks (identifying the occurrence of phenomena of interest based on the detection of relevant patterns and anomalies in data).

- **Natural language processing tasks involving written or spoken human language.** These tasks can fall into subfields such as speech recognition (the processing of spoken language for purposes such as transforming speech into text or recognising voice commands), natural language analysis (the recognition of meaning patterns in human language, comprising tasks like content classification, sentiment analysis, or machine translation), and natural language generation (the production of written or spoken human language, including tasks such as document drafting, text summarisation, and dialogue response generation).

- **Computer vision tasks involving visual data.** Relevant tasks in this category can involve image or video data and typically take the form of recognition tasks. Examples include the detection of physical objects and their condition, facial recognition, and optical character recognition (i.e. the recognition of characters from images of handwritten or printed text).

2.2. Data

Alongside advances in ML, recent years have seen a vast expansion of data available for and amenable to use in data-driven tools and systems. Several factors contributed to this expansion, including:

- The emergence of new types of data that did not exist previously (e.g. data collected by new kinds of sensor technology);
- Increases in available quantities of established types of data (e.g. growing volumes of social media data);
- Improvements in the accessibility of existing data (e.g. new modes of accessing data stored in legacy systems or data sharing between organisations);
- Advancements in the areas of NLP and computer vision (see above) enabling the computational analysis of unstructured data that traditionally required human analysis (e.g. documents containing free-form text or images).

The benefits resulting from these factors are manifold. Organisations are faced with a growing variety of sources of information available to them, enabling more reliable as well as entirely new types of insights. In addition, increases in data volumes often allow for inferences and insights that were impossible or of poorer quality with smaller quantities of data. Finally, the ability to computationally process unstructured data makes it possible to rely on signals in such data that would be costly or analytically difficult for a human to detect.

While data can be used as part of solutions that do not involve ML, it crucially represents the "raw material" that enables ML applications to exist.[10] ML and data thus represent two elements of innovation whose transformative potential is closely intertwined.

2.3. Automation

Automation can be defined as the reduction or removal of the role of human action in performing tasks and processes. Such tasks and processes can take a diverse range of forms, with examples ranging from operational decision-making and information management tasks to the development of technological tools themselves.

Automation is not necessarily a binary issue in the sense of there being full human involvement versus no human involvement. Instead, different forms of automation fall on a continuum of varying degrees of human involvement. This continuum includes arrangements in which the need for human input is reduced, but where humans retain certain forms of control.

In the current innovation landscape, discussions of automation are often linked to the use of ML. This link can take two forms. First, the output of ML-based systems can be used as a component within an automated process chain. This possibility is illustrated, for example, by decision-making processes that rely on predictions made by an ML model, where automation may mean that prediction outputs trigger certain decisions with limited or no human involvement. Second, automation can play a role in the development of ML-based systems. This is illustrated by the emergence of solutions that automate different aspects of the development or maintenance of ML models, also known as automated machine learning (AutoML).

[10] While the NLP or computer vision capabilities used to transform unstructured language or visual data into structured data typically rely on ML, the resulting structured data can serve as an input for other ML applications.

Automation can also play a transformative role in the context of technological solutions that do not involve ML, such as tools that are designed to perform a series of steps based on explicitly programmed rules. This is illustrated by approaches, some of them with a long history, in the areas of workflow automation or robotic process automation (RPA).

* * * *

The three elements of AI innovation discussed in this section (machine learning, data, and automation) give rise to an almost infinite number of applications across all sectors of the economy and areas of our lives. Such technological progress is exciting and opens a wide range of opportunities, including for regulators, who can use AI to achieve their mission more effectively and efficiently. Technological progress also needs appropriate guardrails to ensure that it leads to socially beneficial outcomes. Regulators play a crucial role in setting these guardrails. To be able to take advantage of the benefits that AI offers to their own work and to fulfil their role in setting guardrails, regulators must develop a sophisticated understanding of AI technologies that covers not only the technical elements of these complex systems, but also the ethical, social, and economic dimensions of AI innovation. In Section 4, we will take a deep dive into the concept of regulatory readiness and outline how regulators can ensure that they are well-placed to steer AI innovation in a beneficial direction.

3. The UK's regulatory landscape and regulators' interest in AI

Section at a glance:

- Presents a map of the current UK regulatory landscape;
- Outlines regulators' interests when it comes to regulating AI;
- Discusses regulators' interests in using AI technologies for regulatory purposes.

If the previous section focused on the technology itself, in this section, we turn our attention to the regulators.

In the first part, Section 3.1, we outline who the UK's regulators are. At the time of writing, there is no mapping of the UK's regulatory bodies. The diversity of statutory and non-statutory organisations in the UK, their large number, and their dynamic nature make it difficult to create a resource that collects information about who these organisations are. Nevertheless, we created a resource for this report that outlines existing bodies and notes their approximate size and sector of activity. While this resource is not complete, it is the most comprehensive one available to date.

In the second part of this section, 3.2, we explore regulators' interest in regulating AI. We show that, as a general-purpose technology, AI has some horizontal uses, which cut across sectors of activity, and some highly specialised, vertical uses, which are specific to individual sectors. The horizontal uses of the technology pose a challenge to sector-specific regulators if they are to address AI regulation on their own. For the remainder of Section 3.2, we outline some individual initiatives linked to regulating AI and some collective legislative and regulatory initiatives that extend across the remits of individual regulators.

Finally, in the third part of this section, 3.3, we focus on regulators' interest in using AI tools to fulfil their regulatory mission. While most regulators are at the beginning stages of developing AI tools for their own organisations, some have made significant progress. We give a couple of examples of the advances that some regulators have made and then dedicate the remainder of Section 3.3 to outlining possible applications of *AI for Regulation*. We group these applications into four categories: (1) modelling and simulation; (2) processing and analysing documents; (3) information exchange and stakeholder engagement; and (4) monitoring and detection.

3.1. Mapping the UK's regulatory bodies

The UK has a complex range of regulatory bodies, including both statutory and non-statutory organisations. A first step in this research was to map the UK regulatory landscape and create a resource that outlines existing bodies. The resulting overview presented here highlights the large number and diverse nature of regulatory organisations.

The map (see Table 3) covers both statutory and non-statutory bodies. It includes relevant professional associations and categorises regulators based on their sectoral remit and size (defined by the number of employees). The map includes bodies whose remit is defined vertically (through a focus on particular sectors) as well as those with a horizontal (i.e. cross-sectoral) remit.

The map has been developed through consultation with UK regulatory bodies. An initial draft of the map was circulated within the Regulators and AI Working Group (convened by the ICO) for comments and suggestions. This resulted in some refinement of the sectoral categories and the addition of several regulatory bodies.

The regulatory landscape is continually evolving as regulatory bodies adapt in size and remits. The map should be read with this caveat in mind. It should also be noted that, while efforts were made to identify significant examples, the map is not exhaustive with respect to non-statutory bodies such as professional associations or industry bodies that perform regulatory or quasi-regulatory functions in relation to their members.

Table 3: Map of UK Regulators

Sector:	Horizontal (cross-sector)	Communication	Education	Financial Services	Healthcare, Social Care, and Medicine
> 1,000 employees	• Companies House	• Office of Communications (Ofcom)	• Office for Standards in Education, Children's Services and Skills (Ofsted)	• Bank of England (BoE)/ Prudential Regulation Authority • Financial Conduct Authority (FCA) • HM Revenue and Customs (HMRC) • Insolvency Service	• Care Quality Commission (CQC) • General Medical Council • Health and Safety Executive • Medicines and Healthcare products Regulatory Agency (MHRA)
500 – 1,000 employees	• Competition and Markets Authority (CMA) • Information Commissioner's Office				• NHS Improvement • Scottish Care Inspectorate
100 – 500 employees	• Advertising Standards Authority (ASA) • Equality and Human Rights Commission (EHRC)		• General Teaching Council, England • Office for Students • Office of Qualifications and Examinations Regulation (Ofqual)	• Pensions Regulator • Payment Systems Regulator	• General Dental Council • General Pharmaceutical Council • Health and Care Professions Council (HCPC) • Health Research Authority (HRA) • Nursing and Midwifery Council • Scottish Social Services Council
50 – 100 employees		• British Board of Film Classification	• General Teaching Council, Scotland		• Healthcare Inspectorate Wales • Human Fertilisation and Embryology Authority • Northern Ireland Social Care Council
< 50 employees	• Scottish Human Rights Commission (SHRC)	• Independent Press Standards Organisation	• Education Workforce Council (Wales) • General Teaching Council, Northern Ireland	• Office of the Regulator of Community Interest Companies	• The Complementary and Natural Healthcare Council • General Chiropractic Council • General Optical Council • General Osteopathic Council • Human Tissue Authority • Pharmaceutical Society of Northern Ireland • Professional Standards Authority for Health and Social Care

Table 3: Map of UK Regulators (cont.)

Sector:	Legal and professional services	Policing and Justice	Utilities, Housing, Transport, Infrastructure, and Environment	Miscellaneous
> 1,000 employees	• Association of Chartered Certified Accountants • Office for Statistics Regulation	• Independent Office for Police Conduct (IOPC)	• Civil Aviation Authority • Driver and Vehicle Standards Agency • Driver and Vehicle Licensing Agency • Environment Agency • Natural Resources Wales • Northern Ireland Environment Agency • Scottish Environment Protection Agency (SEPA)	• Animal and Plant Health Agency • Food Standards Agency • Intellectual Property Office • Maritime and Coastguard Agency
500 – 1,000 employees	• Faculty of Advocates • Royal Institution of Chartered Surveyors • Solicitors Regulation Authority	• College of Policing • Independent Police Complaints Commission	• Building Safety Regulator • Office of Gas and Electricity Markets (Ofgem) • Office for Nuclear Regulation • Planning Inspectorate	
100 – 500 employees	• Chartered Institute of Legal Executives (CILEx) • Chartered Institute of Public Finance and Accountancy • Institute of Chartered Accountants (England and Wales) • Institute of Chartered Accountants of Scotland • Financial Reporting Council (FRC) • Law Society of Scotland	• Her Majesty's Inspectorate of Constabulary and Fire & Rescue Services (HMICFRS)	• Office of Rail and Road • Oil and Gas Authority • Regulator of Social Housing • Vehicle Certification Authority • Water Services Regulation Authority (Ofwat)	• The Charity Commission • Gambling Commission • Office for Product Safety and Standards (OPSS) • Security Industry Authority
50 – 100 employees	• Bar Standards Board		• Northern Ireland Authority for Utility Regulation	• Electoral Commission • Gangmasters and Labour Abuse Authority • Office of the Immigration Services Commissioner • Scottish Charity Regulator
< 50 employees	• Architects Registration Board • Engineering Council • Legal Services Board (LSB) • Law Society of Northern Ireland • Master of the Faculties	• Commissioner for the Retention and Use of Biometric Material • Forensic Science Regulator • The Scottish Biometrics Commissioner	• Office of the Traffic Commissioner • Scottish Housing Regulator • Water Industry Commissioner for Scotland	• Charity Commission Northern Ireland • Chartered Institute for the Management of Sport and Physical Activity • Groceries Code Adjudicator • Farriers Registration Council • Fundraising Regulator • The Office for Professional Body Anti-Money Laundering Supervision • Single Source Regulation Office (SSRO)

3.2. The landscape for the *Regulation of AI*

The previous section, and Table 3 in particular, highlight the diversity of UK regulators in terms of their remits and sizes. This diversity is matched by the variety of AI applications in use today. Businesses rely on AI in each sectoral domain identified in our map of UK's regulatory landscape. In Table 4, we outline examples of applications of AI for each sector.

AI is a general-purpose technology. As such, some of its uses cut across all sectors. For example, businesses from vastly different industries — from local pizza shops to large financial institutions — rely on targeted advertising. Similarly, consumers are increasingly reliant on chatbot advice, whether they are contacting their mobile phone provider or airline company. In recognition of this fact, the first row of Table 4 outlines some of AI's general uses, which cut across all sectors. In the literature, these general uses of AI are also referred to as "horizontal" uses.

AI is also well-suited to highly specialised tasks. Some of these tasks are particular to their area of application and sector of activity. High-frequency algorithmic trading, for example, is an application of AI specific to financial services. Similarly, high-precision robotic surgery is an application of AI specific to healthcare. Besides noting some of the horizontal uses of AI, Table 4 also outlines sector-specific applications of AI. In the literature, these sector-specific uses of AI are also referred to as "vertical" uses.

Table 4: Examples of Applications of AI Across Sectors

Sector	Examples of Applications of AI	
General (applicable across sectors)	• Personalisation of services • Targeted marketing and advertising • Dynamic pricing • Chatbots	• Virtual assistants for customer support • Monitoring employee performance • Tools for financial/regulatory reporting
Communication	• Network optimisation • Predictive maintenance	• Media monitoring
Education	• Virtual classrooms • Personalisation of learning	• Automated grading of exams or coursework • Monitoring student progress
Financial services	• Detection of suspicious transactions and fraud • Client risk profiling (e.g. credit or insurance risk) • Insurance claim management • Robo-advisors and virtual money coaches	• Predicting the performance of financial assets • Portfolio management and financial trading • Market abuse detection

Table 4: Examples of Applications of AI Across Sectors (cont.)

Sector	Examples of Applications of AI	
Healthcare, social care and medicine	• Predictive modelling for diagnostics and prognostics • Triaging support • Chatbots and virtual doctors for remote consultations	• Medical imaging analysis • Drug discovery • High-precision robotic surgery
Legal & professional services	• Document discovery and review • Automation in due diligence	• Contract review • Pattern recognition to detect irregularities
Policing and justice	• Facial recognition • Predictive policing algorithms	• Behavioural biometrics
Utilities, housing, transport, infrastructure and environment	• Supply chain management • Autonomous vehicles • Modelling and predicting infrastructure needs	• Optimising public transport routes

The examples in Table 4 highlight two challenges of regulating a general-purpose technology like AI. The first relates to the large number of applications: the possibilities of using AI seem limitless, challenging regulators with limited resources to effectively oversee a vast landscape of use cases. The second relates to the fact that some AI applications cut across sectors and regulatory remits. These more horizontal uses of AI challenge the traditional sectoral boundaries that have delimited regulators' remits until now.

The growing importance of questions linked to the *Regulation of AI* is reflected in the evolving agendas of individual regulatory bodies as well as recent legislative and regulatory initiatives that extend across the remits of individual regulators.

At the level of individual regulatory bodies, prominent examples of the surge in attention around the *Regulation of AI* include initiatives at the Competition and Markets Authority, the Information Commissioner's Office, the Financial Conduct Authority, the Bank of England, and Ofcom:

- The Competition and Markets Authority have published several reports relating to AI and competition. They first published their Digital Markets Strategy in 2019, subsequently updated in 2021.[11] In 2020, they also published a study on online platforms and digital advertising.[12] Their Digital Markets Taskforce has produced several relevant outputs relating to the design and implementation of pro-competitive measures for unlocking competition in digital markets. In 2021, the CMA launched their "Analysing Algorithms Programme."[13]

- As the independent regulatory office dealing with the Data Protection Act 2018 and the General Data Protection Regulation, the Information Commissioner's Office is concerned with considerations around fair, legal, and transparent data processing and data use in AI. The ICO identified AI as one of its top three strategic priority areas for 2018 — 2021. In 2020, in collaboration with The Alan Turing Institute, they published guidance on explaining decisions made with AI.[14] They have also produced guidance on AI and Data Protection[15] and on the accountability and governance implications of AI.[16]

- In 2019, the FCA embarked on a collaboration with The Alan Turing Institute to research ethical and regulatory questions raised by the use of AI in financial services and the role of AI transparency in addressing such questions. The resulting report was published in June 2021.[17] Besides its individual initiative, in 2019, the Financial Conduct Authority also collaborated with the Bank of England to conduct a joint survey of firms.[18] Later on, the Bank of England and the FCA established the Artificial Intelligence Public-Private Forum (AIPPF).[19] AIPPF's final report was published in February 2022.[20]

- In 2019, Ofcom commissioned a study to explore uses of AI in online content moderation.[21] In 2020, it was announced that Ofcom had been appointed as the regulator for online harm. In 2021, Ofcom commissioned a report by The Alan Turing Institute on online hate to support the implementation of its new Video Sharing Platform (VSP) regulatory duties.[22] In order to fulfil its new regulatory responsibilities, Ofcom is also acquiring new technology and data skills.[23] By the time the Online Safety Bill moved towards legislation in 2022, Ofcom had appointed 300 staff to work on social media regulation and grown their Online Safety policy team to comprise nearly 50 people, with six principals and two directors.

Beyond these large regulators, smaller bodies are also increasingly developing interests and in some cases, programmes of work relating to the *Regulation of AI.* For example, in 2019, the Financial Reporting Council produced a report on artificial antelligence and

[11] CMA, 2021a.

[12] CMA, 2020.

[13] CMA, 2021b.

[14] ICO & ATI, 2020.

[15] ICO, 2020a.

[16] ICO, 2020b.

[17] Ostmann & Dorobantu, 2021.

[18] FCA & BoE, 2019.

[19] FCA, 2020a.

[20] AIPPF, 2022.

[21] Cambridge Consultants, 2019.

[22] Vidgen & Margetts, 2021.

[23] Ofcom, 2020.

corporate reporting.[24] The Legal Services Board has a technology project which focuses on technology and regulation. It explores opportunities to develop approaches to regulation for the use of technology in legal services. Through this project, the LSB published a collection of 11 articles reviewing opportunities for legal services regulation to support responsible technological innovation and improve access to justice.[25]

The initiatives outlined above are only a few examples of the work that individual regulators are currently undertaking when it comes to regulating AI. Many other regulators, besides the ones mentioned here, are turning their attention to AI and dedicating resources to understanding how to regulate AI. Indeed, our interviewees consistently noted that AI was an area of relevance or interest to their organisation's regulatory remit. Only one interviewee described AI as not being relevant to their organisation's regulatory remit.

Mirroring our interview findings, the UK's National AI Strategy also notes the importance of AI to regulators across all sectors. The National AI Strategy goes one step further, stating that: "While some regulators are leading the way in understanding the implications of AI for their sector or activity, we need all regulators to be able to do this."[26]

As we noted above, the horizontal nature of some AI applications, as well as some of the questions that arise in the area of *Regulation of AI,* make it difficult for individual regulatory bodies to regulate AI on their own. Regulating AI effectively requires conceptual, analytical, and strategic perspectives that extend beyond traditional regulatory remits, necessitating different forms of coordination and collaboration across the regulatory landscape.

Recent legislative initiatives, such as the Online Harms Bill, highlight this need for coordination and collaboration across regulatory remits. The need is also reflected in several recent collaborative initiatives between regulatory bodies in the UK that touch on the *Regulation of AI* (see Table 7, Section 7.3). Prominent examples include the Digital Regulation Cooperation Forum (comprising the CMA, ICO, FCA, and Ofcom), the Regulators and AI Working Group, and the Digital Markets Taskforce. Such initiatives highlight the importance of and interest in collaboration among regulators to identify and address emerging challenges. We will cover them in depth in Section 7.

3.3. The landscape for *AI for Regulation*

AI tools can have significant benefits for the delivery of regulatory bodies' missions. These benefits can take two forms, often in combination with each other: increases in regulatory *effectiveness* (i.e. quality improvements in the performance of regulatory tasks) and increases in *efficiency* (tasks becoming easier, faster, or less resource-intensive, and cheaper to perform). Relevant tasks in relation to which AI can enable such benefits can take many forms and stretch across the entire "regulatory lifecycle," ranging from regulatory research and rulemaking to licencing and approval decisions, supervision and surveillance, and investigation or enforcement activities.

[24] FRC, 2019.

[25] LSB, 2020.

[26] Office for AI, 2021: 54.

Our interviews revealed that while there is significant and growing interest in *AI for Regulation* across the regulatory landscape, most regulators do not yet have substantial capabilities in this area. Many interviewees described their organisations as being at the early stages of "experimenting" with *AI for Regulation* or exploring opportunities and means to develop capacity in this regard. Interest in further exploring the potential of *AI for Regulation* and developing capacities to harness the potential benefits of *AI for Regulation* was expressed by interviewees at regulators across all sectors and sizes included in our research. This highlights the value of building capacity in this area to address consistent and common needs across the regulatory landscape.

However, while most regulators were described as being at early stages in the journey to using *AI for Regulation*, some regulatory bodies already have established programmes of work developing and trialling AI tools. Two prominent examples are the FCA and the CMA:

- The FCA published its latest Data Strategy in 2020.[27] This set out the FCA's vision to be "smarter in the way [they] use [their] data and advanced analytics to transform the way [they] regulate and reduce the burden on firms." The strategy includes a focus on improving the use of artificial intelligence to better understand and manage harm, improving the use of predictive analytics to identify patterns and trends, and strengthening analytics capabilities. The FCA already have well-established AI capacities. Most notably, they have an advanced analytics team which develops AI tools to be used internally. Alongside this is a federated model of data science units distributed across the organisation. The engineering team industrialises tools developed by the advanced analytics team to maximise deployment and use across the organisation. The transformation team builds internal capacity around AI through the FCA's community of practice.
- The CMA established its Data, Technology and Analytics (DaTA) unit in October 2018. This unit was set up to ensure that the CMA "stayed ahead" in terms of using the latest data engineering, machine learning, and AI techniques. The DaTA unit has developed and trialled AI tools internally. Early examples of CMA's applications of AI include developing machine learning tools to identify possible breaches of consumer law on digital platforms and using natural language processing to sift and review large volumes of documents.

Recent years have seen a growing literature on possible uses of AI by regulatory bodies.[28] This literature comprises contributions from the UK as well as many other jurisdictions. It includes examples of AI use across different stages of maturity, ranging from AI tools in deployment to experimental uses, proofs of concept, and hitherto untested hypothetical use cases.

The remainder of this section provides a high-level overview of possible applications of *AI for Regulation*, drawing on the existing literature as well as on use cases that played a salient role during our interviews. It should be noted that the overview is limited to the use of AI to perform tasks that are distinctly recognisable as regulatory tasks. In other words, it focuses on AI tools related to regulatory bodies' primary operational objectives, setting aside uses of AI to perform tasks that are more generic in nature and

[27] FCA, 2020.

[28] Department for Business, Energy & Industrial Strategy, 2020a; Engstrom et al., 2020a; Financial Stability Board, 2020; Misuraca & van Noordt, 2020; World Bank, 2020; International Association of Insurance Supervisors and Access to Insurance Initiative, 2019; Financial Stability Institute, 2018; Deloitte, 2018a; Toronto Centre, 2017.

not uniquely connected to regulatory activities. The scope thus excludes the use of AI for internal management tasks and other use cases with shared applicability across a wide range of other organisations.

Specific examples of out-of-scope use cases include the use of AI in contexts such as human resource management, accounting and finance, procurement management, legal services, or cybersecurity. It is worth noting that the decision to set aside these use cases is not based on a judgment of their significance in terms of innovation potential. Instead, it is based on the fact that these uses are not unique to the needs of regulatory bodies and are common across other public and private organisations. As a result, they are less relevant from the perspective of coordinated capacity-building for regulatory bodies.

Two further points regarding the scope of the overview presented below are worth highlighting. First, the overview adopts a wide lens with respect to the kinds of tools and solutions that count as "AI." The three elements of innovation described in Section 2 (ML, data, and automation) inform this lens. As highlighted above, technological solutions may use these elements in combination with each other or on their own. Our focus is on solutions that involve ML. Still, we include some examples of technological solutions that do not necessarily involve ML where this seems warranted by the prominence of these solutions in recent innovation debates (e.g. digital regulatory reporting).

Second, the overview is not based on an assessment of technical or practical feasibility in relation to individual use cases. It includes existing uses as well as use cases that, to date, represent conceptual possibilities. For many use cases, there is evidence of regulatory bodies actively exploring them, albeit often at an experimental stage. In some instances, such exploration has ended with projects being dropped due to resource constraints or feasibility issues, illustrating the significant obstacles in turning hypothetical uses into reality.

In terms of structure, relevant uses cases can be grouped into four broad categories, with each of them comprising multiple subcategories:

- Modelling and simulation;
- Processing and analysing documents;
- Information exchange and stakeholder engagement;
- Monitoring and detection.

These categories and subcategories were designed with a view to organising use cases in a way that highlights similarities between AI tools in terms of the general functions they serve (rather than similarities between the regulatory domains in which they are deployed or similarities in technological design, for example). This approach is not without alternatives, but it is well-suited to inform discussions about the potential for shared capacity building and for learning across regulatory domains.

3.3.1. Modelling and simulation

AI can be useful in relation to a wide range of modelling and simulation tasks faced by regulatory bodies. The element of innovation at the core of use cases in this category is

the use of ML to analyse structured data. In addition, innovative approaches to modelling and simulation may rely on previously unused forms of data input. Where such data is unstructured (e.g. written or spoken human language or visual data), solutions may involve NLP or computer vision capabilities.

Relevant modelling and simulation tasks in the regulatory domain can take various forms. In some cases, the use of AI may enable improvements over and replace more traditional approaches to modelling and simulation. In others, the use of AI may make it possible to perform modelling and simulation where this was previously technologically infeasible (e.g. due to the kinds or quantities of data involved). The resulting benefits can take the forms of increased regulatory effectiveness as well as increased efficiency (e.g., in the case of risk scoring of regulated entities, due to improved targeting in the allocation of regulatory resources).

Three kinds of use cases are worth highlighting as particularly salient within this category:

- **Risk scoring of regulated entities.** In the context of supervision, inspection, and enforcement activities, ML models can be used to predict individual regulated entities' likelihood of non-compliance or need for assistance. This can enable targeted interventions and new forms of prioritisation that direct regulatory resources to high-risk entities. Applications for this use case include a wide range of regulatory domains. Documented examples of regulatory bodies exploring this use case range from risk scoring of MOT testers,[29] GP practices,[30] care homes,[31] and schools[32] to banks (financial distress),[33] financial advisers (misconduct),[34] restaurants (hygiene),[35] and technical equipment (safety).[36]

- **Modelling to inform rulemaking or regulatory approval.** The design of rules or decisions about regulatory approval often depend on empirical assumptions that are informed by statistical modelling. The use of ML and previously unused forms of data can result in models whose improved accuracy, reliability, or granularity enables improved decisions in such cases. Examples of relevant contexts include models to predict traffic accidents,[37] the toxicity of chemical compounds,[38] or the effectiveness and safety of medical drugs or devices.

- **Modelling and simulation for scenario analysis.** In cases where regulators need to understand potential market dynamics or other aspects of future scenarios, novel approaches to modelling and simulation enabled by AI — including agent-based modelling — can provide innovative insights. Relevant contexts include regulatory planning or research activities aimed at understanding the dynamics of

[29] Department for Business, Energy & Industrial Strategy, 2020b: 54–57.

[30] The Behavioural Insights Team, 2017.

[31] The Behavioural Insights Team, 2017.

[32] The Behavioural Insights Team, 2017.

[33] Financial Stability Board, 2020: 51.

[34] Financial Stability Board, 2020: 52.

[35] French General Directorate for Food, 2019:12.

[36] Technical Safety BC, 2018.

[37] Engstrom et al., 2020b: 28–29.

[38] Engstrom et al., 2020b: 30.

demand and supply (e.g. in relation to transport or communications infrastructure, energy, or schools). Efforts to understand shocks and resilience in various domains are another prominent area of application.[39] In the context of financial services regulation, this includes stress testing for financial institutions and modelling systemic risks.[40]

3.3.2. Processing and analysing documents

AI tools can facilitate the processing and analysis of various kinds of documents that are central to many regulatory activities. NLP is the most important element of innovation for use cases in this category. Depending on the nature of the task and the technological solution chosen, tools may also rely on computer vision, the use of ML to analyse structured data, and automation.

The transformative potential of these uses of AI partly arises from the fact that regulatory activities often involve documents that come in large volumes, and that processing and analysis tasks often take repetitive forms. AI can enable significant improvements in operational efficiency by making it possible for relevant tasks to be performed at scale with reduced human involvement. In addition, AI can facilitate analytical insights that would be difficult to achieve for human analysts, especially in the area of identifying signals of suspicious activity.

- **Document digitisation.** In cases where documents include handwritten text or involve other forms of information that defy digital processing, AI tools can render the task of digitising the content of documents more efficient and reliable.[41]

- **Triaging and summarisation.** Where regulators are confronted with the need to screen large amounts of documents, AI tools can help address this need by performing tasks such as ranking documents for relevance or producing summaries of their content. Examples of contexts in which such use cases hold promise include investigations or enforcement proceedings that require screening large amounts of documents from the regulated entities involved in the case (e.g. merger investigations). Another relevant context is processing complaints or consultation responses, discussed separately in Section 3.3.3 below.

- **Analysing document content.** AI tools can also perform more sophisticated forms of analysis on the content of documents. One illustration of this is using NLP or computer vision to detect similarities between the text or images contained in documents. This may be useful, for instance, in the context of tasks that require categorising or determining the uniqueness of content. In financial services, such capabilities have been used to identify themes and trends in the large volumes of documents received by regulators from regulated firms on a recurring basis.[42] Intellectual property agencies have explored the use of AI tools to search for similarities between the content of patent or trademark applications and existing

[39] The Alan Turing Institute, 2021.

[40] Engstrom et al., 2020b: 4; Financial Stability Board, 2020: 53.

[41] Financial Stability Board, 2020: 45 and 55; Deloitte, 2018a: 10–11.

[42] Financial Stability Board, 2020: 41, 47, and 55.

[43] Department for Business, Energy & Industrial Strategy, 2020b: 7–13; Engstrom et al., 2020a: 46–52.

patents or trademarks to determine the merit of applications or to categorise their content.[43]

- **Identifying errors, non-compliance, and suspicious signals in documents.** One specific form of content analysis worth highlighting as a separate use case is the identification of inaccuracies and red flags in documents. In this case, AI tools are used to detect content that may be indicative of errors or problematic behaviour on the part of regulated entities, meriting closer scrutiny. Examples of contexts in which regulatory bodies have explored this use case include the detection of: errors or fraud in corporate financial statements;[44] non-compliant content or signs of misconduct in consumer-facing documents or regulatory filings issued by financial service providers;[45] indicators of compliance failures in emails and other forms of communication between companies and supervisors.[46]

3.3.3. Information exchange and stakeholder engagement

External-facing processes of information exchange and communication are crucial to regulatory bodies' missions. They can take unidirectional or bidirectional forms and involve various types of stakeholders, including regulated entities, consumers, or the wider public. AI can facilitate a variety of tasks in relation to such processes, primarily through the combined use of NLP and different forms of automation.

Across the three prominent types of use cases distinguished below, AI can enable significant efficiency benefits, for regulatory bodies and stakeholders alike. In addition, solutions for digital regulatory reporting and the analysis of complaints and consultation responses also hold the promise of making regulation more effective: in the former case by increasing the timeliness and accuracy of reported information; in the latter case, by identifying trends or patterns in complaints or consultation responses that human analysts may miss.

- **Providing and receiving information.** Regulatory bodies are faced with requests for information from stakeholders (e.g. consumers or regulated entities seeking advice) as well as administrative processes that involve receiving information (e.g. applications from companies in sectors that require authorisation). In both cases, AI can enable innovative digital solutions that facilitate the process of providing or receiving information. Relevant examples include using chatbots to respond to stakeholder queries or virtual assistants to facilitate the submission and processing of authorisation requests.[47]

- **Digital regulatory reporting.** One type of solution for providing and receiving information that applies specifically to regulatory reporting and has attracted growing attention in recent years is the translation of reporting rules into machine readable and machine executable formats. Combined with suitably configured data management and data transmission environments, this could enable the automation of reporting processes while reducing rule ambiguity and increasing

[44] Deloitte, 2018b: 5; Financial Stability Board, 2020: 52.

[45] Engstrom et al., 2020b: 37–38; Financial Stability Board, 2020: 44, 47, and 50.

[46] Engstrom et al., 2020b: 5.

[47] European Central Bank, 2020.

[48] FCA, 2020.

the accuracy and timeliness of the data available to regulators. The FCA and Bank of England are currently exploring this possibility in the context of financial services reporting.[48] These developments occur against the background of a growing international literature on "rules as code" and "law as code," which considers the potential of machine consumable versions of rules and laws across various domains.[49]

- **Analysing consultation responses, complaints, and other submissions.** Where regulatory bodies receive large amounts of solicited or unsolicited information, for example, in the form of consultation responses or consumer complaints, AI tools can help process and distil insights from such information. AI tools may perform specific tasks, including prioritising submissions for human review, determining whether complaints fall within a body's regulatory remit, assessing the authenticity of consultation responses,[50] and categorising submissions to identify trends and emerging regulatory concerns.[51]

3.3.4. Monitoring and detection

As a final category, AI can be of use in the performance of monitoring and detection tasks associated with regulatory mandates. Given the diverse characteristics of such tasks across different regulatory contexts, use cases in this category may rely on ML methods to analyse structured data, NLP, or computer vision, potentially in combination with previously unused forms of data and different forms of automation.

Like with previous categories, the benefits of using AI for monitoring and detection tasks include efficiency gains (e.g. through reduced human involvement in the performance of the relevant tasks) as well as increases in effectiveness (in the form of improved rates of detection compared to tasks being carried out by humans without AI support).

- **Monitoring regulated behaviour.** Where regulators have access to observational data concerning the conduct of regulated entities, AI tools can be used to monitor behaviour and detect instances of non-compliance or misconduct. Relevant examples for this kind of use include the detection of: insider trading or market manipulation (based on financial trading data);[52] instances of collusion and other competition violations (through the analysis of price data); failures to declare instances of paid advertising on social media posts explicitly; scam ads; the sale of unsafe products online (based on text and image similarity compared to known ads of banned products); problematic company ownership structures;[53] and instances of illegitimate "company phoenixing" (based on company registry data and network analysis).

- **Monitoring environments.** In contexts where regulatory bodies have a need to monitor conditions in natural, built, economic, or digital environments, AI — potentially in conjunction with the use of sensor technology — can be equally

[49] Organisation for the Economic Cooperation & Development (OECD), 2020.

[50] Engstrom et al., 2020: 59–64.

[51] Engstrom et al., 2020a: 53–64; Engstrom et al., 2020b: 6, 39; European Central Bank, 2020.

[52] Engstrom et al., 2020b: 38–39; Financial Stability Board, 2020: 53.

[53] Financial Stability Board, 2020: 54 and 56.

[54] Department for Business, Energy & Industrial Strategy, 2020b: 51–53.

[55] WaterAnalytics, 2018.

useful. For example, AI tools may facilitate monitoring and detection tasks in relation to physical infrastructure, such as the detection of blocked culverts,[54] the detection of leaks in water supply networks,[55] or the monitoring of road conditions[56] and road traffic.[57] Similarly, AI can help with monitoring tasks in various market environments, including detecting patterns across suspicious financial transactions in the context of anti-money laundering measures.[58] In the digital sphere, AI can play a crucial role in performing tasks related to online safety and online harms. Examples include measuring the occurrence of hate speech and misinformation and assessing an online platform's approach to managing these issues.[59] Here, the role of AI can be particularly fundamental, since many of the relevant tasks could not feasibly be performed without reliance on algorithmically enabled solutions.

- **Monitoring indirect sources of information.** Setting aside the direct monitoring of behaviour or conditions of interest, insights and signals of interest to regulatory bodies can originate from media reports, social media posts, and other indirect sources of information. AI tools can be designed to derive insights and detect relevant signals in such sources. Specific uses in this category include identifying trends or keeping track of reported incidents for purposes such as anticipating complaints or initiating regulatory interventions. For instance, food safety authorities have explored the use of AI to screen social media posts for signs of food poisoning incidents related to individual restaurants.[60] Similarly, financial regulators are exploring the use of AI tools to monitor public sentiment in relation to individual supervised firms.[61]

This completes our overview of possible applications of *AI for Regulation.* In Section 3, we turned our attention to the regulators. We outlined who they are and, in the process, created the most comprehensive mapping of the UK's regulators to date. We also explored regulators' interest in regulating AI, focusing on both individual and collective initiatives. And we highlighted the potential that AI technologies have to help regulators fulfil their missions. Having taken a deep dive into who the regulators are and their interests in AI, in the next section, we will focus on the concept of readiness as a way to uncover what organisations need to do to keep pace with AI innovation.

[56] Palaimon, 2020.

[57] AI-X, 2021a; AI-X, 2021b.

[58] Financial Stability Board, 2020: 48–49.

[59] Vidgen & Margetts, 2021.

[60] National Science Foundation, 2016.

[61] Financial Stability Board, 2020: 53.

4. Understanding AI and regulation through the lens of readiness

Section at a glance:

- Introduces the concept of readiness, in terms of regulatory readiness for AI;
- Describes the three levels of readiness (system-level, organisational, and participant), and explores how certain innovation factors (related to values, needs, and knowledge) influence conditions of readiness;
- Discusses regulators' capacity needs in relation to readiness;
- Introduces a self-assessment tool for regulators and discusses initial assessment results.

This report focuses on the need for regulators to adapt to the emergence of AI, in terms of regulating AI as well as using AI for regulatory purposes. This section develops the concept of "readiness" as a way to understand what regulators might need to do in order to adapt. The concept of readiness allows us to move from beyond a set of "why" questions to a set of "how" questions — that is, from the reasons why regulators need to develop new expertise and capacity to an understanding of how to make it possible in the first place. Readiness is the most important common denominator across the competencies required to foster effective regulation of AI and those required for deploying AI for regulatory purposes. The realisation of readiness in organisations and people is a necessary precondition for enabling regulatory capacity around AI innovation.

Readiness refers to an individual's, an organisation's, or a larger system's degree of preparedness to meet novel challenges or to successfully navigate change. In the context of AI and regulation, it refers to the conditions of preparedness — at the participant, organisational, and system-levels — that enable the effective integration of AI technology and technology policy into the regulatory environment. To understand the essential determinants of readiness, we need to gain a full view of how the barriers and enablers of these kinds of innovation are situated in broader system-level, organisational, and motivational contexts and how these determinants are interrelated. From such a wide-angled standpoint, beyond considering any particular obstacle or catalyst to innovation in isolation, attention must also be paid to how such obstacles and catalysts are embedded in the broader social, cultural, economic, legal, political, and psychological contexts of regulation and regulatory practice.

In pursuing this holistic approach, we become better positioned to identify the underlying infrastructure of system-level, organisational, and psychological/motivational factors that operate separately and in concert to determine the readiness of participants in regulatory settings to accept the changes brought about by potentially disruptive AI

technology and technology policy innovations.[62] This broader ecological view of the innovation environment is important, because it provides a useful way to organise the positive and negative determinants of innovation intervention outcomes. In particular, it enables us to arrange the determinants in a systematic manner, which may then allow for the development of a more deliberate and logical approach to identifying and anticipating them. It consequently works toward clearing possible pathways to capacity-building.

It is important to note that much of this research into understanding the effective integration and sustainability of innovation and evidence-based interventions in organisational and community settings has already been undertaken in the fields of implementation science, organisational theory, social psychology, and sociology, among others.[63] Drawing on previous work, we undertook a comprehensive literature review of this multidisciplinary area and then used the findings from the literature review to organise and analyse our interview-based research.

In this section, we will begin by laying out and describing the three levels of readiness (system-level, organisational, and participant) and then explore how certain innovation factors (related to values, needs, and knowledge) influence conditions of readiness across these levels. We then zoom in on each of the levels individually and explain some of the key factors of readiness that were emphasised throughout our interviews as bearing significance for the regulatory capacity to confront the challenges posed by emerging AI technologies. Finally, we summarise our main findings about which components of system-level, organisational, and participant readiness should play a role in tackling the challenges and capitalising on the opportunities that AI presents to regulators.

4.1. Three levels of readiness for AI technology and technology policy innovation

To understand the conditions of readiness for AI that regulators need to attain, it is first necessary to build out an analytical frame that appropriately separates elements of preparedness according to where and how they are realised. One can speak about readiness in terms of three distinctive levels:

1. The **readiness of individual people** — namely, the motivational, attitudinal, and psychological antecedents of the successful adoption of new technologies or technology policy innovations. At this participant level, readiness involves the attitudes, perceptions, cognitive abilities, skills, and investments that enable individuals to embrace and integrate AI innovation and AI-prompted policy change.

2. The **readiness of organisations** — namely, the institutional, cultural, and policy-level antecedents of the successful adoption of new technologies or technology policy innovations by organisations and institutions. At this organisational level, readiness involves the way that the institutional culture, the availability of resources, and the environment of policies, procedures, and collective learning

[62] Metz and Albers, 2014; Ghate, 2016.

[63] For helpful surveys: Tabak et al., 2012; Nilsen, 2015; Leeman et al., 2015; Strifler et al., 2018.

facilitates the uptake of AI innovation and AI-prompted policy change.

3. The **readiness of wider systems** — namely, the socio-economic, political, and interorganisational circumstances and the general legal, regulatory, and policy surroundings that operate as preconditions of the successful adoption of new technologies or technology policy innovations among organisations and wider social institutions. At the system-level, readiness involves the way that structural factors such as educational infrastructure and mechanisms of inter-organisational cooperation and multi-stakeholder coordination allow organisations and people to adopt and integrate AI innovation and AI-prompted policy change.

Although these three levels represent unique layers of human action, collective organisation, and social structure respectively, the boundaries between them are porous, and dynamics of readiness often cut across such layers. For instance, one crucial quality of readiness, leadership, does not find a root or home at any one level. Rather, each of the three levels have a direct bearing on leadership characteristics. At the individual or participant level, leadership becomes possible only when cognitive abilities, sense-making capacity, and positive attitudes towards change are cultivated in the individual agents that take on leadership roles; at the organisational level, leadership involves the part that people with decision-making authority play in creating cultural conditions within organisations that are amenable to the adoption of innovation or policy change; at the system-level, policy owners with a wider remit exercise readiness-supporting leadership when they actively promote institutional enablers of innovation adoption in cross-governmental or inter-organisational spheres.

Acknowledging the complex and interconnected relationship between these levels is important when considering how to build regulatory capacity in AI. This is because the enablers of the effective integration of AI technology and technology policy into the regulatory environment have an interlocking character. The readiness of individual participants is entangled with the organisational and system-level conditions that foster the successful adoption of new technologies and technology policy innovations. For this reason, effective recommendations about building readiness capacity cannot treat any of these aspects in isolation — but must instead endeavour to grasp their relations-of-fit and interdependencies. Likewise, in considering any set of recommendations for capacity building as a whole, we must consider the relationships of individual parts and ensure that proposals at the level of participant readiness support and are supported by proposals about system-level or organisational readiness, and *vice versa*.

4.2. Cross-cutting innovation factors

Before describing the key components of participant, organisational, and system-level readiness that emerged in this research, we should briefly examine some cross-cutting innovation factors that bear upon the successful adoption of AI technologies and policy change in the regulatory sphere. Regulators face a particularly difficult challenge in having to rapidly adapt to and integrate the fleet-footed development of new AI applications. They must figure out, often in real-time, how prevailing regulatory approaches to law, policy, and enforcement line up both with unprecedented use cases and with the multiple emerging standards, guidelines, and best-practices protocols that attend this accelerating impetus to AI innovation. The weight that many regulators

reasonably give to existing norms of regulatory practice, enduring regulatory cultures, and administrative stability is put under pressure by the momentum of innovation and technological change.

One overriding question about regulatory readiness that emerges in this connection is: How do regulators transform patterns of institutional inertia or change resistance, so that they can keep pace with the growing set of challenges and opportunities posed by the emerging tidal wave of AI innovation?

A direct, but demanding, answer to this question is that regulatory bodies (both large and small, both vertical and horizontal) should undertake an institutional and cultural transformation, where passive and reactive attitudes towards AI innovation are converted into proactive and dynamic approaches to it. Instead of responding on the back foot, regulatory bodies should endeavour to embrace and seize upon the state-of-the-art for themselves and upskill and increase their capacity to regulate AI in ways that then incorporate new modalities of innovation into durable regulatory cultures, norms of practice, and administrative stability.

The successful pursuit of such a transformation of regulatory attitudes, culture, and practice will hinge on three cross-cutting innovation factors that underwrite the development and sustainment of readiness in individuals, organisations, and systems. These factors have to do with how the **values, needs,** and **knowledge** of regulators align with the AI technologies and policy changes that disrupt their conventional modes of working:

Innovation-values-fit. The successful uptake of disruptive innovation and policy change is affected by the degree to which their characteristics align with the values, beliefs, purposes, and missions of the innovation producers, users, and individuals affected by their implementation.[64] In the regulatory context, this means that regulators must make efforts to develop and strengthen those values, beliefs, and purposes within their regulatory missions that can **underwrite a pro-innovation stance on AI adoption and an openness to the accompanying changes in policies and practices.** For instance, in Ofcom's recently published Plan of Work for 2021/22, the regulator's mission to "make communications work for everyone" is restated as an anchoring principle that then supports a shift in values and purposes towards technological agility and openness to change: "High-quality, reliable communications services have never mattered more to people's lives. But as consumers shift their habits increasingly online, our communications sectors are transforming fast. It is an exciting moment for our industries and for Ofcom as a regulator - it requires long-term focus alongside speed and agility in response to change."[65]

Innovation-needs fit. The successful uptake of disruptive innovation and policy change is affected by the degree to which their characteristics align with the administrative and practice needs of users and the service needs of individuals affected by their implementation.[66] In the regulatory context, this means that regulators must develop their technical capacity in both regulating AI and deploying *AI for Regulation* from a user-centred and user-needs-based perspective.

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[64] Klein and Sora, 1996; Glisson and Schoenwald, 2005; Aarons, 2011.

[65] Ofcom, 2021b.

[66] Klein and Sora, 1996; Aarons, 2011; Moullin, 2019.

Innovation-knowledge fit. The successful uptake of disruptive innovation and policy change is affected by the degree to which their characteristics align with users' cognitive needs, adaptability, skills levels, and capabilities; with organisations' commitments to training and development; and with the cognitive participation, sense-making, and informed acceptance of users and individuals affected by their implementation.[67] In the regulatory context, this means that regulators must make efforts **to upskill their workforce from tip to toe of their organisations and from the bottom up.** Such comprehensive upskilling efforts should involve professional development and training to expand technical knowledge, but they should also involve a socio-technical and ethics component whereby an awareness of the social, moral, and policy stakes of the design, development, and deployment of AI systems is integrated into regulatory sense-making as well as into the cognitive participation of staff across all levels of seniority and operational domains. The prospect of shared capacity building mechanisms has a paramount role to play in building this innovation-knowledge fit across regulators inasmuch as a shared facility for knowledge expansion and collective cognitive enhancement among regulators would operate as a force multiplier of readiness.

4.3. Main interview findings on participant, organisational, and system-level readiness

Throughout the interviews we conducted, participants from small, medium, and large regulators alike emphasised the importance of building participant, organisational, and system-level readiness into regulatory practices. They often stressed that some of the more intractable existing gaps in regulatory capacity to tackle the challenges posed by AI innovation were rooted in a poor fit between the new demands that this sort of innovation is placing on their organisations and the values, needs, and knowledge that currently characterise them.

A useful way to organise this interview-based input on readiness is to zero in on the specific levels of readiness (participant, organisational, and system-level) introduced in Section 4.1 and employ them as filters to better classify and analyse the key determinants of preparedness on individual, collective, and structural planes. This makes it possible to formulate recommendations in a more granular way, though also with an appropriate awareness of the interconnectedness of levels of readiness, in the aggregate.

As noted above, the analytical categories of participant, organisational, and system-level readiness that we present here are derived from an extensive literature review of research in implementation science, organisational theory, social psychology, and other related social sciences. Our tack in presenting the results of our interviews (as regards questions of readiness) through the lens of this body of research is, at once, to extend the latter into the regulatory sphere but also to draw on these adjacent knowledges of effective technology and policy implementation to sharpen our insights into future paths and prospects for capacity building.

Across the interviews we conducted, participants displayed a keen awareness of the need to bridge the divide between (1) the current state of play in an inter-regulator environment widely characterised by institutional siloing and organisational resistance

[67] Zahra and George, 2002; Murray et al., 2010; Proctor et al., 2011; Finch et al. 2013.

to change and (2) the increasing pressure to rapidly ramp up readiness across regulatory bodies through inter-organisational cooperation, visionary leadership, partnership building, and collective learning and skills development.

In summary form, these interviews revealed concerns that spanned all the analytical categories of readiness presented above:

- **Interviewees from small, medium, and large regulatory bodies consistently identified readiness gaps across all three levels of readiness (system, organisational, and participant).** Resource gaps, an absence of adequate mechanisms for partnership-building and inter-organisational cooperation, a lack of sufficient skills, expertise and technical facilities, change-resistant norms of practice and leadership, and motivational deficits across organisations were all emphasised as creating barriers to readiness.

- **Perceptions of a lack of organisational readiness figured most prominently throughout the interviews.** Many of the expressed concerns focused on the cultural components of absorptive capacity, change readiness, and receptive context, but several interviewees emphasised more concrete issues like lack of resources and organisational support, as well as a scarcity of buy-in from senior leadership.

- **Gaps in system-level and organisational leadership at the senior level were also widely emphasised.** Interviewees identified a connection between deficiencies at the organisational level (in needed resources, support, skills, and cultural components of readiness) and an absence of strong senior leadership both within regulatory bodies and within relevant governmental departments with cross-regulator remits. This signalled an interesting intersection of readiness transformation needs across participant, organisational, and system levels: individuals in leadership roles were seen to require technical and sociotechnical upskilling to bolster their cognitive participation and to cultivate pro-innovation attitudes and change readiness. In turn, this was viewed as a precondition of appropriate resource allocation and the stewardship of cultural transformation at the organisational level as well as proper and sustainable external support and inter-organisational collaboration at the system level.

- **Interviewees stressed the need for developing strong mechanisms for inter-organisational cooperation and partnership building in the ends of collective learning, resource pooling, and sharing expertise, training, and skills development.** Interview participants stressed the connection between readiness and the kinds of interorganisational cooperation and partnership building. On the inter-organisational plane, interviewees underlined the desiderata of co-cultivating (1) shared understandings, vocabularies, best practice protocols, and common knowledge to enable accelerated collective learning, (2) shared training and skills development programmes across regulatory bodies from senior level down, (3) shared expertise and advice to supplement in-house capacity, (4) shared tools and data science capability that could be made accessible to all regulators, and (5) cross-regulator career development opportunities and secondment regimes to battle tendencies of institutional siloing. A need to build infrastructures for interorganisational capacity building, sharing, and collaboration was also seen to accompany this demand for cross-regulator cooperation.

Table 5 presents the main aspects of readiness that interviewees emphasised along with a representative quote from individual interviews.

Table 5: Aspects of Readiness Emphasised in Interviews

Readiness Level	Readiness Category	Aspect of Readiness	Illustrative Quotation
System Readiness	Partnership building	The success of a technology or technology policy innovation will be affected by the degree to which meaningful partnerships can be formed and cultivated between organisations, community groups, and affected individuals, so that the innovation is cooperatively shaped and collectively monitored for quality.[68]	*"Although we've invested a significant amount... it's still not in the orders of magnitude that you might expect, that colleagues in Ofcom or CMA might have, my thinking was well, what we need is an essential core unit where we can really leverage the joint capacities and knowledge and skills that others might have, and if there are groups... who are established and have access to what we need, [there should be] an effective way to work together and leverage that while maintaining our regulatory independence."* (Large regulator)
	Inter-organisational cooperation	The success of a technology or technology policy innovation will be affected by the degree to which meaningful and continuous collaborations are undertaken between relevant organisations. These collaborations need to be recursively interactive: there should be a reciprocal responsiveness to feedback and input between actors, which enables organisational learning.[69]	*"I would say, certainly learning from other regulators would be at the top of the list, to try and understand, you know, how they're dealing with this and how they're incorporating AI tools into their regulatory work."* (Small regulator)
	System-level leadership competence	The success of a technology or technology policy innovation will be affected by the degree to which leadership at all levels establishes affirmative goals as well as actively supports and promotes the innovation.[70]	*"I think you need that sort of mentor or some way you can reach... for support outside of the organisation so as we found with the accelerator program, actually we didn't have that."* (Medium-sized regulator)

[68] Mendel et al., 2008; Aarons et al., 2014.

[69] Becan et al., 2018.

[70] Akerlund, 2000; Mancini and Marek, 2004; Moullin et al., 2019.

Table 5: Aspects of Readiness Emphasised in Interviews (cont.)

Readiness Level	Readiness Category	Aspect of Readiness	Illustrative Quotation
System Readiness (cont.)	External support and fidelity monitoring	The success of a technology or technology policy innovation will be affected by the degree to which external support, beyond training and education provided by intervention developers, is available for users. Initial training and internal oversight by organisations are often not sufficient to guarantee implementation fidelity and sustainability.[71]	*"If there was some kind of government scheme or an overarching government software development team that said 'Oh, you need a data science team you're going to need X, Y, and Z tools we can have them set up for you, here is a training schedule and here is your on-site IT experts or your onsite software or your onsite database developer or your onsite architects...' You know we don't have a solutions architect. We don't have a software engineer. We have none of that, so we're having to build that start from scratch, and given that this is something completely new for us there's lots of convincing that we need for this before we can get it."* (Medium-sized regulator)
Organisational Readiness	Absorptive capacity	The success of a technology or technology policy innovation will be affected by the degree to which an organisation is able to build upon a strong knowledge and skills base and assimilate new knowledge into existing practices and capabilities. This is often supported by established mechanisms for sharing and disseminating knowledge throughout the organisation.[72] Challenges to absorptive capacity are posed by excessive workloads, high levels of variation between workers in their training and educational background, and non-specialised roles that demand completion of multiple tasks. [73]	*Internally we've been trying to upskill ourselves already to meet the needs of those who are writing the new regulatory codes—those that are inspecting the accounts—and so we can audit the codes and the output of the technology that's being used well. And that's proving challenging because that's not knowledge that the [organisation] has previously had."* (Medium-sized regulator)

[71] Sabalauskas et al., 2014; Powell, 2019.

[72] Damanpour, 1991; Ferlie and Shortell, 2001; Grol et al., 2007; Aarons et al., 2011.

[73] Yoo et al., 2007; Ebert et al., 2012; Gleacher et al., 2011; Lang et al., 2015; Nadeem and Ringle 2016; Wenocur et al. 2016; Powell, 2019.

Table 5: Aspects of Readiness Emphasised in Interviews (cont.)

Readiness Level	Readiness Category	Aspect of Readiness	Illustrative Quotation
Organisational Readiness (cont.)	Change readiness	The success of a technology or technology policy innovation will be affected by the degree to which an organisation's members share confidence in their efficacy to implement change, value change as important and beneficial, reject institutional inertia, and share a resolve to initiate, persist, and cooperate in carrying out innovation.[74]	*"The biggest challenge is having an organisation that wants to get [AI] into their hands and use it and engage with it and circumnavigate old ways of doing things or the processes that probably are really painful and very manual and very time consuming, but they have always been done that way so there's a degree of comfort and familiarity, confidence, security that comes from doing it that way."* (Large regulator)
	Receptive context	The success of a technology or technology policy innovation will be affected by the degree to which the norms and shared expectations of an organisation create conditions of openness to change and lower the burdens of compliance and opposing demands. A receptive context is enabled in organisational environments that encourage ingenuity, demonstrate tolerance to novel or unconventional ideas, and accept conceptual risk-taking.[75]	*"The business area just couldn't cope with [our AI web scraping tool], they just couldn't compute [the new scale and speed of the innovation]. [They would say] 'even though you can tell us in a matter of minutes how many websites are not displaying their license number, we're not set up [for that], if you tell us 200 we're not really set up to do anything about that... it doesn't really compute in the business processes.' So that didn't really go anywhere."* (Medium-sized regulator)
	Organisation-level leadership	The success of a technology or technology policy innovation will be affected by the degree to which members in leadership positions steward a cultural environment that is amenable to innovation adoption and take ownership over end-to-end best practices and responsible innovation.[76]	*"The appointment of a chief data intelligence and innovation officer at the top of the shop is so important because you get someone at that senior level who can critique, challenge, and bring that level of insight and acuity that I think is needed in those senior level conversations."* (Large regulator)

[74] Weiner, 2009; Gleacher et al., 2011; Aarons et al., 2011.

[75] Ash, 1997; Aarons, 2011.

[76] Edmondson, 2004; Aarons, 2011.

Table 5: Aspects of Readiness Emphasised in Interviews (cont.)

Readiness Level	Readiness Category	Aspect of Readiness	Illustrative Quotation
Organisational Readiness (cont.)	Innovation appropriate resource availability	The success of a technology or technology policy innovation will be affected by the degree to which an organisation's resource availability is sufficient for the development, implementation, and sustainability demands of the specific innovation they are producing and deploying. Resource shortage may cause a deterioration of service quality and a reduction in availability, which then leads to decreased service initiation and completion.[77]	*"Just as a regulator we've got massive budgetary issues at the moment... and then internal skills, I suppose, as a follow on from that. But, if we have the funding, we could buy in and develop the internal skills, but [that and a lack of commitment from senior leaders are] the key blockers."* (Medium-sized regulator)
Participant Readiness	Positive attitudes about innovation and change readiness	The success of a technology or technology policy innovation will be affected by the degree to which participants have pro-innovation attitudes and a strong belief in the role that an innovation intervention will play in bringing about a needed change. Buy-in about the transformative utility of an innovation from implementers leads to more consistent decisions to adopt the innovation and undergo training in preparation for its use.[78]	*"[Having] confidence... is a space [regulators] felt like they really struggled. There was a degree of risk aversion and in terms of both the financial and reputational risks [related to] the ways in which technology projects can go wrong, so there is definitely some capability building to be done to get regulators to a place where they are confident that they can adopt AI powered solutions..."* (Large regulator)
	Cognitive participation and intervention coherence	Success of an innovation intervention will be affected by the degree to which relevant participants are able to justify and to see the legitimacy of an innovation intervention. When participants grasp that an innovation is a good idea, they are more likely to invest it with commitment. Success will also be affected by the degree to which the implementation of the innovation makes sense to its users, who are then able to invest it with meaning.[79]	*"You know, it is really taking people on... a journey of 'this is the thing, and this is the value, I think I will get from it, and I can see the value in my hands, I can see how it's making my job different.' And, there are going to be points which feel very unfamiliar and quite scary, and there's a language and culture around AI and machine learning that might for me feel quite impenetrable. But let's start to drop those barriers to help people get the tooling into the hands and use them."* (Large regulator)

[77] Weiner, 2009; Murray et al., 2013, Wenocur et al., 2016; Powell, 2019.

[78] Nadeem et al., 2011; Murray et al. 2014; Sigel et al., 2013; Powell et al., 2019.

[79] May, 2006; May et al. 2007; May and Finch, 2009; Murray et al., 2010; Finch et al., 2013.

4.4. Readiness self-assessment tool

Throughout our interviews, it was clear that participants did not have an existing framework to think about the important issues of readiness that were raised in discussions. Motivated by this finding and the desire to facilitate further structured reflection on the topic of readiness, we developed the readiness self-assessment tool described in Section 1.3.3.

The tool was developed to facilitate reflection on regulatory readiness at the organisational and participant level. Therefore, it was developed principally around dimensions of organisational and participant readiness (as set out in Table 5 above). However, two elements of system-level readiness which are within the realm of influence of organisational actors are included within the self-assessment tool: *Partnership* Building and Inter-Organisational Cooperation.

The questions included in the self-assessment questionnaire reflect each of the headings within the summary of readiness table above (Table 5). The final dimension — *Cognitive Participation and Intervention Coherence* — was expanded to focus on key elements of salience identified through interviews: *Training and Skills Development, Knowledge of State-of-the-Art, and Capacity for Gap Understanding.*

The tool was piloted with the organisations represented in our interviews. Each organisation was asked to complete the self-assessment and provide feedback on the experience of doing so.

Responses were received from 7 organisations representing a range of sectors and sizes, as illustrated in Table 6. While the small sample precludes statistical claims or generalisations from the findings of this exercise, the outputs from this pilot phase of the self-assessment tool, in conjunction with the finding of our interviews, provide some insights into the self-reported readiness of regulators.

Table 6: Overview of Organisations Represented in Piloting the Readiness Self-Assessment Tool

Sector	Size of organisation		
	Large	Medium	Small
Horizontal (cross-sector)	1	1	
Communications			
Finance			
Health	1		
Legal and professional services		1	1
Miscellaneous		2	

As illustrated in Figure 1, a range of responses was elicited through the piloting of the readiness self-assessment tool. In most areas, average responses were "3" or below, with "3" representing the mid-range response: "somewhat confident." This points to overall low levels of self-reported readiness across each of the indices. There were particularly low levels of confidence expressed in relation to *Training and Skills Development*; this was also an area in which responses were most consistent across the organisations included. The results resonate with the interview findings, where regulators frequently spoke about the need for greater training and skills development to build and enhance capacities (discussed further in Section 6.5). Importantly, training and skills development relates to both technical and non-technical dimensions of AI and encompasses technical, ethical, policy, and governance dimensions.

The second lowest average response relates to *Absorptive Capacity*, which encompasses organisational ability to draw upon a strong knowledge and skills base about AI, to use and assimilate new knowledge related to AI into existing practices and capabilities, and to have accessible and established mechanisms for sharing and disseminating knowledge about AI throughout the organisation.

Similarly, low average responses were found in relation to *Knowledge of the State-of-the-Art*. This dimension included questions relating to organisations' access to expertise and knowledge to scrutinise adequately and appropriately uses of AI and claims made about regulatory compliance, and to develop and deploy innovative AI regulatory tools.

The highest average responses related to *Capacity for Gap Understanding*. This relates to organisations' existing internal processes to map and understand the risks posed by AI, identify regulatory gaps, and map regulatory options for addressing these gaps.

Figure 1: Summary of Organisations' Responses to the Readiness Self-Assessment Tool

Key for "Level of Confidence:"

5 = Completely confident; 4 = Fairly confident; 3 = Somewhat confident; 2 = Not very confident; 1 = Not confident at all.

While the responses provided by the organisations who piloted the self-assessment tool are not intended to make generalisations about regulatory readiness, the feedback received from the organisations indicates the value of this tool. Organisations who engaged with the self-assessment tool consistently reported that they found this to be a valuable mechanism through which to facilitate discussions across teams regarding current organisational capacities and needs with regards AI. Some respondents reported that the process of completing the self-assessment tool led to nuanced discussions which are not fully represented in the quantitative outputs, but which added considerable value to the teams in facilitating reflection and enabling them to identify their own strengths and weaknesses as well as different perspectives and experiences within the organisation.

Going forward, we envisage this tool being a valuable device to facilitate and inform reflections on regulatory readiness at the participant, organisational, and system-level. Our interviews highlighted the need for developing common understandings of the challenges and opportunities presented by AI and shared approaches to addressing these. Organisational reflection on existing levels of readiness and identification of gaps will be vital to underpin effective approaches to developing readiness at the participant, organisational, and system-level.

5. Capacity building for readiness: *Regulation of AI*

Section at a glance:

- Sets out current challenges faced by regulators in regulating uses of AI;
- Discusses the importance of capacity building to identify and address risks of AI;
- Sets out the role of capacity building to increase the clarity, consistency, and effectiveness of regulatory approaches.

Recent years have brought a steady increase in international attention directed at the role of regulation in ensuring ethical and trustworthy AI practices.[80] However, much of the discussions in this regard have centred on the extent to which AI should be regulated (e.g. through soft or hard law), and there has been comparatively less attention directed at the practical mechanisms and challenges regulators face in this context.[81] Our research addresses this gap by engaging directly with regulators' experiences with the *Regulation of AI.*

In Section 4, we observed some of the ways in which regulators felt that they needed to build capacity to achieve greater readiness levels. In this section, we will explore the specific capacity needs that regulators highlighted when discussing how to regulate the use of AI. Specifically, we elaborate on the capacity needed to help regulators develop shared vocabulary (5.2), map and understand the risk posed by AI (5.3), identify regulatory gaps (5.4), map regulatory options and identify the most effective ways of addressing regulatory gaps (5.5), and anticipate and adapt to future risks and the speed of technological change (5.6).

The view that develops here is that regulatory capacity is not merely needed to mitigate the externalities and potential harms of improperly governed AI technologies. Instead, it can serve as an enabler of the kind of responsible and pathbreaking AI innovation for which the UK is already widely known. Regulatory capacity could bolster the UK's position as a thought leader and pacesetter in responsible AI innovation, but also in the global conversation on AI standards, ethics, and governance.

[80] Key developments include the OECD (2019) adoption of Principles on Artificial Intelligence which suggested that internationally there was a need for harmonised regulations relating to AI, the G20 Ministerial Statement on Trade and Digital Economy (G20 2019), the European Commission's High Level Expert Group (HLEG) (European Commission 2019) ethics guidelines setting out requirements that AI systems, and more recently, the European Commission (2021) proposals for harmonised regulation of AI in Europe.

[81] Armstrong et al 2019.

5.1. The importance of issues that cut across traditional regulatory remits

AI presents challenges for regulators due to the diversity and scale of its applications. Simultaneously, it highlights the limitations of the sector-specific expertise built up within vertical regulatory bodies. **Capacity building, therefore, must provide a means to navigate through this complexity and move beyond sector-specific views of regulation.**

Interviewees in our research often spoke of the challenges of regulating uses of AI technologies which cut across regulatory remits. Some also emphasised that regulators must collaborate to ensure consistent or complementary approaches. This reflects Nesta's recommendation for greater collaboration among regulators to underpin new approaches to "anticipatory regulation."[82]

Additionally, there are instances where firms are developing or deploying AI in ways that cut across traditional sectoral boundaries. Interviewees noted that this can lead to concerns around appropriate regulatory responses.

It is vital that regulators address questions concerning the *Regulation of AI* in order to prevent AI-related harms, and simultaneously to achieve the regulatory certainty needed to underpin consumer confidence and wider public trust. This will be essential to promote and enable innovation and uptake of AI, as set out in the UK's National AI Strategy:

> "Effective, pro-innovation governance of AI means that (i) the UK has a clear, proportionate and effective framework for regulating AI that supports innovation while addressing actual risks and harms, (ii) UK regulators have the flexibility and capabilities to respond effectively to the challenges of AI, and (iii) organisations can confidently innovate and adopt AI technologies with the right tools and infrastructure to address AI risks and harms."[83]

While interest in the *Regulation of AI* is shared across regulatory bodies of different sizes and sectoral remits, there are significant differences in how advanced regulatory bodies are in their work in this area. While some organisations are actively working on firmly established projects relating to AI and regulation (for example, through horizon scanning activities or producing reports and guidance on AI), others consider the *Regulation of AI* as an emerging area of interest. This difference is particularly pronounced when comparing regulators of different sizes. While interviewees at larger regulators typically pointed to particular departments or teams within their organisations who were developing thinking and approaches relating to the *Regulation of AI*, interviewees at smaller or medium-sized regulators typically described AI as an area where work is at a nascent stage.

[82] Armstrong et al 2019.

[83] Office for AI, 2021: 50.

5.2. Developing a shared vocabulary across regulators

An effective regulatory regime requires consistency and certainty across the regulatory landscape. This gives regulated entities the confidence needed to pursue the development and adoption of AI while also encouraging them to incorporate norms of responsible innovation into their practices.

Conversely, discrepancies in messaging around the *Regulation of AI* risk lowering industries' confidence insofar as such deficits in communication create doubts around compliance, controls, and process management. Regulatory certainty about the governance of AI is needed both within and across sectors to enable an environment in which the full benefits of AI technologies can be realised.

Currently, there is no single definition of AI to form the basis of regulation.[84] Therefore, **there will be value in developing conceptual clarity and common language around AI.** A lack of lucidity in this regard may lead to uncertainty or inconsistency and can negatively impact stakeholders' confidence to develop or deploy innovative AI technologies.

This was a common observation in interviews, with many interviewees noting the need to develop common language and shared understandings around AI. An interviewee at a large regulator noted common language is needed to ensure consistency even where regulators' responsibilities and remits vary:

> "Although there are obviously differences between different regulators in terms of scope and remit, there must be some common requirement for non-specialists to understand [AI], to get people speaking the same language if nothing else, because that's one of the major problems at the moment, people are talking about the same thing but in different ways."
>
> (Director, large regulator)

A common language can likewise expose the gaps in knowledge and regulatory understanding in specific regulatory bodies, and do this in a way that then draws on the experience and knowledge of other regulatory bodies to plug such gaps. This has also been identified by the Ada Lovelace Institute, AI Now Institute, and Open Government Partnership in their joint report on Algorithmic Accountability, where they noted the importance of establishing shared terminology across government departments.[85]

5.3. Mapping and understanding the risks posed by AI

In developing appropriate and effective regulatory responses, there is a need to fully understand and anticipate risks posed by current and potential future applications of AI. This is particularly challenging given that uses of AI often reach across traditional regulatory boundaries.

[84] Buiten, 2019.

[85] Ada Lovelace Institute, AI Now Institute & Open Government Partnership, 2021.

AI systems are increasingly being used by organisations of all sizes and in all sectors. This ranges from major tech firms such as Google or Facebook to small businesses that buy machine learning tools developed by third parties (e.g. sold via Amazon Web Service Marketplace).[86] One interviewee at a large regulator stated that this can pose particular challenges for regulators who need to develop dynamic approaches to engage with firms of all sizes:

> "I think that... we are regulating into an environment that is very complex, [it ranges] from one man bands trading on the high street all the way through to global firms. How the AI is even conceived of in some of those entities varies enormously, and so I think that does pose a particular set of challenges, there's not going to be a one size fits all."
>
> (Technology specialist, large regulator)

Having a comprehensive and consistent view of the ways in which AI technologies are being deployed is beyond the scope of any single regulatory body. While individual regulators have specific expertise relating to their particular remits and sectors, they may not be well-equipped to anticipate and identify the various risks of AI technologies, as these cut across traditional sectoral boundaries. Considering the risks posed by AI applications solely within particular sectors may lead to gaps in understanding. Moreover, there is a risk that this can enable AI to be developed or deployed "on the edges of existing regulatory perimeters" or even to fall through gaps in regulation entirely.[87] Currently risks and potential or actual harms are all-too-often characterised as unique, individual risks. This overlooks the system-wide and structural nature of risks posed by AI innovation. **A more systemic and synoptic view of risks posed by AI requires thinking across regulatory boundaries and remits.**

Interviewees in our research consistently emphasised their common interests with other regulators and noted that they were likely to face common challenges with organisations that operate across different sectors. These common interests and challenges relate to AI's technical and socio-technical aspects. For example, some interviewees described challenges of needing to develop in-house expertise in order to be able to scrutinise the range of AI uses, while others discussed challenges around establishing ethical standards or defining expectations around the explainability or transparency of AI. Given that these challenges were recognised as being faced by regulators across all sectors, interviewees typically noted that there is considerable value in collaboration to address the common problems through joint approaches.

From the interviews, it was evident that there is considerable commonality among regulators with regard to the risks they perceive as emerging from the production and use of AI systems. A particular area of concern expressed across the interviews related to transparency and explainability, and the extent to which regulators are adequately equipped to scrutinise AI (particularly uses of machine learning). This highlights **the importance of regulators having access to state-of-the-art knowledge** in order to be able to monitor and scrutinise claims made about the design, deployment, and operation of AI technologies or systems.

As such, while there may be some sector-specific risks, there is a clear need to identify and address cross-sectoral risks and knowledge gaps through horizontal approaches.

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[86] CMA, 2021.

[87] Black and Murray, 2019: 14.

5.4. A collaborative approach to identify regulatory gaps

Our interviewees highlighted the importance of collaboration between regulators to identify current and future gaps in regulation and regulatory practices. These gaps may relate to:

- Law and rules (areas not covered in existing legislation);
- Prioritisation (gaps arising from differences between individual regulators' policy objectives and available resources) and execution (gaps due to siloed approaches to regulatory practices and enforcement).

Risks posed by AI systems can cut across the remits of different regulators or can be addressed by tools at the disposal of more than one regulator (e.g. data protection and competition policy). Collaboration is thus crucial for an informed and comprehensive understanding of current regulatory gaps in relation to AI, be it in terms of policy, engagement, or enforcement.

5.4.1. Gaps in law and rules

As innovation is bringing ever new AI capabilities, and AI technologies are being deployed in an increasingly diverse range of products and services, there is a need to review existing law and rules to ensure that these remain fit for purpose and can address the risks associated with new AI technologies. As has been suggested by by the Institute for the Future of Work (2020), this may demand "a review of existing laws and governance structures, to make sure that they address and advance these underlying purposes in a changing world, rather than straining existing laws and regulatory structures to 'fit' new technologies."[88]

During our interviews, interviewees pointed to particular pieces of legislation which were considered to be out of date, for example:

> "The Consumer Protection Act was I think last updated in like 1987 and around liability [...], but that is out of date, and that needs updating not specifically necessarily for AI but for [...] new things like connected devices, and the kind of the new focus on this is the software, the device, rather than the kind of mechanical, physical features of it."
>
> (Technical specialist, medium-sized regulator)

As the pace of innovation continues to accelerate, there remains a need to continuously review and monitor the scope and relevance of existing law and rules in relation to new AI technologies and the changing ways in which they are deployed.

Given that different regulators have sector-specific knowledge of legislation, there is value in cross-regulator discussions and collaborative exploration to identify gaps in law and rules across sectors.

[88] IFOW, 2020: 7.

5.4.2. Gaps in prioritisation and execution

As different regulatory bodies follow different priorities, there is a risk that particular uses of AI may fall through gaps in regulation,[89] or that specific risks of AI will not be "owned" by any particular regulatory body. Therefore, greater collaboration among regulators is needed to ensure consistent and adequate regulatory action and intervention. This may require taking a decentred view of regulation to look beyond individual regulatory bodies and to "emphasise instead the multitude of actors which constitute a regulatory regime or regulatory network in a particular domain, and the interactions within and between them."[90]

Several interviewees noted that there might be gaps or inconsistencies in regulatory approaches due to the siloed nature of the regulatory landscape. This was viewed as leading to missed opportunities to learn from the experiences and insights of other regulators. Such a siloing dynamic also meant that many interviewees did not feel confident that they knew what other regulatory bodies were doing in relation to AI.

Moreover, there was said to be friction, at times, between the remits and activities of different regulators. An interviewee at a large horizontal regulator stressed that addressing these areas of friction will require regulators to collaborate more:

> "It's hard to know how to balance that friction, and I don't think there's anything inherently contradictory in the remits of the regulators, but there needs to be further conversation to get us [on a] line that is consistent with both approaches."
>
> (Policy role, large regulator)

Additionally, as firms are operating across sectoral boundaries or providing services (e.g. web hosting or data processing) that underpin services within diverse sectors, there is an growing risk of duplication of effort among regulators. This is particularly important in relation to the large tech firms, with which regulators across all sectors increasingly need to engage. As Nesta has contended, "coordinated national and supranational initiatives are becoming more important" in relation to the regulation of large tech firms.[91]

Interviewees shared concerns around the *Regulation of AI* due to the increasing power of large tech firms. For example, one interviewee from a large regulator stated:

> "I think we've kind of agreed there is a need for new approaches to regulation. We are concerned that AI, the powerful use of AI, is in the hands of a relatively small number of large online firms. I mean they're not the only people using it, but they are able to gain because of their market position, gain particular advantage with it."
>
> (Policy role, large regulator)

[89] ibid.

[90] Black and Murray, 2019: 9.

[91] Armstrong et al 2019: 17.

5.5. Identifying the most efficient and effective ways of addressing regulatory gaps

Once gaps have been identified, **regulators are faced with the need to scope out options and find the most efficient and effective ways of addressing regulatory gaps.** The CMA note that several of the harms identified in their report on algorithmic harm overlap and may be tackled through a combination of approaches and legal tools, or in collaboration with other regulators.[92] These include the Information Commissioner's Office, Financial Conduct Authority, Ofcom, and the Equalities and Human Rights Commission. Collaboration among regulatory bodies across sectors will be essential to identify appropriate and effective measures to address gaps in regulation.

Across our interviews, interviewees from regulators in various sectors noted organisational interest in scoping out potential new regulatory approaches. There were a number of drivers noted for this. One driver was the changing regulatory context following Brexit (as has also been noted by DCMS).[93] Another significant driver was the novel uses of AI and the increasing diversity of products or services underpinned by AI technologies. Finally, there were additional concerns that AI technologies are being used in new sectors which are not covered by relevant legislation.

5.6. Anticipating and adapting to future risks and the speed of technological change

In identifying and addressing risks relating to AI, it is important to take an anticipatory approach in order to ensure that regulatory responses are fit for purpose not only in relation to current applications of AI, but also to future uses. This requires regulators to be agile in their approaches and to understand how state-of-the-art AI is being developed and used by firms.

The required technical know-how and foresight can pose significant difficulties for regulatory bodies, particularly those who have not traditionally engaged with new and rapidly evolving technologies. The weight that many regulators reasonably give to existing norms of regulatory practice, enduring regulatory cultures, and administrative stability is being challenged by the momentum of AI innovation and technological change.

The need to stay ahead of the far-reaching societal risks effected by accelerating and swiftly scaled AI innovation is illustrated by examples ranging from algorithmic targeting to AI-enabled biometric surveillance. As recent developments in these areas have shown, regulators need access to cutting-edge expertise in AI in order to be able to ask timely, relevant, and appropriate questions of regulated entities, and to anticipate and manage potentially harmful outcomes.

As will be discussed further below, many regulators currently lack expertise relating to the technical understanding of AI and data science. Given the comparatively faster

[92] CMA, 2021a.

[93] DCMS, 2021.

pace of the development of industry knowledge and expertise compared with that of the public sector, keeping abreast of developments in AI technologies and their commercial applications may be a significant challenge for regulators — particularly small or medium-sized regulators.

Moreover, to be able to adequately and effectively scrutinise or investigate the uses of AI, regulators must be equipped with state-of-the-art knowledge about current, and likely future, uses of AI. Cutting-edge knowledge is needed for assessing whether claims made about the uses of AI technologies and their compliance with rules and laws are accurate and to ensure that regulators place appropriate and realistic requirements (e.g. relating to transparency) on regulated entities. This may require **not only keeping pace with innovation, but also being one step ahead of it, enabling regulators to take an anticipatory, rather than a reactive, approach to regulation.**

In this context, one interviewee at a large horizontal regulator stressed that the need to anticipate future uses of AI was a driver behind the organisation's approach to developing data science capabilities:

> "In my mind, I'm always thinking if there was another Facebook or Cambridge Analytica, how would we approach it differently, how could we be more effective, what insights would we discover if we had more data scientists now."
>
> (Policy role, large regulator)

6. Capacity building for readiness: *AI for Regulation*

Section at a glance:

- Sets out current barriers and facilitators for regulators' uptake of AI technologies;
- Identifies areas of capacity building to bolster regulators' ability to use AI for regulatory purposes.

In this section, we set out capacity building needs to establish readiness across the regulatory landscape in order to realise the enormous potential of *AI for Regulation*.

We begin by reviewing current experiences of regulators in this area and setting out the main facilitators and barriers to developing or deploying *AI for Regulation* identified by our interviewees (6.2). We then discuss the role of capacity building in addressing the barriers and developing regulatory readiness in *AI for Regulation*. We begin our discussion with the areas which are likely to require least resource to establish, and move on to areas that are increasingly complex. As we do so, we set out the need for capacity building to share knowledge and best practices on uses of *AI for Regulation*, as well as the development of internal data science capability (6.3); to share knowledge and best practices for governance mechanisms relating to *AI for Regulation* (6.4); to attract and retain talent within regulators (6.5); to develop shared training and skills development (6.6); to provide shared resources (6.7); and to provide shared tools or tool prototypes (6.8).

Our analysis identifies the need to establish system, organisational, and individual-level readiness through cross-regulator collaboration and the sharing of best practices. Addressing this need is crucial if regulators are to realise the full benefits of *AI for Regulation*.

6.1 Regulators' current experiences in *AI for Regulation*

Regulators have varied capacities in relation to data science and AI, with large regulatory bodies generally having more capacity than small- and medium-sized regulators. Interviewees provided a range of responses when asked to describe current internal capacities relating to AI and/or data science. A small number of interviewees described their organisations as having well-developed capacities pertaining to AI and data science, as well as established teams focusing on these areas. These interviewees typically noted that their organisations were "ahead" of other regulators, and that their advanced capabilities had been driven by commitment and enthusiasm from senior leadership. For example, one interviewee stated:

> "I think what we have seen over the last two or three years is that there was, certainly at senior levels in the organisation, a real understanding of the value that AI could bring for us as a regulator, and that was shown by the level of investment that was made from a very early start."
>
> (Technology role, large regulator)

Conversely, some interviewees noted that their organisations had very limited capacities in AI or data science. In particular, many interviewees indicated that the understanding of AI was likely to be very low across their organisations. Lack of understanding — or misunderstanding — of AI often leads to concern about AI and, at times, over-excitement about AI. Describing the challenges of having to develop new AI tools while people have unrealistic expectations about what AI can offer, one interviewee stated:

> "We're in that kind of juncture where people have enough understanding that they think about it, but not enough understanding that they understand the limitations."
>
> (Innovation role, medium-sized regulator)

While some organisations have a "hub and spoke" model with data scientists or technical specialists distributed across the organisation (as at the FCA, see Section 3.3 above), a common theme among many of the interviewees, particularly at larger organisations, was that there is limited knowledge or understanding of AI across their organisation, with pockets of expertise within particular teams.

Most interviewees felt their organisations needed to do much more to develop capacity in AI. They noted that it is crucial for regulators to have the knowledge and skills to interrogate AI systems or decisions made with the assistance of AI. However, developing adequate capacity related to emerging technologies or novel uses of AI was a significant and ongoing challenge. Given the complexity of developing algorithmic systems, organisations must develop internal capacities, both through harnessing internal expertise located across the organisation and through engaging with other organisations.[94]

When asked what they considered to be most important factor for developing or strengthening capacities relating to AI and data science within their organisations, interviewees' answers reflected a range of considerations. Common priority areas mentioned were: improving understandings of AI, identifying opportunities to use AI effectively within the organisation, and recruiting data scientists and technical specialists. Additionally, interviewees noted that raising awareness of how uses of AI might benefit the organisation is important.

Reflecting on the diverging internal data science and technical capabilities among regulatory bodies, interviewees described varying levels of experience and expertise in developing and/or using AI as a regulatory tool. While some interviewees stated that their organisations did not currently use any form of AI as a regulatory tool, several interviewees did provide examples of methods and techniques being trialled and implemented. Existing uses of AI within regulatory bodies were often described as not "particularly sophisticated." In several interviews, participants described their

[94] As has been suggested by Ada Lovelace Institute, AI Now Institute, and Open Government Partnership, 2021.

organisations as "experimenting in" or "dabbling with" AI methods. This suggests that at least some organisations are at an early stage in the journey to using AI systems for regulation. Moreover, many interviewees did not appear confident in discussing approaches or techniques.

Where interviewees did describe the ways in which their organisations had adopted, or experimented with, AI technologies, a range of experiences were noted.

Positive experiences were typically related to **organisational commitments to innovation and organisational enthusiasm** to experiment with new methods. In particular, several interviewees noted that their organisations were committed to becoming "data-driven" or "data-enabled." Interviewees also expressed that, in addition to demanding a commitment to innovation, the successful adoption of AI technologies requires a **problem-solving mindset** within the organisation. **Openness to new modes of working** and an ability to inspire people within the organisation to do things differently are important factors underpinning the successful adoption of new AI tools.

One interviewee noted that learning from the experiences of other regulators is a valuable way of inspiring people to be open to new modes of working:

> "People like to think: 'But this works for me so I'm just going to do it the same way that I am used to,' and so I think there's a bit [of work to do] about inspiring people, and learning from other regulators is a great way of inspiring people to think about things a bit differently."
>
> (Innovation role, medium-sized regulator)

The importance of organisational culture and commitment to innovation was also stressed in interviewees' discussions of challenges related to the adoption of AI technologies. For example, some interviewees described their organisations as being **resistant to change** or risk averse, and viewed these attributes as barriers to developing a pro-innovation culture. This is illustrated by the following quote from an interviewee whose role involves developing new technologies within a large regulator:

> "The biggest challenge is having an organisation that wants to get [AI tools] into their hands and use them and engage with them and circumnavigate old ways of doing things or the processes that probably are really painful and very manual and very time consuming. But they have always done things that way so there's a degree of comfort, familiarity, confidence, and security that comes from doing it that [traditional] way."
>
> (Technology role, large regulator)

Resistance to change was also thought to be related to a lack of understanding of AI and, in some instances, f**ear or nervousness about AI.** Moreover, in some organisations, there was a sense that the organisation was **not sufficiently up to speed with new technologies**, in general, to be able to embrace using AI in particular. Examples included organisations being late adopters of digital communications platforms or mobile devices.

Perceived cost was cited as another reason why regulatory bodies do not currently use AI technologies. Costs are a particular concern for regulators, given their funding

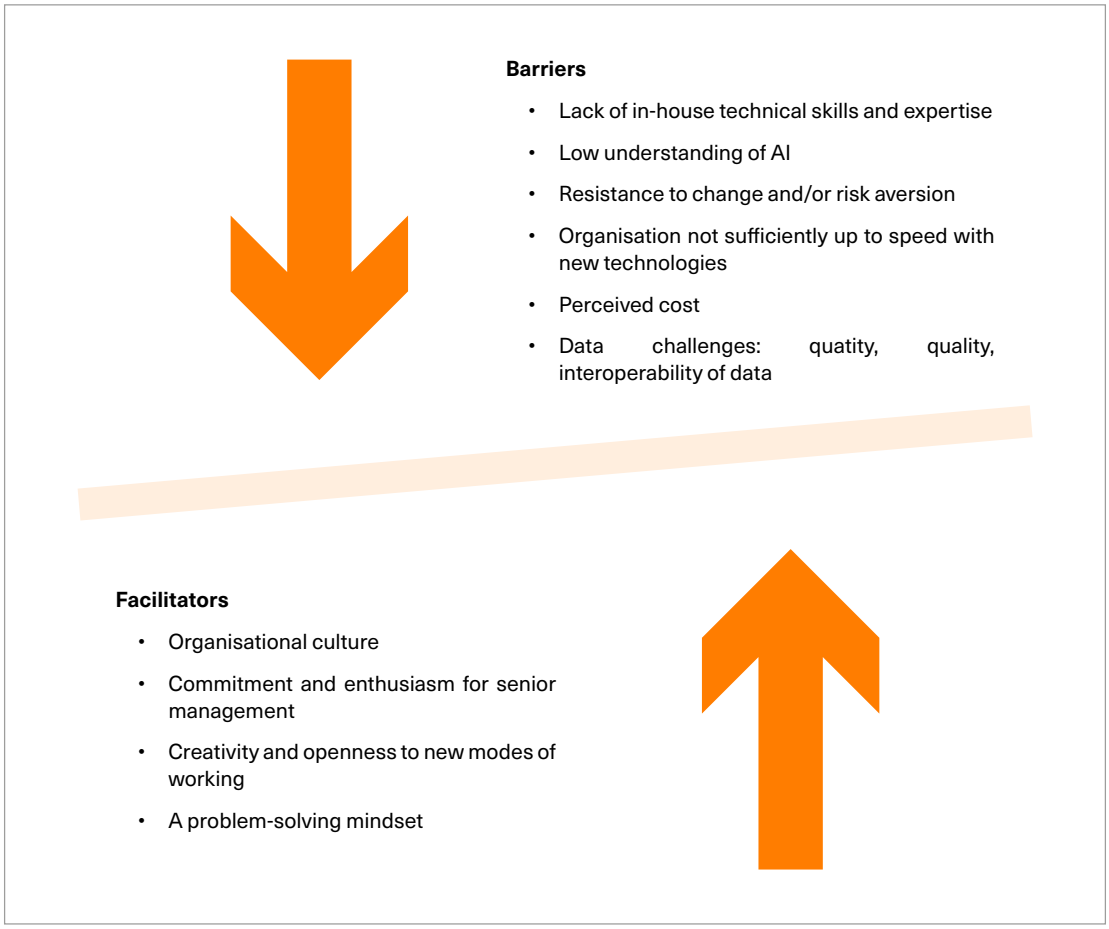
structures. However, interviewees also recognised that perceptions might deviate from actual costs. As such, this is an area where there may be value in sharing experiences among regulators and building understanding around the financial commitments required to develop and deploy new AI tools or systems.

Another common area of concern expressed across the interviews related to **data-related challenges** as barriers to developing and implementing AI solutions. For example, interviewees often commented that the data they collect and/or have access to is of **insufficient quality** or that using it productively would require substantial work to clean and process the data.

The **quantity of available data** was also often described as a barrier to developing or deploying AI solutions. Interviewees noted that they considered it essential to have larger volumes of data or a steady stream of data to develop or deploy AI tools.

Finally, interviewees expressed concerns regarding the **interoperability and standardisation of data**, noting that existing datasets often lack a common format, resulting in differences and inconsistencies that stand in the way of possible data uses.

Figure 2: Facilitators and Barriers to Developing or Deploying AI for Regulation



6.2. Knowledge around uses of AI and the development of data science capabilities

Having explored the current state of play in regulators' use of AI as well as the challenges they face in building the capacity to develop and deploy AI tools, we now move to the question of capacity building needs to support regulatory bodies in their adoption of AI technologies.

Previous reports have pointed to the value of collaborative practices and initiatives to share best practices around innovative regulatory approaches and challenges in developing and deploying new technologies within regulatory contexts.[95]

Interviewees in this research were enthusiastic about the value and importance of potential new opportunities to learn from other regulators' experiences with AI, particularly from those who were more advanced in terms of data science and AI capabilities. As an interviewee at a small regulator suggested, when describing the potential value of learning from experiences of larger or more advanced regulators:

> "I think with other regulators, in particular, it's really interesting to know a bit more about kind of how they've built up their data science capabilities and how they use it day-to-day. So I guess looking at the CMA, for example, and how they've built up their data science function, it's interesting to see a really tangible example."
>
> (Policy role, small regulator)

Interviewees noted that they would benefit from understanding the practical steps that other regulatory bodies had taken to establish their data science teams or AI capabilities and what considerations or challenges need to be addressed in doing so.

6.3. Knowledge and best practices around governance for regulators' use of AI

The prospect of using AI for regulatory purposes raises the question of how the internal governance processes of regulators need to be adjusted to ensure that such technologies are used responsibly. Of particular relevance to this question are the potential changes needed in risk management and auditing functions to accommodate new AI capabilities. Areas of organisational "fitness" that are needed for the responsible adoption of AI include established processes of quality assurance and compliance, but also new ethics protocols and mechanisms that go beyond these processes.

Given that regulators across sectors are increasingly grappling with the same challenges of responsible adoption, and are seeking to develop internal governance structures and controls relating to the application of *AI for Regulation*, there can be significant value in developing common approaches and resources.

Many interviewees expressed interest in developing best practice for the governance of AI tools used across regulators. In this regard, it was felt that shared resources

[95] E.g. Ada Lovelace Institute, AI Now Institute, and Open Government Partnership, 2021; Armstrong et al., 2019.

could be important for establishing cross-regulator best practice regimes. Many of our interviewees contended that **best practice guidance needs to go beyond principles and be practical as well as actionable.** As an interviewee from a large regulator noted:

> "General best practice sharing is good, but needs to be actionable and goodness knows, there are enough sort of best practice sharing for that in the world and trying to make sure that they're actually something actionable is quite important."
>
> (Director, large regulator)

6.4. Attracting and retaining talent within regulators

Within our interviews, there was widespread concern around the difficulty of attracting and retaining data science and AI talent within regulators.[96] One interviewee noted that it can be particularly difficult to recruit people with state-of-the-art knowledge in innovative applications of AI:

> "There is a limited number of people globally, who really understand what is happening with these sorts of developments. How likely is it that we'll be able to attract and retain those individuals and how much value would it be for them to join the [organisation]?"
>
> (Policy role, large regulator)

Interviewees often noted that regulators need to compete with private sector tech firms to attract talented data scientists, but that they lack the resources to offer comparable salaries. In addition to the difficulty in competing on salaries, regulators were also perceived to lack the degree of innovativeness needed to attract talented data scientists and AI experts, who seek out the kind of exciting and diverse projects that are far more prevalent in the private sector.

This is also related to a concern that regulators may not have sufficient data to provide data scientists with enough interesting or varied work.

The challenge of attracting and retaining AI and data science talent was a prominent theme throughout all the interviews, highlighting that this is a major concern shared across regulators of all sizes and in all sectors.

6.5. Training and skills development

The majority of our interviewees stated that their organisations currently lack training and capacity development programmes relating to AI or data science. Some interviewees were confident in stating that there was no training on offer within their organisations, while others noted that they were unaware of any training available but that it might be on offer in different parts of their organisations.

[96] A survey conducted by Ipsos Mori has found that this is also a concern across the wider UK workforce (Dabhi et al 2021).

There is a clear desire for greater training and skills development relating to AI and data science. This was seen as a priority by many of our interviewees. The training and skills development needs identified are important to equip regulators both in relation to *AI for Regulation* and the *Regulation of AI*. Importantly, training and skills development were emphasised as being vital across the whole organisation, and it was recognised that this needs to reach all levels of seniority, including senior management teams. **Building understandings relating to AI at senior management levels was seen to be important for establishing organisational readiness and commitments to develop new approaches.**

It should be noted here that regulators' training needs in relation to AI go beyond technical requirements. **It is important for regulators to have up-to-date knowledge and understandings of both technical and non-technical dimensions of AI.** This includes policy, ethical, and commercial dimensions of AI design, development, and implementation. With regard to ethical considerations, in 2020, the House of Lords "AI in the UK" report stated that: "The ICO must develop a training course for use by regulators to ensure that their staff have a grounding in the ethical and appropriate use of public data and AI systems, and its opportunities and risks."[97] Our research has demonstrated that there is demand for this training by regulators across sectors.

6.6. Building capacity through sharing resources

An area of particular interest across the interviews was the potential for a model of resource sharing which facilitates the exchange of technical expertise between organisations. This could involve a **shared pool of data scientists** who provide ad hoc advice or can be brought into different regulatory bodies to work on particular projects. This suggestion of a pool of data scientists may reflect the proposal included in the DRCF's plan of work for 2021 – 2022 to create a shared centre of excellence that would serve as a hub for specialist expertise and resource sharing among regulators.[98] A similar existing model is the French Expertise Centre for Digital Regulation (PEReN) (see Box 1).

A shared pool of data scientists would be an effective and efficient use of regulators' limited resources. Across all the interviews, the creation of a shared pool of data scientists was viewed as being very valuable, particularly for smaller or medium-sized regulators.

In some instances, a regulator might need to bring in a team of data scientists to work on substantial projects. However, in other cases, it might only require one or two data scientists to work on a particular objective or challenge.

Importantly, and as noted by our interviewees, the expertise that is needed is not always purely technical or focused on data science. As such, a **shared pool of resources should also provide access to other forms of expertise, including state-of-the-art knowledge relating to governance, ethics, or commercial applications of AI.**

[97] House of Lords, 2020.

[98] DRCF, 2021.

Box 1: PEReN – the Expertise Centre for Digital Regulation, France

Launched in the autumn of 2020, PEReN is a French national competency centre that provides data science capacity for regulatory bodies in relation to the regulation of digital platforms.

PEReN responds to requests from French regulatory bodies in areas relating to digital regulation. As a national competency centre, it is under the authority of the French government and is attached to three French ministers: Minister for Culture, Minister for the Economy, and Secretary of State for the Digital Economy. These ministers set the strategic priorities for PEReN.

The support that PEReN provides can range from providing resources, people, analysis, or code. Its main function is providing expertise. PEReN also conducts research relating to the regulation of digital platforms and has a partnership with INRIA (National Institute for Research in Digital Science and Technology). Regulatory bodies can request specific pieces of research.

The PEReN team has around 16 members, most of whom are data scientists, with ongoing recruitment for additional positions.

Secondments could be an alternative, or complement, to a shared pool of data scientists. Secondments would move people between regulatory bodies, and other relevant organisations with technical expertise, to work on particular projects. The DRCF's plan of work for 2021 – 2022 includes a proposal to use "pro-active and flexible" secondment programmes between regulators.[99] It is suggested that the DRCF members could engage with the UK Regulators' Network (UKRN) secondment working group to establish secondments focused on the skills and roles specific to digital regulation. **Secondments are a potentially valuable means of both increasing efficiency and developing internal capacities.**

Interviewees noted that secondments could also be a potential mechanism to increase the attractiveness of data science careers within regulatory bodies by ensuring a level of interest and variety in the work on offer. For example, an interviewee at a large regulator stated:

> "I think we're going to all face challenges in recruiting and retaining people with these kinds of skills, and even if we do get their attention, if you do get people through the door, they're going to be much sought after. And so we need to think long term about how we will retain them. [... It may be that through secondments they] feel like they're developing their careers by applying their knowledge and understanding and expertise in a number of different areas."
>
> (Director, large regulator)

While interviewees widely agreed that secondments between regulatory bodies would be very valuable, one interviewee spoke candidly from their point of view as a team

[99] DRCF, 2021.

manager that this could cause some problems for managers of teams from which seconded individuals departed:

> "If you're a manager, you've got people coming in and out of your team, it's a real pain to manage your workload, so [...] actually as a team manager that just causes me more headaches."
>
> (Enforcement, medium-sized regulator)

In order to make secondments most effective, **regulators need a system through which they can advertise opportunities or organisational needs that people with relevant skills and expertise can easily find.** This would be valuable in relation to both technical and non-technical roles.

6.7. Building capacity by developing shared tools

As well as sharing resources, the development of shared tools or tool prototypes was an area of interest for interviewees. Regulators are increasingly developing and deploying AI tools themselves, (for example, web scraping tools; NLP for triaging consumer complaints; tools to predict the likelihood of infringements to inform the allocation of supervision and enforcement resources; and tools to scrutinise the deployed use of algorithms in live environments).

Many interviewees considered the development of tools that could be used by different regulatory bodies to be a good idea. In particular, some interviewees commented that where regulators are funded by public money any tools developed should be shared and used in ways that create wider public benefits.

While acknowledging the possible benefits of shared tools, interviewees also noted that a general-purpose tool may not be able to accommodate the particular needs that arise in the context of individual regulators. As such, **developing shared tools will require consideration of where there are common needs across regulators and where there are meaningful differences that might limit the value of shared tools.**

Interviewees also stressed that currently there is a tendency for regulators to want to keep things "in-house." Doing so is perceived to have benefits in terms of the efficiency gained by retaining ownership and control over design and development processes. Where regulators develop tools in-house, they would likely seek assurance that they maintain ownership and access if these tools were to be made available to other regulators. It was also noted that due to the financial and resource investment required to develop a new tool, regulators may be reluctant to share the fruits of their labours without a clear benefit to themselves for doing so.

A common sentiment expressed by interviewees was that shared tools would be a "nice-to-have" but are not an immediate priority area. Interviewees tended to stress that other resources (including sharing experience and expertise rather than specific tools) were a higher priority and of more immediate interest. Indeed, many interviewees felt that shared tools would be of limited value until organisations had increased their knowledge and capacities relating to AI in order to make good use of available tools. For example, an interviewee at a medium-sized regulator said:

> "I think it could definitely be helpful to have shared tools, but I think there's quite a lot of the basics that are missing across the regulators first before you know, before you could make use of a lot of those tools."
>
> (Innovation role, medium-sized regulator)

This highlights the importance of establishing readiness to underpin and enable adoption of AI. Moreover, **before regulators are able to share tools, there needs to be an infrastructure to enable sharing and collaboration more generally** (for example, data governance arrangements or cloud-based servers for sharing information). Interviewees recounted previous experiences where they had attempted to collaborate with other regulatory bodies or public sector organisations and had been unable to do so due to complications in establishing data-sharing and joint working practices.

In sum, **shared tools are of significant interest** across the regulators represented in our interviews. However, this interest was tempered by concerns around practical considerations (e.g. ownership, accessibility, and control of shared tools) and organisational readiness to benefit from available tools.

7. The case for a "common capacity" approach to advancing readiness

Section at a glance:

- Sets out the value of coordination, knowledge sharing, and resource pooling to advance AI readiness;
- Justifies adopting a unified approach that extends across the *Regulation of AI* and *AI for Regulation*;
- Provides an overview of existing collaborations and their limitations;
- Considers potential models for realising a more comprehensive approach to common regulatory capacity for AI.

In this section, we distil the findings of the earlier sections to propose a model for capacity building. We advance the ideas put forward by many interviewees that developing some kind of shared capacity could help with their efforts to achieve readiness at the individual and organisational level. We also move beyond the organisational level to think about how shared capacity could contribute to readiness at the system level. We examine the role that such a "shared" or "common" capacity model — the use of mechanisms and structures that enable coordination, knowledge sharing, and resource pooling — can play in advancing AI readiness across the UK's regulatory landscape.

The importance of individual aspects of common capacity in achieving regulatory readiness in relation to AI has been highlighted elsewhere. For example, DCMS's recent policy paper on Digital Regulation states that "digital regulators [must be able] to work effectively together to deliver coherent outcomes for industry and consumers."[100] Recent years have also seen the emergence of several collaborative initiatives between UK regulators that focus on AI- and technology-related questions, reflecting a recognition of the need for and value of joint approaches to addressing issues of regulatory capacity.

This section seeks to provide a comprehensive analysis of the role that forms of coordination, knowledge sharing, and resource pooling can play in advancing AI readiness. It draws together the various dimensions of capacity building discussed in Sections 5 and 6, taking into account the needs of all relevant regulatory bodies.

We begin by setting out in Section 7.1 the powerful contribution that common capacity can make to addressing the capacity building needs identified within Sections 5 and 6. We then highlight in 7.2 the case for a unified approach to delivering common regulatory capacity for AI that extends across the areas of *Regulation of AI* (Section 5) and *AI for Regulation* (Section 6). Next, we provide an overview of existing collaborative initiatives

[100] DCMS, 2021.

and discuss the gap between the scope of these initiatives and the full potential contribution that common capacity can make to advancing AI readiness (7.3). Finally, we examine possible concrete models for delivering such a unified programme of common capacity that would both complement and go beyond existing initiatives, addressing the challenges that regulatory bodies face in the current landscape (7.4).

7.1. The potential of common capacity to address existing needs

As discussed in Section 3, AI innovation has a horizontal, cross-sectoral character, which gives rise to shared and overlapping sets of questions and challenges for regulators. Common expertise, skills, and resources can play a key role in enabling regulators to respond to the challenges and opportunities that AI presents.

Sections 5 and 6 demonstrated that there are capacity building needs and readiness gaps across regulatory bodies of all sizes and in all sectors. The interviews also showed widespread interest in the possibilities for common capacity. They emphasised the value of developing strong mechanisms for inter-organisational cooperation, partnership building, coordination, sharing expertise, collective learning, training and skills development, and resource pooling.

Such mechanisms could make a crucial contribution to advancing readiness across all areas of capacity building in the *Regulation of AI* and *AI for Regulation*.

7.1.1. The value of common capacity in the *Regulation of AI*

Capacity needs in the *Regulation of AI* are often difficult to respond to for individual regulatory bodies acting on their own. Examining and addressing them effectively requires conceptual, analytical, and strategic perspectives that extend beyond traditional regulatory remits, necessitating different forms of coordination and collaboration across the regulatory landscape.

- **Developing a shared vocabulary (Section 5.2).** Common capacity could help to establish common language and shared understandings across regulatory bodies. A shared vocabulary of this kind could underpin collaboration and future joint working but also facilitate clarity and consistency in external communications and increase the confidence of stakeholders in the regulatory system.

- **Mapping and understanding the risks posed by AI (Section 5.3).** Common capacity can play an important role in facilitating joint working among regulators to identify more holistically common AI-related risks, informed by cross-sectoral and cross-remit perspectives.

- **Identifying regulatory gaps (Section 5.4).** Common capacity can be a catalyst for facilitating the collaborative work required to assess gaps in law and rules that emerge when considering the regulatory landscape as a whole. This is particularly true for contexts in which the remits of individual bodies intersect, as the required assessments in such contexts can be particularly intricate. Common capacity can also help address gaps in prioritisation and execution by challenging traditional siloed approaches and ensuring the coordination needed for clear risk ownership.

- **Identifying the most efficient and effective way of addressing regulatory gaps (Section 5.5).** As regulators across sectors are increasingly undertaking similar work to scope out potential new regulatory approaches, common capacity can play an important role in minimising duplication and capitalising on interests and efforts across regulatory bodies. More importantly, common capacity mechanisms can make it easier for regulators to identify the most efficient and effective ways of addressing regulatory gaps where they involve concerted action across regulators. By addressing vertical domain specificities as well as the "general-purpose" nature of AI, they can help identify areas of friction and ensure consistency and complementarity across vertical and horizontal approaches and regulatory remits.

- **Anticipating and adapting to future risks and the speed of technological change (Section 5.6).** Common capacity can play an important role in combining the horizon-scanning work of regulators across sectors and can provide a shared set of insights, skills, expertise, and resources to inform regulators' work. Securing and sustaining leading-edge knowledge about the AI technologies being used in markets is especially difficult for small or medium-sized regulators. As such, common capacity has a valuable role to play in providing a shared source of expertise, skills, and insight into the state–of–the-art of AI.

Common capacity could also ensure a joined up and consistent approach in regulators' engagement with regulated entities. Common capacity can ensure unified, consistent messaging and potentially a single point of contact for large tech firms rather than piecemeal, and potentially inconsistent interactions with a multitude of regulatory bodies.

7.1.2. The value of common capacity in *AI for Regulation*

Capacity needs in *AI for Regulation* are similarly cross-cutting. Given regulators' shared interests in *AI for Regulation*, there will be considerable value in developing opportunities for shared learning and capacity development across the regulatory landscape. Interviewees at regulators with less advanced capacities in relation to *AI for Regulation* placed particular emphasis on the importance of being able to learn from the experiences of others.

- **Knowledge and best practices on possible uses of AI and the development of internal data science capabilities (Section 6.2).** There is considerable scope for common capacity to facilitate opportunities and mechanisms for exchanging knowledge about practical considerations and challenges in establishing data science teams. This includes knowledge sharing across regulatory bodies that face the same questions but may be at different stages in their "AI journey."

- **Knowledge and best practices for governance mechanisms for regulators' use of AI (Section 6.3).** Similarly, common capacity can facilitate the sharing of knowledge and best practices regarding internal governance mechanisms, including questions of compliance and ethics, for the use of AI within regulatory bodies.

- **Attracting and retaining talent (Section 6.4).** As the proposals on "building skills and capabilities" in the DRCF's work plan for 2021-2022 highlight, there may be considerable value in joint recruitment activities or the development of cross-regulator career development opportunities as strategies for addressing challenges around attracting and retaining talent.[101] A more comprehensive common capacity model could facilitate such strategies at a larger scale for a wide range of regulatory bodies.

- **Training and skills development (Section 6.5).** Common capacity can play an important role in addressing the current lack of structured or formal training and skills development regarding AI, facilitating the design and delivery of training for organisations across the regulatory landscape.

- **Sharing resources (Section 6.6).** A common capacity model can make an important contribution to addressing resource constraints by enabling the shared reliance on personnel to support work across regulatory bodies. As highlighted above, possibilities include the facilitation of secondments as well as the establishment of a shared pool of experts as exemplified by PEReN in France (see Section 6.6, Box 1). As highlighted in Section 6.6 such mechanisms can also help to increase the attractiveness of data science careers in regulatory bodies, thereby addressing the challenge of attracting and retaining talent.

- **Developing shared tools (or tool prototypes) (Section 6.7).** As the use case overview in Section 3.2 illustrates, many functional uses of *AI for Regulation* can be relevant to a variety of regulatory bodies. A common capacity model could help drive regulatory innovation, avoid the duplication of efforts, and increase resource efficiency by providing, where possible and appropriate, shared AI tools or proofs of concepts that have applications across regulatory bodies. Common capacity could also contribute to transforming existing attitudes that hold back the sharing of tools. For example, the existence of a commonly funded resource to support the development and deployment of shared tools would overcome the potential reluctance to share tools whose development is the result of unilateral efforts and investments made by individual regulatory bodies on their own.

7.2. The case for a unified approach across the *Regulation of AI* and *AI for Regulation*

Our research has highlighted crucial considerations for the design of any new structures that are needed to realise the potential of common capacity. Most importantly, the findings from across the strands listed above combine to suggest that common capacity should be pursued through a single integrated initiative. In particular:

- there are a multitude of cross-fertilising and synergistic connections between individual strands of capacity building,

[101] DRCF, 2021.

- pursuing strands jointly enables efficiencies that mean that more can be achieved with a given amount of resources, and

- combining individual strands through a single initiative addresses concerns about the unnecessary duplication of parallel structures in an already crowded landscape.

There is a strong case, therefore, for the pursuit of common capacity across different dimensions of need to take a unified form through a single organisational structure. Such a unified approach extends to the fact that a common capacity model should stretch across the areas of *Regulation of AI* and *AI for Regulation*. While these areas can be distinguished analytically, there are important links and synergies between them. As a result, there is significant value in an initiative that seeks to address capacity building needs in both areas jointly rather than focusing on one area alone.

These links and synergies between the two areas emerge most clearly when considering the sets of skills and expertise required for success in each area. While these sets of **skills and expertise** are not identical, there is significant overlap between them. In particular, policy expertise and technical expertise in data science and AI are equally crucial for success in both areas:

- **Technical data science and AI expertise** is not only central to the delivery of *AI for Regulation*, it is also an indispensable asset in the area of *Regulation of AI* when it comes to understanding and scrutinising uses of AI by regulated entities and evaluating the adequacy of regulatory regimes in relation to these uses. As the complexity and sophistication of AI solutions deployed by regulated entities increases, technical expertise will be a core determinant of regulators' ability to assess claims made by regulated entities about the technologies they deploy, the risks involved, and the feasibility of different strategies for addressing these risks.

- **Policy expertise concerning the regulation and governance of relevant technologies,** in turn, is not only key in the area of *Regulation of AI.* It is also required to inform and guide regulatory bodies' use of *AI for Regulation.* For instance, our interviews suggest that one of the factors currently impeding regulators' confidence to explore innovative uses of AI internally is a lack of knowledge and certainty within the relevant teams around legal and regulatory constraints that are applicable to relevant *AI for Regulation* use cases. This illustrates the importance of policy expertise — covering multiple regulatory domains — for enabling regulatory bodies to develop confidence with respect to internal uses of AI from the perspectives of compliance, governance, and ethics.

This overlap between the skills and expertise required in each area means that there is a compelling argument for a common capacity model to cover both areas, such that it can provide shared pools of expertise that can inform work in both areas. At one level, this argument is a matter of **resource efficiency**. An institutionally separated pursuit of capacity building dedicated to the *Regulation of AI* on the one hand and to *AI for Regulation* on the other would require separate teams, each of them combining sufficient levels of technical and policy expertise. A unified approach, in contrast, can draw on shared teams to support work in both areas, thus allowing for a more efficient use of relevant expertise, which can be hard to come by.

At another level, however, the case for a setup that involves experts collaborating across the areas of *Regulation of A*I and *AI for Regulation* goes beyond considerations of resource efficiency. There are strong **intrinsic reasons** why collaboration across these two areas can be crucial. Two contexts that illustrate this are worth highlighting.

- **Using AI to regulate AI.** There is a growing range of contexts where the speed and complexity of AI applications deployed in markets mean that effective forms of regulatory oversight and enforcement are difficult to achieve through traditional regulatory practices and instead call for AI-enabled forms of scrutiny, analysis, and monitoring. These contexts can be thought of as a subset of *AI for Regulation*: cases in which the recourse to AI solutions on the part of regulators is driven by needs in the area of *Regulation of AI*. Examples of this are particularly prominent in the online sphere and include areas like AdTech, problematic content on social media platforms (such as hate speech and misinformation),[102] and other forms of online harm. The successful development and use of "AI to regulate AI" in such cases requires close collaboration between tool developers, policy teams, as well as supervisory or enforcement staff who may be involved in deploying a given tool. In order for such tools to be fit for purpose and to be used successfully, integrated cross-team efforts are needed to ensure alignment with frontline needs and usability. As a result, the need for integration of expertise from staff in the areas of *Regulation of AI* and *AI for Regulation* in these cases is not merely a matter of resource efficiency, but a necessity for success in achieving innovation-values fit, innovation-needs fit, and innovation-knowledge fit (see Section 4.2).

- **"Practising what you preach."** When it comes to regulators' internal use of AI more broadly, not only is it important for such work on *AI for Regulation* to be informed by general policy expertise to ensure clarity about and compliance with relevant legal and regulatory requirements. For regulatory bodies to maintain integrity and public credibility, it is arguably necessary for there to be a deeper join-up and coherence between a body's external-facing AI-related policy stances and its internal practices around the use of AI. This is especially true in light of unavoidable questions of governance and good practice the answers to which are not determined by the letter of any applicable laws and regulatory rules. Achieving this join-up not only hinges on the utilisation of policy expertise in *AI for Regulation*, but arguably requires that this expertise comes from the same source that informs the body's work in the area of *Regulation of AI.*

Setting aside synergies and links at the level of skills and expertise, there are important benefits to a joined-up approach across the areas of *Regulation of AI* and *AI for Regulation* at the level of **managing organisational change**. Achieving readiness in each area is a significant undertaking involving the transformation of individual and organisational attitudes along the various lines described in Section 4. The organisational change required can pose significant management challenges and the success of change management can be threatened by factors such as a perceived lack of purpose or a proliferation of seemingly uncoordinated change processes. Pursuing a joined-up approach to organisational change and transformation that stretches across the areas of *Regulation of AI* and *AI for Regulation* can make a significant contribution to addressing these risks.

[102] For examples, see Ahmed et al., (2022) and Vidgen et al., (2020).

There are various reasons why a joined-up approach can make change processes more effective and efficient than they would be if they only focused on one or the other area:

- Cultivating capabilities in developing and using AI tools internally can be a catalyst for fostering innovation- and technology-focused organisational attitudes that regulatory bodies need to effectively navigate questions concerning the *Regulation of AI*, and vice versa.

- Conceiving of change processes in both areas as part of a larger integrated whole can help create a sense of purpose by providing a broader vision and a unified narrative.

- Approaching organisational change in both areas jointly reduces the number of perceived separate processes and facilitates the coordination needed for success across the two areas, helping to mitigate the risk of failure due to "change fatigue" or insufficient alignment.

In summary, an effective common capacity model will address regulators' needs both in relation to the *Regulation of AI* and *AI for Regulation*. Both at the systemic and organisational levels there is a strong case for regulators to pursue capacity-building strategies that stretch across these two areas, rather than approaching them in isolation from each other. The knowledge, skills, and expertise needed in each of these areas are complementary and overlapping. Moving back and forth between effectively regulating AI and effectively using *AI for Regulation* requires a distinctively *horizontal* and cross-cutting set of cognitive skills, practical abilities, and technical expertise. Indeed, building capacities in relation to either one of these areas will also better equip regulators in relation to the other, further making the case for a common capacity model. In particular, the state-of-the-art interdisciplinary expertise that a common capacity hub will provide is vital both to enable the scrutiny of claims relating to uses of AI and to underpin innovative uses of AI as a regulatory tool. As such, the ***Regulation of AI*** **and** ***AI for Regulation*** **can be viewed as two sides of a single coin and a model for common capacity needs to address each dimension simultaneously.**

7.3. Existing collaborations

Interviewees often remarked that there is an existing culture of collaboration among regulators regarding the topic of AI and highlighted several relevant existing collaborations. Table 7 provides a summary of the most prominent existing collaborative initiatives mentioned during interviews. This includes the Digital Regulation Cooperation Forum, a more detailed description of which can be found in Box 2.

Interviewees contended that the biggest benefits of existing collaborations were the relationships that were established between individuals in different organisations. It was stressed that there is considerable value in knowing who to speak to and being able to pick up the phone or drop someone an email.

Beyond cross-regulator collaborations within the UK, many interviewees also described the significant role played by existing international collaborations and working relationships. In several cases, international collaborations with peer organisations from other jurisdictions working in similar regulatory domains were described as more productive or beneficial than domestic collaborations across domains. It was stressed that, going forward, **it will be important to maintain, and expand, international links and to share experiences across both sectoral and geographic boundaries.**[103]

Table 7: Summary of Existing Collaborations Focused on Regulation and AI

Examples of Collaborative Models	Member Organisations	Purpose/Scope
The Digital Regulation Cooperation Forum	CMA, ICO, Ofcom, FCA	The DRCF was established in July 2020 to ensure greater cooperation on online regulatory matters. It aims to increase the clarity, consistency, and effectiveness of digital regulation. See Box 2 for further details.
Regulators and AI Working Group	Chaired by the ICO with membership representing diverse regulatory bodies	The working group's membership includes a wide range of regulators from across diverse sectors. It meets on a quarterly basis and focusses on information sharing, coordination, and harmonisation. The Working Group acts as a forum for the development of a collaborative and multilateral approach to AI and regulation by existing UK regulators.
AI Public-Private Forum	FCA and Bank of England	In 2020, the FCA and BoE established this forum to facilitate dialogue with the public and private sectors to better understand the use and impact of AI/ML in the financial sector. The Forum explored questions around the safe adoption of AI within financial services, and how principles, guidance, regulation and/or industry good practice could support this adoption. The AIPPF's final report was published in February 2022.[104]
Multi-Agency Advice Service (MAAS)	The National Institute for Health and Care Excellence (NICE), MHRA, HRA, CQC	MAAS aims to be a single source of support, information, and guidance on regulation and evaluation for innovators and health and care providers developing AI technologies.[105]

[103] The importance of international collaborations relating to innovation in regulation has been noted by Armstrong et al 2019.

[104] AIPPF, 2022.

[105] NHSX, n.d.

Box 2: The Digital Regulation Cooperation Forum — Objectives and Initial Workplan

As a pertinent example of collaboration among regulators, the DRCF was established in 2020 by the CMA, ICO, and Ofcom, with the FCA joining as a full member in April 2021. The DRCF is a voluntary forum and works to ensure a greater level of coordination between regulators of online services.[106]

In March 2021, the forum published a workplan for 2021/22, highlighting the issues of online harm for consumers and the impact of fast-changing online services on regulators. The workplan focused on three priority areas to deliver coherent and joined up approaches to these challenges:[107]

- responding strategically to industry and technological developments;
- joining up regulatory approaches;
- building skills and capabilities.

For each area, the workplan sets out several concrete objectives. In the area of responding strategically to industry and technological developments, this includes the following four specific areas that strategic joint work will focus on for 2021/22:

- **Design frameworks** — "collaborat[ing] with government and stakeholders to develop coherent design frameworks and approaches" with the aim "to provide greater clarity for industry regarding regulatory requirements and, where relevant, make compliance with them more efficient."[108]
- **Algorithmic processing** — "strengthen[ing] our shared understanding of, and expertise in, algorithmic systems [...] by identifying areas where common practical approaches in different regulatory regimes can be streamlined and by developing solutions to deliver efficiencies for industry, for example in relation to impact assessments for algorithmic systems."[109]
- **Digital advertising technologies** — "develop[ing] a more holistic view of how the digital advertising sector (including advertising-funded business models) interacts with people's rights and creates potential consumer harms."[110]
- **End-to-end encryption** — "understand[ing] the implications of end-to-end encryption for the people using digital services, as well as for industry, and its implications for policy objectives relevant to the current and future remits of the CMA, the ICO and Ofcom."[111]

[106] Ofcom, 2021a.
[107] DRCF, 2021: 6.
[108] DRCF, 2021: 9.
[109] DRCF, 2021: 10.
[110] DRCF, 2021: 12.
[111] DRCF, 2021: 12.

7.3.1. Scope and limitations of existing collaborations

Existing collaborations between UK regulators resonate with some of the fields of activity for common capacity outlined in Section 7.1 above. Yet, there is a wide gap between the scope of these initiatives — individually as well as collectively — and the full range of benefits that a more exhaustive and holistic common capacity approach covering all the fields above would bring.

In particular, existing initiatives cover only a subset of the areas of capacity-building outlined above and, insofar as they do, address these areas through activities whose objectives are more limited in scope compared to what a more ambitious common capacity model could provide. In addition, the mission of initiatives such as the DRCF and MAAS limits their membership to subsets of the UK's regulatory landscape that are important, but only cover a minority of the large number of regulatory bodies mapped out in Section 3.1 whose work is impacted by AI. MAAS is limited to regulators whose remit touches on health and care. The mission of the DRCF is defined by a focus only on online services and "regulators for whom digital regulation is core to their remit."[112]

DRCF's membership currently comprises four organisations, with additional plans to collaborate with the Advertising Standards Authority for specific purposes.[113] Even if the DRCF membership were to expand in line with its mission, it would not extend to regulators whose core remits are not defined with reference to digital regulation and online platforms, which is the case for the vast majority of regulatory bodies in Table 3. In light of the role of online services as a key context for the use of AI, the DRCF is clearly a significant initiative in the AI and regulation space. Yet, as highlighted in Section 3, questions of regulating AI and using *AI for Regulation* arise in a much wider range of contexts and are relevant across the entire regulatory landscape.

It is worth noting that MAAS and the DRCF are more substantial in terms of the scope of collaborative activities and capacity building needs that they seek to address when compared to existing initiatives that include larger segments of the regulatory landscape. The Regulators and AI Working Group, for example, is open to all interested regulatory bodies, but its activities to date have been comparatively "light touch" in terms of organisational commitments and outputs. This contrast is particularly significant given that the membership of MAAS and DRCF consists of large regulatory bodies. Smaller regulatory bodies, for whom readiness gaps and capacity building challenges in relation to AI can often be much greater, do not benefit from the more substantial collaborations taking place through these fora.

7.3.2. Challenges in the context of existing collaborations

In discussing existing collaborations, interviewees noted that working with other regulatory bodies can be challenging. One prominent factor contributing to this are vertical (sector-specific) boundaries that often characterise established modes of working. A common theme emerging through the interviews was that effective collaboration requires a culture of collaboration that transcends these boundaries. Collaboration challenges dominant siloed modes of working. In order to be successful,

[112] Ofcom, 2021c.

[113] DRCF, 2021: 12.

collaborative initiatives need to take account of this fact and seek to **normalise collaborative modes of working across traditional silos.**

One major challenge mentioned was making collaborative efforts impactful. A number of interviewees noted that while existing, or previous, collaborations have been positive in generating discussions relating to AI, they have so far not led to productive or substantive outcomes in terms of regulatory approaches or practices. A common theme was that **interviewees wanted collaborative activities to have a practical and outcome-oriented focus.**

Further challenges were noted relating to agreeing roles and approaches between different regulators. Interviewees emphasised the importance of securing a good understanding of the remit and perspectives of different regulatory bodies. Some unique collaboration challenges were seen to arise between statutory and non-statutory regulators. One interviewee from a non-statutory regulator described some of these challenges:

> "Some of the statutory regulators have quite significant constraints around information sharing. And we encounter this sometimes in our discussions with them, where the people that we're speaking to really want to help. If someone from a statutory regulator wants to collaborate with us, they have to check first that they're allowed to, and that can get in the way, and I think will continue to get in the way."
>
> (Head of Operations, Medium-Sized Regulator)

At times there may be tensions between the interests and stakes of individual regulatory bodies in relation to the focus of collaborative activities. This can lead to friction among participants and requires transparency, dialogue, and an active management of relationships. **Regulators' ongoing participation in collaborative initiatives, therefore, depends on the sense that it is valuable and beneficial for their organisation.**

A further significant challenge noted by interviewees related to sustaining cross-regulator collaboration and **the need for adequate resourcing and infrastructure** (rather than being dependent on a small number of enthusiastic individuals) **to ensure sustainability.**

> "I think with working groups, as well, it's not always, but they're quite often driven by perhaps one or two kind of really enthusiastic people, and I've seen working groups before where that enthusiastic person leaves and does something else, and working group kind of crumbles around it, so I like the idea of working groups, [but] it has to have the structure in place and the governance in place and everything for it to work."
>
> (Enforcement Role, Medium-Sized Regulator)

The resources required to sustain collaboration include dedicated staff, established governance frameworks, sufficient staff time allocated by participating organisations, and financial resourcing.

Finally, interviewees expressed concern that, as there is increasing expectation of collaboration among regulators, and as the number of collaborative activities grows, it may become burdensome on individuals to undertake this alongside their day-to-day jobs.

7.4. Delivering common capacity

7.4.1. Potential models for common capacity

Our interviews showed a clear recognition of the limitations of existing collaborations and the **need for greater, more formalised, and more structured collaboration between regulators.** The interviews also considered different possible models to facilitate common capacity and discussed conditions that interviewees thought would determine a common capacity model's success.

At a high level, the interviews covered three general options for building common capacity:

- A top-down, centralised approach organised around a new or existing regulatory body;
- Expanded voluntary collaboration between regulators based on the institutional status quo;
- An intermediary model with a dedicated organisation that facilitates collaborative working and serves as a source of expertise.

A top-down centralised model could give a new role to an existing regulatory body or involve the creation of a new regulatory body with responsibilities focused on AI.[114] However, there was very little support for this option within our interviews. Participants expressed a variety of concerns about this possibility in general, and about potential proposals to create a new regulatory body in particular.[115]

For some interviewees, their opposition to this model was intuitively based rather than related to specific worries. Others were worried that creating a new centralised body would be an unnecessary complication or distraction in an already crowded landscape and one which may lead to duplication of effort. There was also concern that a top-down, centralised model would pose risks for individual organisations' independence and autonomy:

> "I think we'll probably be prepared to make some trade-offs, but I think that operational independence will still be quite important for the [organisation] so something that's less than fully top down, I think, is probably where we might be tempted to take."
>
> (Policy role, small regulator)

Regarding the option of voluntary collaboration based on the institutional status quo, interviewees felt that this model would likely lack the authority needed to be effective. Moreover, there was concern that, given experiences with current collaborative initiatives, such a model would not be sustainable:

[114] Rodrigues et al., 2019.

[115] This was similarly reported in House of Lords 2018.

> "I've been in lots of conversations with other regulators about how do we move forward with all these things and one of the problems is that you just don't, okay no one quite knows how to move it forward and then it doesn't quite happen because it's nobody's actual job to do that. It's not like a thing that's mandated, then it ends up dropping down agendas, people aren't quite sure how to do it so they just keep talking about it. So, one of the most important things is to actually have that remit and have people that have the space to get that going and get people involved to make it happen."
>
> (Director, large regulator)

Interviewees frequently pointed to the importance of organisational solutions involving dedicated resources, responsibilities, and infrastructure in order to be able to act as a "driving force."

> "If collaborative organisations are all voluntary and best effort it's very difficult to get things moving, so I think you do need that element of a sort of Permanent Secretary with some resource to take issues forward otherwise you're always just trying to use people's spare time and it makes for slow progress."
>
> (Director, medium-sized Regulator)

Overall, while existing collaborations are highly valued and seen as important by interviewees, the organisational status quo was widely considered insufficient to serve as a foundation for realising the benefits of a more fully developed common capacity approach.

In line with their emphasis on the importance of having a coordinating or facilitating body, participants expressed **widespread support for potential intermediary models,** resulting in this being the option preferred by most interviewees. Under such a model, individual regulatory bodies would maintain autonomy and sovereignty while an intermediary organisation would take responsibility for facilitating collaboration and serving as a home for shared resources. This was seen to have the benefits of enabling regulators to act autonomously while having a central resource to ensure that collaboration was effective and continuous.

An intermediary model was seen as desirable based on its potential both to facilitate collaboration between and to serve as a source of expertise needed by regulators:

> "If somebody were able to say okay, there is a business model here where we're going to have a unit, which is kind of almost a consultancy unit to regulators with people who have experience of working across a number of different regulatory spheres and we're able to provide specialist advice kind of on tap to different projects. That to me sounds like something that would bring about better natural alignments and help tackle some of the skills capability challenges here."
>
> (Director, large regulator)

In sum, interviewees saw an intermediary model as the most promising path to facilitating and strengthening collaboration and the sharing of resources among regulators while maintaining the sovereignty and independence of existing regulatory bodies. They considered this model to have the potential of commanding wide support and adequate levels of resourcing to ensure effectiveness and sustainability, while simultaneously

being suited to capitalise on already existing resources, capabilities, expertise, and collaborations.

Nesta have previously recommended the creation of a hub for expertise relating to regulatory theory and practice,[116] which would serve to collate and share evidence of best practices and to facilitate collaborations in order to equip regulators to develop and evaluate innovative approaches. A similar hub model could be developed relating to common capacity. This hub model would reflect the desirable characteristics of the intermediary model identified by our interviewees.

7.4.2. How can an intermediary model be implemented?

Recognising the preference expressed for an intermediary model of common capacity, we now consider possible organisations where a hub for common capacity could be located.

There are various organisations that could take on the facilitating role that the intermediary model relies on. Interviewees were asked for their views on the following three options:

- **A cross-regulator collaboration,** such as the Digital Regulation Cooperation Forum, utilising resources from the regulators in question;
- **A central government organisation**, like the Centre for Data Ethics and Innovation (CDEI);
- **A multi-disciplinary independent research centre,** like The Alan Turing Institute (with expertise in computer science, statistics, ethics, philosophy, social science, and law).

Key considerations shaping interviewees' responses to each of the potential intermediary bodies were their perceived independence and authority. A common sentiment expressed across the interviews was that, regardless of which particular organisation might take on this role, it was important that it was **established, well-resourced, and in a position that commanded respect and authority** in order to make things happen.

It was also considered important that in order to host the common capacity hub, an organisation must have **relevant expertise and knowledge**. It is recognised that regulation requires interdisciplinary expertise,[117] encompassing technical, ethical, and policy dimensions. This includes knowledge of AI and data science but also of the regulatory landscape and policy context, in recognition of the links described in the Section 7.2.

Relatedly, it was considered important for an intermediary organisation to be well-positioned to bring together regulators across vertical and sectoral boundaries, challenging existing siloed approaches.

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[116] Armstrong et al., 2019.

[117] Miettinen, 2020.

Currently, collaborative initiatives in the AI and regulation space are largely led by regulatory bodies. **As such, a cross-regulator approach is most closely aligned with the status quo.** Interviewees considered such an approach to have an advantage in avoiding further crowding of the AI regulatory landscape. There was some reluctance around the potential creation of a new body or oversight organisation. Accordingly, interviewees often pointed to opportunities to work with existing bodies and organisations. The DRCF was considered to be a potential body to take on this role. Similarly, the Digital Markets Unit was considered to have some overlap with the remit of a potential facilitating organisation.

Given the range of expertise and skills needed to facilitate common capacity, there may be merit in this being facilitated through a collaborative model rather than by a single organisation. In this regard, interviewees pointed to existing collaborations such as the DRCF or the UK Regulators' Network as potentially having a role to play. However, as noted above, interviewees stressed limitations with current collaborative approaches due to limited resourcing and challenges associated with the unfamiliarity of working horizontally (that is, across sectoral boundaries). As such, **a collaborative model would require adequate and sustainable resourcing in order to be effective.**

Furthermore, a common capacity hub will need to provide regulators with access to state-of-the-art expertise in relation to both the *Regulation of AI* and *AI for Regulation*. As set out above, current regulatory expertise in this area is limited. As such, this may represent a significant limitation of regulators' capacity to take on this role.

A range of views were expressed regarding the potential for a central government organisation to take on the role of an intermediary body to facilitate common capacity. Some interviewees felt that a central government organisation is needed to ensure that the common capacity model has buy-in and impact. However, others were more ambivalent and noted both pros and cons of central government involvement. Some suggested a hybrid model, which has the authority of central government, on the one hand, but the independence and creativity of academia, on the other.

As noted above, independence was a key consideration. While interviewees regarded a central government body as being potentially effective, they were concerned about how this might impact regulatory independence. For example, one interviewee stated:

> "I don't think that you can have a central government body filling that space without it ending up being perceived as some sort of meddling in regulatory independence."
>
> (Director, large regulator)

A key area of concern around central government bodies was the extent to which they could be agile and forward-looking enough to keep pace with innovations relating to AI. One interviewee stated:

> "I'd be worried that, particularly in a space that moves quite quickly and is quite innovative, that tying [common capacity] into a central government approach, which is not really designed to respond to rapidly evolving issues, might be difficult."
>
> (Assurance role, medium-sized regulator)

A further concern related to the sustainability and continuity of government bodies, given the potential for political priorities and budgets to change.

By contrast, **the potential for an intermediary role to be fulfilled by an independent research organisation was largely received favourably by interviewees.** The independence of the organisation was considered a key factor here. Academic institutions were considered to represent a **"safe space"** in which regulators could engage in open discussions, which would be valuable for informing and refining thinking. An interviewee at a large regulator stated:

> "I think that one of the good things about collaborating with a university is that it doesn't have as much of the baggage that regulators and government have in terms of how you talk to people. We can have open conversations in this space and that's totally fine because it's exactly what academic institutions are for. [...] If you don't have that openness, or a vehicle for that, then there's an obvious danger that you stick to the kind of tired traffic kind of guardrail, so to speak, and you're not able to engage in some of those trickier issues."
>
> (Strategy role, large regulator)

Interviewees also valued academic institutions as organisations that can provide access to state-of-the-art expertise, including the diverse range of technical and non-technical expertise needed to realise the full benefits that a common capacity model can deliver across the areas of *Regulation of AI* and *AI for Regulation*. As a potential limitation to the role that a purely academic institution could play, interviewees noted that it may require a government department to be involved if standards were to be set.

The Alan Turing Institute, in particular was discussed by a number of interviewees. As described in the following quote, some interviewees had previously engaged with The Alan Turing Institute and had positive experiences:

> "We were doing some good work with the Turing, and it struck me that we don't necessarily need to have hundreds of technical researchers or policy researchers if there are groups like the Turing who are established and have access to that. What we need is an effective way to work together and leverage that while maintaining our regulatory independence."
>
> (Policy role, large regulator)

An advantage of The Alan Turing Institute was considered to be that it is already established and well-known to regulators. Moreover, interviewees recognised its expertise in relation to both technical and non-technical dimensions of AI.

7.4.3. Taking account of differences between larger and smaller regulators

Regulators are heterogenous in their size, with some comprising only a few members of staff while others have thousands of employees. AI is cutting through this heterogeneity, requiring regulators to come together to address common challenges.

At the same time, regulatory bodies of different sizes and with different levels of existing capacity can have varying interests and expectations in relation to common capacity. Among our interviewees, there were concerns that a common capacity model may

not benefit all regulators equally. In particular, it was noted that smaller regulators may need greater support to be able to make use of shared resources. Relatedly, there were concerns that, if participating in a common capacity model required a resource commitment (e.g. in terms of financial or time commitment), this may make it more difficult for smaller regulators.

Concurrently, smaller organisations, and those new to this area, clearly recognised that they may benefit particularly strongly from the sharing of resources and experiences among regulators. Interviewees at smaller regulators noted their organisations would considerably benefit from having access to common resources to support their development and uptake of new AI technologies. Several interviewees noted that smaller regulators face unique challenges in developing new capacities and implementing new approaches. For this reason, common capacity may be particularly beneficial for smaller regulatory bodies.

Differences in how advanced individual regulatory bodies are in their work in this area is one reason why the pursuit of common capacity models to build regulatory readiness holds unique promise: it enables less advanced regulatory bodies to benefit from the experience and expertise that exists in other bodies. Accordingly, interviewees at larger, or more advanced, regulators recognised that their role within a common capacity model may at times be focused more on sharing experiences and knowledge rather than on benefitting from that of others. Some interviewees regarded this as potentially limiting the value of common capacity for more advanced organisations. Concerns around the extent to which larger organisations would stand to benefit from common capacity were expressed by an interviewee at a large regulator:

> "I think one of the things that we have seen in the past is that we have typically been in this space of being tapped on the shoulder to offer people up, and actually we don't get much of the benefit. We send people out, which is fantastic when they get a great experience, but there's no reciprocity, so how would reciprocity work in this kind of environment?"
>
> (Technology role, large regulator)

An important challenge was hence considered to be the need to create equity among participants in a common capacity model.

In this regard, **it is important that a model for common capacity takes account of the different needs and interests of regulators and ensures equity in access to resources.**

Locating a common capacity hub within an independent organisation — rather than within one or more regulatory bodies — may be an advantage in terms of mediating relationships between regulatory bodies and, in particular, facilitating and enabling the involvement of smaller regulators.

8. Summary and recommendations

Section at a glance:

- Summarises our main research findings;
- Sets out our recommendations for a future model of common regulatory capacity for AI.

8.1. Summary of findings

Regulators of all sizes and sectors are increasingly grappling with common challenges brought about by AI – both in terms of regulating AI and developing capacities to use AI for regulatory purposes. Strengthening regulatory capacities in both of these areas is essential for developing readiness in the regulatory environment, for mitigating the risks associated with AI, and for building the confidence of industry and innovators.

Our research has identified enormous diversity within the existing regulatory landscape, with regulators ranging in size from one to thousands of employees. Regulators are also heterogeneous in terms of their existing skills and capacities relating to AI. However, while the regulatory landscape is characterised by diversity, AI technologies cut across traditional sectoral boundaries, challenging established vertical modes of working. **Common capacity is needed to underpin and sustain horizontal approaches, building the skills, knowledge, and understandings needed across participant, organisational, and system levels.**

Common AI capacity for regulators is needed to bolster existing regulatory strengths, increase efficiency and effectiveness, and ensure consistency and clarity across the regulatory landscape.

The regulators we interviewed stressed that the development of a muscular common capacity regime to bolster regulatory readiness, while preserving organisational autonomy and independence, should involve cross-regulator cooperation in co-cultivating:

- Shared understandings, vocabularies, best practice protocols, and common knowledge to enable accelerated collective learning;
- Shared, cross-sectoral views of risks surrounding AI, regulatory gaps, and appropriate regulatory responses to these gaps and risks;
- Shared capabilities to anticipate and adapt to future risks and the speed of technological change;
- Shared training and skills development programmes across regulatory bodies from the senior level down;

- Shared expertise and advice to supplement in-house capacity, including access to state-of-the-art knowledge to equip regulators both in relation to the *Regulation of AI* and *AI for Regulation*;
- Shared tools and data science capability that could be made accessible to all regulators;
- Cross-regulator career development opportunities and secondment regimes to battle tendencies toward institutional siloing.

8.1.1. Common capacity at the system, organisational, and individual level

The particular features identified as needed to establish system, organisational, and individual-level readiness are outlined below.

At the system level:

- Provide access to expertise and knowledge relating to the state-of-the-art in AI to equip regulators with the understandings needed both to adequately and appropriately scrutinise uses of AI and claims made in relation to regulatory compliance, and to develop and deploy innovative AI regulatory tools.
- Facilitate sharing knowledge and best practices relating to governance mechanisms for regulators' use of AI, increasing regulators' confidence to develop and use *AI for Regulation*.
- Establish horizontal modes of working, facilitating:
  - Cross-regulator collaboration and partnership building to create holistic understandings of the ways that AI is being used and its impacts — recognising that AI is increasingly employed in ways that cut across traditional sectoral boundaries.
  - Cross-regulator collaboration to develop shared vocabularies, map and understand the risks posed by AI, identify regulatory gaps, and map regulatory options identifying the most efficient and effective ways of addressing regulatory gaps.
- Facilitate secondments between regulators to strengthen relationships and understandings between regulatory bodies, breaking down existing regulatory siloes.
- Establish mechanisms and processes for sharing AI tools among regulators.
- Facilitate cross-regulator recruitment drives for AI and data science professionals focusing on attracting and retaining individuals with cutting-edge skills and expertise in state-of-the-art technologies needed both for the *Regulation of AI* and *AI for Regulation*.

At the organisational level:

- Support the development of organisational cultures that are open and adaptable to change and encourage agility and ingenuity.

- Facilitate and incentivise the participation of senior management in capacity-building activities to establish the understandings needed to underpin effective leadership in both the *Regulation of AI* and *AI for Regulation*.

- Provide regulators with access to state-of-the-art knowledge about AI and its current and likely future applications to facilitate the absorptive capacity, change readiness, and receptive contexts at the level of organisational cultures.

- Strengthen internal capacities through the provision of shared resources accessible to all regulators. These shared resources should include practical guidance for developing and deploying AI tools and a shared pool of data scientists.

- Facilitate secondments to enhance the existing capacities of regulators.

- Develop formalised programmes for career progression for data science and AI professionals within regulatory bodies. This should include skills development, secondments, and opportunities to pursue innovative projects to nurture and retain talent.

At the individual level:

- Build regulatory readiness at the participant level through training and skills development which improves both technical and non-technical understandings of AI. This will help to equip regulators both in relation to the *Regulation of AI* and *AI for Regulation* (training and skills development needs to encompass technical, ethical, policy, governance, and commercial dimensions of AI).

- Ensure that training and skills development programmes are accessible to all parts of the organisation, including individuals at all levels of seniority and across departments and teams.

8.1.2. Effective models

In summary, a model for common capacity aimed at achieving readiness at individual, organisational, and system-levels should achieve the following objectives:

1. Fill gaps and act as a catalyst for developing regulatory readiness in relation to AI in ways that go beyond what current structures can achieve;

2. Capitalise on the synergies between the *Regulation of AI* and *AI for Regulation*, offering solutions to the challenges faced in both;

3. Be facilitated by a neutral, but respected, authoritative, and well-established organisation with recognised expertise in both technical and non-technical dimensions of AI;

4. Capitalise on existing relationships and collaborations, avoiding both duplication and further crowding of the landscape;

5. Be well-resourced, ensuring sustainability and effectiveness with adequate administrative support;

6. Be voluntary but strongly incentivise the inclusive participation of regulators;

7. Provide access to thought leadership, expertise, best practice, and leading-edge knowledge in relation to technical, ethical, legal, policy, and commercial dimensions of AI (equally important for the *Regulation of AI* and *AI for Regulation);*

8. Develop shared tools for detecting, monitoring, and measuring trends in the use of AI;

9. Take account of differences in requirements between larger and smaller regulators, ensuring that all benefit from common capacity (in different ways) and that shared resources are accessible and beneficial to regulators of all sizes and across all sectors.

These objectives apply to common capacity across the entire regulatory landscape, including existing bodies: government agencies and departments, regulators, and the research community (including universities, research institutes, and NGOs).

8.2. Recommendations

Realising the potential of common regulatory capacity in relation to AI will require change across the regulatory landscape, including action across the following organisations:

- Government departments and agencies, who will be asked to support the development of pro-innovation common capacity;

- Regulatory bodies, who will be asked to tackle organisational and cultural barriers to the development of AI and reach out to collaborative initiatives, including with civil society.

Our research has revealed that while regulators perceive gaps in regulatory capacity in AI that need to be filled, there is a desire to avoid the unnecessary duplication of structures and to prevent the existing landscape from becoming more crowded. At the same time, our findings show that existing structures and modes of collaboration are insufficient to achieve the objectives mentioned above.

In light of these desiderata, we propose the creation of just one new entity: an AI and Regulation Common Capacity Hub. This new entity would serve to advance objectives 1-9 in ways that go significantly beyond what existing structures and modes of collaboration can achieve, while being closely integrated into the existing landscape and avoiding the addition of unnecessary layers of complexity or parallel structures.

ARCCH would focus on filling gaps and performing functions that are lacking or under-resourced in the existing landscape (objective 1). It would provide common capacity in relation to the *Regulation of AI* and *AI for Regulation* (objective 3), leveraging synergies by addressing needs in both areas.

In order to satisfy objective 3, it should be an expert body positioned to draw on interdisciplinary expertise and excellence at the national level.

In order to satisfy objective 4, the new body should be part of an existing institution that has experience with and established links to relevant existing elements of the regulatory landscape, being positioned to play a consolidating role within the existing landscape.

This new entity would develop and offer thought leadership, knowledge, expertise (leading on objective 7), and shared tools (objective 8) that would benefit all regulators (contributing to objectives 6 and 9), large and small. It would convene organisations from across the regulatory landscape (objective 4) to develop and provide state-of-the-art knowledge and thought leadership (contributing to objective 7).

ARCCH will need to be independent. It will need to be led by an organisation with an established reputation in AI (including both technical and non-technical aspects), meaning that it is trusted and authoritative. It will need to be multi-disciplinary, developing a bank of knowledge and expertise that transcends scientific disciplines, and drawing on knowledge and expertise from national and international research communities. It must leverage synergies by addressing needs in the areas of both the *Regulation of AI* and *AI for Regulation*. It will need to develop specialist expertise in:

- The development of AI-based solutions and innovations (including machine learning, agent computing, behavioural science, and human-computer interaction).

- Responsible innovation (including both ethical and technical dimensions of fairness, accountability, and transparency).

ARCCH would complement existing initiatives and avoid duplicating them. For example, ARRCH could work with the DRCF to explore synergies, including skills development and shared technical expertise, for the benefit of UK's entire regulatory landscape. ARCCH could also provide pathways for other regulators to learn from the DRCF and avoid further crowding of the landscape while sharing tools for monitoring trends in AI.

We, therefore, recommend the creation of an independent AI specialist body to perform these functions. In order to make this happen:

Government departments and agencies should:

- Provide funding to support the establishment of a common capacity hub;

- Provide funding to support other forms of pro-innovation cross-regulator collaborative initiatives.

Regulatory bodies should:

- Evaluate, pursue, and strengthen existing collaborations and investigate new collaborations;

- Be inclusive and pursue a participatory approach that includes civil society;

- Develop organisational cultures that are open and adaptable to change, encouraging agility and ingenuity.

The newly created **AI and Regulation Common Capacity Hub** should:

- Convene, facilitate, and incentivise regulatory collaborations around key AI issues;

- Cultivate state-of-the-art knowledge on the use of AI by regulated entities;

- Conduct risk mapping, regulatory gap analysis, and horizon scanning;

- Provide thought leadership on regulatory solutions and innovations;
- Develop proofs of concept and build shared AI tools for regulators;
- Supply training and skills development;
- Build up and facilitate the sharing of human and technical resources across the regulatory landscape;
- Act as an interface for regulators to interact with relevant stakeholders including industry and civil society.

9. References

Aarons, G. A., Fettes, D.L., Hurlburt, M.S., Palinkas, L.A., Gunderson, L., Willging, C.E., & Chaffin, M.J. (2014). Collaboration, negotiation, and coalescence for interagency-collaborative teams to scale-up evidence-based practice. *Journal of Clinical Child and Adolescent Psychology,* 43(6), 915–928. **https://doi.org/10.1080/15374416.2013.876642**

Aarons, G. A., Hurlburt, M., & Horwitz, S. M. (2011). Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(1), 4–23. **https://doi.org/10.1007/s10488-010-0327-7**

Ada Lovelace Institute, AI Now Institute & Open Government Partnership. (2021). *Algorithmic Accountability for the Public Sector.* **https://www.opengovpartnership.org/documents/algorithmic-accountability-public-sector**

Ahmed, Z., Vidgen, B., & Hale, S.A. (2022) "Tackling racial bias in automated online hate detection: Towards fair and accurate detection of hateful users with geometric deep learning." EPJ Data Science 11, (8). **https://doi.org/10.1140/epjds/s13688-022-00319-9**

AIPPF. (2022). *The AI Public-Private Forum: Final report.* **https://www.bankofengland.co.uk/-/media/boe/files/fintech/ai-public-private-forum-final-report.pdf**

AI-X. (2021a). *Machine Vision for Collecting Information on Traffic Load (Public Transport and Traffic Management Transport Board in Tallin).* **https://ai-watch.github.io/AI-watch-T6-X/service/90029.html**

AI-X (2021b). *FITS ITEMS - Road Safety (State Public Traffic Safety Directorate Latvia).* **https://ai-watch.github.io/AI-watch-T6-X/service/90069.html**

Akerlund, K.M. (2000). Prevention program sustainability: The state's perspective. *Journal of Community Psychology*, 28(3), 353-362. **https://doi.org/10.1002/(SICI)1520-6629(200005)28:3<353::AID-JCOP9>3.0.CO;2-6**

Armstrong, H., Gorst, C., & Rae, J. (2019) *Renewing regulation: 'Anticipatory regulation' in an age of disruption.* **https://media.nesta.org.uk/documents/Renewing_regulation_v3.pdf**

Ash, J. (1997). Organizational factors that influence information technology diffusion in academic health sciences centers. *Journal of the American Medical Informatics Association*, 4(2), 102–111. **https://doi.org/10.1136/jamia.1997.0040102**

Becan, J. E., Bartkowski, J. P., Knight, D. K., Wiley, T. R. A., DiClemente, R., Ducharme, L., Nelsh, W. N., Bowser, D., McCollister, K., Hiller, M., Spaulding, A.C., Flynn, P. M., Swartzendruber, A., Dickson, M. F., Horan Fisher, J., & Aarons, G. A. (2018). A model for rigorously applying the exploration, preparation, implementation, sustainment (EPIS) framework in the design and measurement of a large scale collaborative multi-site study. *Health & Justice*, 6(1), 9. **https://doi.org/10.1186/s40352-018-0068-3**

Black, J., & Murray, A.D. (2019). Regulating AI and machine learning: Setting the regulatory agenda. *European Journal of Law and Technology*, 10(3). **http://eprints.lse.ac.uk/102953/4/722_3282_1_PB.pdf**

Brundage, M., Avin, S., Clark, J., Toner, H., Eckersley, P., Garfinkel, B., Dafoe, A., Scharre, P., Zeitzoff, T., Filar, B., Anderson, H., Roff, H., Allen, G. C., Steinhardt, J., Flynn, C., Ó hÉigeartaigh, S., Beard, S., Belfield, H., Farquhar, S., ... Amodei, D. (2018). The malicious use of artificial intelligence: Forecasting, prevention, and mitigation. **https://arxiv.org/pdf/1802.07228.pdf**

Buiten, M. C. (2019). Towards intelligent regulation of artificial intelligence. *European Journal of Risk Regulation*, 10(1), 41–59. **https://doi.org/10.1017/err.2019.8**

Cambridge Consultants. (2019). *Use of AI in Online Content Moderation*. **https://www.cambridgeconsultants.com/sites/default/files/uploaded-pdfs/Use%20of%20AI%20in%20online%20content%20moderation.pdf**

CMA. (2020). *Online platforms and digital advertising market study*. **https://assets.publishing.service.gov.uk/media/5fa557668fa8f5788db46efc/Final_report_Digital_ALT_TEXT.pdf**

CMA. (2021a). *The CMA's digital markets strategy: February 2021 refresh*. **https://www.gov.uk/government/publications/competition-and-markets-authoritys-digital-markets-strategy/the-cmas-digital-markets-strategy-february-2021-refresh**

CMA. (2021b). *CMA lifts the lid on impact of algorithms.* **https://www.gov.uk/government/news/cma-lifts-the-lid-on-impact-of-algorithms**

Dabhi, K., Crick, C., Douglas, J., McHugh, S., Zatterin, G., Donaldson, S., Procter, R., Woods, R. (2021). *Understanding the UK AI labour market: 2020*. **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/984671/DCMS_and_Ipsos_MORI_Understanding_the_AI_Labour_Market_2020_Full_Report.pdf**

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(3), 555–590. **https://www.jstor.org/stable/256406**

DCMS. (2021). Digital Regulation: *Driving growth and unlocking innovation*. **https://www.gov.uk/government/publications/digital-regulation-driving-growth-and-unlocking-innovation/digital-regulation-driving-growth-and-unlocking-innovation**

Deloitte. (2018a). *The Regulator's new toolkit*. **https://www2.deloitte.com/tr/en/pages/public-sector/articles/the-regulators-new-toolkit.html**

Deloitte. (2018b). *Future of regulation: Case studies.* **https://www2.deloitte.com/content/dam/Deloitte/us/Documents/public-sector/us-fed-future-of-regulation.pdf**

Department for Business, Energy & Industrial Strategy. (2020a). The use of emerging technologies for regulation. **https://www.gov.uk/government/publications/the-use-of-emerging-technologies-for-regulation**

Department for Business, Energy & Industrial Strategy. (2020b). The use of emerging technologies for regulation - annex 1: Case studies. **https://www.gov.uk/government/publications/the-use-of-emerging-technologies-for-regulation**

DRCF. (2021). *Digital regulation cooperation forum: Plan of work for 2021 to 2022*. **https://www.gov.uk/government/publications/digital-regulation-cooperation-forum-workplan-202122/digital-regulation-cooperation-forum-plan-of-work-for-2021-to-2022**

Ebert, L., Amaya-Jackson, L., Markiewicz, J. M., Kisiel, C., & Faribank, J. A. (2012). Use of the breakthrough series collaborative to support broad and sustained use of evidence-based trauma treatment for children in community practice settings. *Administration and Policy in Mental Health*, 39(3), 187–199. **https://doi.org/10.1007/s10488-011-0347-y**

Edmondson, A. C. (2004). Learning from failure in health care: Frequent opportunities, pervasive barriers. *Quality and Safety in Health Care, 13*(Suppl II), ii3–ii9. **https://doi.org/10.1136/qhc.13.suppl_2.ii3**

Engstrom, D. F., Ho, D. E., Sharkey, C. M., Cuéllar, M. F. (2020a). *Government by algorithm: Artificial intelligence in federal administrative agencies*. Report submitted to the Administrative Conference of the United States. **https://law.stanford.edu/education/only-at-sls/law-policy-lab/practicums-2018-2019/administering-by-algorithm-artificial-intelligence-in-the-regulatory-state/acus-report-for-administering-by-algorithm-artificial-intelligence-in-the-regulatory-state/**

Engstrom, D. F., Ho, D. E., Sharkey, C. M., Cuéllar, M. F. (2020b). *Appendix to 'government by algorithm: Artificial intelligence in federal administrative agencies.'* **https://law.stanford.edu/education/only-at-sls/law-policy-lab/practicums-2018-2019/administering-by-algorithm-artificial-intelligence-in-the-regulatory-state/acus-report-for-administering-by-algorithm-artificial-intelligence-in-the-regulatory-state/**

European Central Bank. (2020). *Exploring the potential of supervisory technology*. **https://www.bankingsupervision.europa.eu/press/publications/newsletter/2020/html/ssm.nl200812_3.en.html**

European Commission. (2021). *Proposal for a regulation of the European Parliament and of the council laying down harmonised rules on artificial intelligence (Artificial intelligence act) and amending certain union legislative acts.* **https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0206**

FCA. (2020a). *Artificial intelligence public-private forum*. **https://www.fca.org.uk/news/news-stories/financial-services-ai-public-private-forum**

FCA. (2020b). *Digital regulatory reporting.* **https://www.fca.org.uk/innovation/regtech/digital-regulatory-reporting**

FCA & BoE. (2019). *Machine learning in UK financial services*. **https://www.fca.org.uk/publication/research/research-note-on-machine-learning-in-uk-financial-services.pdf**

Ferlie, E. B., & Shortell, S. M. (2001). Improving the quality of health care in the United Kingdom and the United States: A framework for change. *Milbank Quarterly*, 79(2), 281–315. **https://doi.org/10.1111/1468-0009.00206**

Financial Stability Board. (2020). *The use of supervisory and regulatory technology by authorities and regulated institutions*. **https://www.fsb.org/wp-content/uploads/P091020.pdf**

Financial Stability Institute. (2018). *Innovative technology in financial supervision (Suptech): The experience of early users*. **https://www.bis.org/fsi/publ/insights9.htm**

Finch, T. L., Rapley, T., Girling, M., Mair, F. S., Murray, E., Treweek, S., McColl, E., Steen, I. N., May, C., R., & Finch, T. L. (2013). Improving the normalization of complex interventions: Measure development based on normalization process theory (NoMAD): study protocol. *Implementation Science*, 8(1), 43. **https://doi.org/10.1186/s12874-018-0590-y**

FRC. (2019). *Artificial intelligence and corporate reporting: How does it measure up?* **https://www.frc.org.uk/getattachment/e213b335-927b-4750-90db-64139aee44f2/AI-and-Corporate-Reporting-Jan.pdf**

French General Directorate for Food. (2019). *Activity report*. **https://agriculture.gouv.fr/dgal-government-department-service-citizen**

G20. (2019). *G20 ministerial statement on trade and digital economy.* **https://trade.ec.europa.eu/doclib/docs/2019/june/tradoc_157920.pdf**

Ghate, D. (2016). From programs to systems: Deploying implementation science and practice for sustained real world effectiveness in services for children and families. *Journal of Clinical Child & Adolescent Psychology*, 45(6), 812-826. **https://doi.org/10.1080/15374416.2015.1077449**

Gleacher, A. A., Nadeem, E., Moy, A. J., Whited, A. L., Albano, A. M., Radigan, M., Wang, R., Chassman, J., Myrhol-Clarke, B., & Hoagwood, K. E. (2011). Statewide CBT training for clinicians and supervisors treating youth: The New York State evidence based treatment dissemination center. *Journal of Emotional and Behavioral Disorders*, 19(3), 182-192. **https://doi.org/10.1177/1063426610367793**

Glisson, C., & Schoenwald, S. K. (2005). The ARC organizational and community intervention strategy for implementing evidence-based children's mental health treatments. *Mental Health Services Research*, 7(4), 243-259. **https://doi.org/10.1007/s11020-005-7456-1**

Grol, R. P. T. M., Bosch, M. C., Hulscher, M. E. J. L., Eccles, M. P., & Wensing, M. (2007). Planning and studying improvement in patient care: The use of theoretical perspectives. *The Milbank Quarterly*, 85(1), 93-138. **https://doi.org/10.1111/j.1468-0009.2007.00478.x**

House of Lords. (2020). *AI in the UK: No room for complacency.* **https://publications.parliament.uk/pa/ld5801/ldselect/ldliaison/196/19602.htm**

House of Lords. (2018). *AI in the UK: Ready, willing and able?* **https://publications.parliament.uk/pa/ld201719/ldselect/ldai/100/100.pdf**

ICO. (2020a). *Guidance on AI and data protection.* **https://ico.org.uk/for-organisations/guide-to-data-protection/key-dp-themes/guidance-on-ai-and-data-protection/**

ICO. (2020b). *What are the accountability and governance implications of AI?* **https://ico.org.uk/for-organisations/guide-to-data-protection/key-dp-themes/guidance-on-ai-and-data-protection/what-are-the-accountability-and-governance-implications-of-ai/**

ICO & ATI. (2020). *Explaining decisions made with AI*. **https://ico.org.uk/for-organisations/guide-to-data-protection/key-data-protection-themes/explaining-decisions-made-with-ai/**

IFOW. (2020) *Mind the gap: The final report of the equality task force*. **https://www.ifow.org/publications/mind-the-gap-the-final-report-of-the-equality-task-force**

International Association of Insurance Supervisors & Access to Insurance Initiative. (2019). *RegTech and SupTech: Implications for supervision.* **https://a2ii.org/en/knowledge-center/regtech-and-suptech-implications-for-supervision---a2iiiais-consultation-call-march-2019**

Klein, K. J., & Sorra, J. S. (1996). The challenge of innovation implementation. *Academy of Management Review,* 21(4), 1055–1081. **https://doi.org/10.5465/amr.1996.9704071863**

Lang, J. M., Franks, R. P., Epstein, C., Stover, C., Oliver, J. A. (2015). Statewide dissemination of an evidence-based practice using breakthrough series collaboratives. *Children and Youth Services Review*, 55, 201–209. **https://doi.org/10.1016/j.childyouth.2015.06.005**

Leeman, J., Calancie, L., Hartman, M. A., Escoffery, C. T., Herrmann, A. K., Tague, L. E., Moore, A. A., Wilson, K. M., Schreiner, M., & Samuel-Hodge, C. (2015). What strategies are used to build practitioners' capacity to implement community-based interventions and are they effective?: A systematic review. *Implementation Science*, 10(1), 80. **https://doi.org/10.1186/s13012-015-0272-7**

Leslie, D. (2019). *Understanding artificial intelligence ethics and safety: A guide for the responsible design and implementation of AI systems in the public sector*. The Alan Turing Institute. **https://doi.org/10.5281/zenodo.3240529**

LSB. (2018). *Technology and innovation in legal services*. **https://legalservicesboard.org.uk/wp-content/media/Innovation-survey-2018-report-FINAL-2.pdf**

Lynch, S. (2017). Andrew Ng: Why AI is the new electricity. *Stanford Business.* **https://www.gsb.stanford.edu/insights/andrew-ng-why-ai-new-electricity**

Mancini, J. A., & Marek, L. I. (2004). Sustaining community-based programs for families: Conceptualization and measurement. *Family Relations*, 53(4), 339-347. **https://www.jstor.org/stable/3700173**

May, C. (2006). Mobilising modern facts: Health technology assessment and the politics of evidence. *Sociology of Health & Illness*, 28(5), 513-532. **https://doi.org/10.1111/j.1467-9566.2006.00505.x**

May, C. & Finch, T. L. (2009). Implementation, embedding, and integration: An outline of normalization process theory. *Sociology*, 43(3), 535-554. **http://dx.doi.org/10.1177/0038038509103208**

May, C. R., et al. (2007). Process evaluation for complex interventions in primary care: understanding trials using the normalization process model. *BMC Family Practice,* 8(1), 42. **https://doi.org/10.1111/j.1467-9566.2006.00505.x**

Mendel, P., Meredith, L. S., Schoenbaum, M., Sherbourne, C. D., & Wells, K. B. (2008). Interventions in organizational and community context: a framework for building evidence on dissemination and implementation in health services research. *Administration and Policy in Mental Health and Mental Health Services Research*, 35(1-2), 21-37. **https://doi.org/10.1007/s10488-007-0144-9**

Metz, A. & Albers, B. (2014). What does it take? How federal initiatives can support the implementation of evidence-based programs to improve outcomes for adolescents. *Journal of Adolescent Health,* 54(3), S92-S96. **https://doi.org/10.1016/j.jadohealth.2013.11.025**

Miettinen, M. (2020). "By design" and risk regulation: Insights from nanotechnologies. *European Journal of Risk Regulation*, 12(4), 1-17. **http://dx.doi.org/10.1017/err.2020.58**

Misuraca, G., & van Noordt, C. (2020). *AI watch: Artificial intelligence in public services*. Publications Office of the European Union. **https://doi.org/10.2760/039619**

Moullin, J. C., Dickson, K. S., Stadnick, N. A., Rabin, B., & Aarons, G. A. (2019). Systematic review of the exploration, preparation, implementation, sustainment (EPIS) framework. *Implementation Science*, 14(1), 1. **https://doi.org/10.1186/s13012-018-0842-6**

Murray, L. K., Dorsey, S., Skavenski, S., Kasoma, M., Imasiku, M., Bolton, P., Bass, J., & Cohen, J. A. (2013). Identification, modification, and implementation of an evidence-based psychotherapy for children in a low-income country: The use of TF-CBT in Zambia. *International Journal of Mental Health Systems*, 7(1), 24. **https://doi.org/10.1186/1752-4458-7-24**

Murray, L. K., Skavenski, S., Michalopoulos, L. M., Bolton, P. A., Bass, J. K., Familiar, I., Imasiku, M., & Cohen, J. (2014). Counselor and client perspectives of trauma-focused cognitive behavioral therapy for children in Zambia: A qualitative study. *Journal of Clinical Child & Adolescent Psychology*, 43(6), 902-914. **https://doi.org/10.1080/15374416.2013.859079**

Murray, E., Treweek, S., Pope, C., MacFarlane, A., Bellini, L., Dowrick, C., Finch, T., Kennedy, A., Mair, F., O'Donnell, C., Ong, B. N., Rapley, T., Rogers, A., & May, C. (2010). Normalisation process theory: A framework for developing, evaluating and implementing complex interventions. *BMC medicine*, 8(1), 63. **https://doi.org/10.1186/1741-7015-8-63**

Nadeem, E., Jaycox, L. H., Kataoka, S. H., Langley, A. L., & Stein, B. D. (2011). Going to scale: Experiences implementing a schoolbased trauma intervention. *School Psychology Review*, 40(4), 549–568. **http://dx.doi.org/10.1080/02796015.2011.12087529**

Nadeem, E. & Ringle, V. A. (2016). De-adoption of an evidence-based trauma intervention in schools: A retrospective report from an urban school district. *School Mental Health*, 8(1), 132–143. **https://doi.org/10.1007/s12310-016-9179-y**

National Science Foundation. (2016). *Fighting food poisoning in Las Vegas with machine learning*. **https://www.nsf.gov/news/news_summ.jsp?cntn_id=137848**

NHSX. (n.d.) *The multi-agency advice service (MAAS)*. **https://www.nhsx.nhs.uk/ai-lab/ai-lab-programmes/regulating-the-ai-ecosystem/the-multi-agency-advice-service-maas/**

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. Implementation science, 10(1), 53. **https://doi.org/10.1186/s13012-015-0242-0**

OECD. (2020). *Cracking the code: Rulemaking for humans and achines*. OECD Working Papers on Public Governance No. 42. Vol. 42 OECD Working Papers on Public Governance. **https://doi.org/10.1787/3afe6ba5-en**

Ofcom. (2020). Ofcom to regulate harmful content online. **https://www.ofcom.org.uk/about-ofcom/latest/features-and-news/ofcom-to-regulate-harmful-content-online**

Ofcom. (2021a). *Gill Whitehead appointed chief executive of digital regulators forum*. **https://www.ofcom.org.uk/news-centre/2021/gill-whitehead-appointed-digital-regulators-forum-chief-executive**

Ofcom. (2021b). *Statement: Ofcom's plan of Work 2021/22.* **https://www.ofcom.org.uk/consultations-and-statements/category-2/plan-of-work-2021-22**

Ofcom. (2021c). *The digital regulation cooperation forum: Working for greater cooperation in regulating online platforms*. **https://www.ofcom.org.uk/news-centre/2021/working-for-greater-cooperation-in-online-regulation**

Office for AI. (2021) *National AI Strategy*. **https://www.gov.uk/government/publications/national-ai-strategy**

Ostmann, F. & Dorobantu, C. (2021). *AI in financial services*. The Alan Turing Institute. **https://doi.org/10.5281/zenodo.4916041**

Palaimon. (2020). *Automatic road condition detection – ARC-D*. **https://palaimon.io/blog/arcd**

Powell, B. J., Patel, S. V., Haley, A. D., Haines, E. R., Knocke, K. E., Chandler, S., Katz, C. C., Seifert, H. P., Ake, G., Amaya-Jackson, L., & Aarons, G. A. (2019). *Determinants of implementing evidence-based trauma-focused interventions for children and youth: A systematic review. Administration and Policy in Mental Health and Mental Health Services Research*, 1-15. **https://doi.org/10.1007/s10488-019-01003-3**

Proctor, E., Silmere, E., Raghavan, R., Hovmand, P., Aarons, G. A., Bunger, A., Griffey, R., & Hensley, M. (2011). Outcomes for implementation research: Conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(2), 65-76. **https://doi.org/10.1007/s10488-010-0319-7**

Rodrigues, R., Panagiotopoulos, A., Lundgren, B., Laulhe Shaelou, S. & Grant, A . (2019). D3 3 Regulatory options for AI and big data. *DeMontfort University. Online resource.* **https://doi.org/10.21253/DMU.11618211.v7**

Sabalauskas, K. L., Ortolani, C. L., & McCall, M. J. (2014). Moving from pathology to possibility: Integrating strengths-based interventions in child welfare provision. *Child Care in Practice*, 20(1), 120-134. **https://doi.org/10.1080/13575279.2013.847053**

Sigel, B. A., Kramer, T. L., Conners Edge, N. A., & Church, J. (2013). Statewide dissemination of trauma-focused cognitive-behavioral therapy (TF-CBT). *Children and Youth Services Review*, 35(6), 1023–1029. **http://dx.doi.org/10.1016/j.childyouth.2013.03.012**

Strifler, L., Cardoso, R., McGowan, J., Cogo, E., Nincic, V., Khan, P. A., Scott, A., Ghassemi, M., MacDonald, H., Lai, Y., Tresiter, V., Tricco, A. C., & Straus, S. E. (2018). Scoping review identifies significant number of knowledge translation theories, models, and frameworks with limited use. *Journal of Clinical Epidemiology*, 100, 92-102. **https://doi.org/10.1016/j.jclinepi.2018.04.008**

Tabak, R. G., Khoong, E. C., Chambers, D. A., & Brownson, R. C. (2012). Bridging research and practice: Models for dissemination and implementation research. *American Journal of Preventive Medicine*, 43(3), 337-350. **https://doi.org/10.1016/j.amepre.2012.05.024**

Technical Safety BC. (2018). *Catherine Roome: Meeting the challenge of artificial intelligence with safety in mind*. **https://www.technicalsafetybc.ca/blog/catherine-roome-meeting-challenge-artificial-intelligence-safety-mind**

The Alan Turing Institute. (2021). *Shocks and Resilience: Project overview.* **https://www.turing.ac.uk/research/research-projects/shocks-and-resilience**

The Behavioural Insights Team. (2017). *Using data science in policy.* **https://www.bi.team/publications/using-data-science-in-policy/**

Toronto Centre. (2017). *FinTech, RegTech and SupTech: What they mean for financial supervision.* **https://res.torontocentre.org/guidedocs/FinTech%20RegTech%20and%20SupTech%20-%20What%20They%20Mean%20for%20Financial%20Supervision%20FINAL.pdf**

Vidgen, B. & Margetts, H. (2021). *Introducing the online harms observatory.* **https://www.turing.ac.uk/blog/introducing-online-harms-observatory**

Vidgen, B., Thrush, T., Waseem, Z., & Kiela, D. (2020). Learning from the worst: Dynamically generated datasets to improve online hate detection. **https://doi.org/10.48550/arXiv.2012.15761**

WaterAnalytics. (2018). *Smart analytics for improving efficiency of water distribution networks*. **https://www.wateranalytics.eu**

Weiner, B. J. (2009). A theory of organizational readiness for change. *Implementation Science*, 19(4), 67. **https://doi.org/10.1186/1748-5908-4-67**

Wenocur, K., Parkinson-Sidorski, M., & Snyder, S. (2016). Provision of child trauma services in emergency family housing (practice note). *Families in Society -the Journal of Contemporary Social Services*, 97(3), 253–258. **https://doi.org/10.1606%2F1044-3894.2016.97.28**

World Bank. (2020). *A roadmap to SupTech solutions for low income (IDA) countries*. Fintech Note No. 7., World Bank. **https://doi.org/10.1596/34662**

Yoo, J., Brooks, D., & Patti, R. (2007). Organizational constructs as predictors of effectiveness in child welfare interventions. *Child Welfare*, 86(1), 53–78. **https://www.jstor.org/stable/45400382**

Zahra, S. A. & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. Academy of Management Review, 27(2), 185-203. **https://doi.org/10.2307/4134351**

10. Annex

In order to facilitate organisational and participant-level reflection on regulatory readiness, we developed a readiness self-assessment tool. The tool was developed through our analysis of interview responses. It focuses on key components of readiness identified as important for equipping regulators both in relation to the *Regulation of AI* and *AI for Regulation*.

The tool can be used by individuals, teams, or whole organisations as a reflective exercise to assess current readiness levels and to identify strengths, weaknesses, and gaps. The tool encompasses readiness requirements relating to both the *Regulation of AI* and *AI for Regulation* and engages with organisational values, needs, and knowledge. These readiness requirements are detailed in Table 8.

Under each of the headings, the tool contains a series of questions to assess readiness in relation to key dimensions. Each question has a range of possible answers: completely confident; fairly confident; somewhat confident; not very confident; not confident at all.

Table 8: List of Readiness Requirements in the Readiness Self-Assessment Tool

Requirement Groupings	Description	Readiness Requirements
Partnership building	The success of a technology or technology policy innovation will be affected by the degree to which meaningful partnerships can be formed and cultivated between organisations, community groups, and affected individuals, so that the innovation is cooperatively shaped and collectively monitored for quality.	Our organisation proactively pursues and cultivates meaningful partnerships so that our technology policies and processes can be cooperatively shaped and collectively monitored for quality and effectiveness
		We pursue partnerships to cooperatively shape and collectively monitor technology policies and processes with: • Other public sector bodies
		• Private organisations
		• NGOs
		• Community groups
		• Affected individuals

Table 8: List of Readiness Requirements in the Readiness Self-Assessment Tool (cont.)

Requirement Groupings	Description	Readiness Requirements
Interorganisational cooperation (both in relation to the *Regulation of AI* and *AI for Regulation*)	The success of a technology or technology policy innovation will be affected by the degree to which meaningful and continuous collaborations are undertaken between relevant organisations. These collaborations need to be recursively interactive: there should be a reciprocal responsiveness to feedback and input between actors, which enables organisational learning.	Our organisation undertakes meaningful collaborations with other regulatory bodies to enable reciprocal organisational learning about: • The Regulation of AI • The use of *AI for Regulation*
Absorptive capacity	The success of a technology or technology policy innovation will be affected by the degree to which an organisation is able to build upon a strong knowledge and skills base and assimilate new knowledge into existing practices and capabilities. This is often supported by established mechanisms for sharing and disseminating knowledge throughout the organisation.	Our organisation is able to draw upon a strong knowledge and skills base about AI Our organisation is able to use and assimilate new knowledge related to AI into existing practices and capabilities We have accessible and established mechanisms for sharing and disseminating knowledge about AI throughout the organisation
Change readiness	The success of a technology or technology policy innovation will be affected by the degree to which an organisation's members share confidence in their efficacy to implement change, value change as important and beneficial, reject institutional inertia, and share a resolve to initiate, persist, and cooperate in carrying out innovation.	Members of our organisation share confidence in their efficacy to: • Implement changes related to new technologies or technology policy • Convey these changes as important and beneficial • Reject institutional inertia • Share a resolve to initiate, persist, and cooperate in carrying out innovation

Table 8: List of Readiness Requirements in the Readiness Self-Assessment Tool (cont.)

Requirement Groupings	Description	Readiness Requirements
Receptivity to change	The success of a technology or technology policy innovation will be affected by the degree to which the norms and shared expectations of an organisation create conditions of openness to change and lower the burdens of compliance and opposing demands. A receptive context is enabled in organisational environments that encourage ingenuity, demonstrate tolerance to novel or unconventional ideas, and accept conceptual risk-taking.	The norms and shared expectations that govern our organisation create conditions of openness to changes spurred by the integration of AI new technofixes or technology policies
		In our organisational culture, we encourage ingenuity, demonstrate tolerance to novel or unconventional ideas, and accept conceptual risk-taking
Organisational-level leadership	The success of a technology or technology policy innovation will be affected by the degree to which members in leadership positions steward a cultural environment that is amenable to innovation adoption and take ownership over end-to-end best practices and responsible innovation.	Members of our organisation in leadership positions steward a cultural environment that is amenable to the adoption of new AI technologies or technology policies
		Members of our organisation in leadership positions take ownership over end-to-end best practices in responsibly implementing the adoption of new AI technologies of technology policies
Resource availability	The success of a technology or technology policy innovation will be affected by the degree to which an organisation's resource availability is sufficient for the development, implementation, and sustainability demands of the specific innovation they are producing and deploying. Resource shortage may cause a deterioration of service quality and a reduction in availability, which then leads to decreased service initiation and completion.	Our organisation can make sufficient resources available for the development, implementation, and sustainability demands of: • The new AI technologies we produce and deploy.
		• The new technology policies we produce and deploy.

Table 8: List of Readiness Requirements in the Readiness Self-Assessment Tool (cont.)

Requirement Groupings	Description	Readiness Requirements
Participant attitudes	The success of a technology or technology policy innovation will be affected by the degree to which participants have pro-innovation attitudes and a strong belief in the role that an innovation intervention will play in bringing about a needed change. Buy-in about the transformative utility of an innovation from implementers leads to more consistent decisions to adopt the innovation and undergo training in preparation for its use.	Our organisation cultivates pro-innovation attitudes among team members across departments and a strong belief in the role that: • New AI technologies will play in bringing about a needed change. • New technology policies will play in bringing about a needed change.
Training and skills development	The success of a technology or technology policy innovation will be affected by the degree to which participants have access to adequate, relevant and up-to-date training and skills development to equip them with the relevant knowledge, understandings and skills.	We have training and skills development processes in place that sufficiently prepare team members across departments to understand the technical dimensions of AI applications and the role they play in the regulatory environment under our remit. We have training and skills development processes in place that sufficiently prepare team members across departments to embrace the use of AI systems to fulfil our mission. The training and skills development processes we have in place encompass dimensions of AI such as: • Technical dimensions • Ethical dimensions • Policy dimensions • Governance dimensions • Commercial dimensions

Table 8: List of Readiness Requirements in the Readiness Self-Assessment Tool (cont.)

Requirement Groupings	Description	Readiness Requirements
Knowledge of the state-of-the-art	The success of a technology or technology policy innovation will be affected by the degree to which participants have access to knowledge about the state-of-the-art in relation to that technology.	Our organisation has access to expertise and knowledge relating to the state-of-the-art in AI that is sufficient to equip us with the understandings needed to: • Adequately and appropriately scrutinise uses of AI and claims made in relation to regulatory compliance • Develop and deploy innovative AI regulatory tools
Capacity for gap understanding	The success of a technology or technology policy innovation will be affected by the degree to which participants, teams, and organisations are equipped to identify, understand and respond to current gaps.	Our organisation has internal processes in place that enable us to: • Map and understand the risks posed by AI • Identify regulatory gaps • Map regulatory options, identifying the most efficient and effective ways of addressing regulatory gaps

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