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Towards an Experimental Governance Framework for Emerging Technologies

Chapter 1: Learning From The Past

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How can we make experimentation the norm when building policy in emerging tech?

Open Loop and Demos Helsinki reflect on past experimental governance initiatives, assess the ones being currently used, and imagine what a holistic, inclusive experimental governance framework for the regulation of emerging technologies could look like.

Reflect to reimagine

The nature and scope of changes and the impact emanating from emerging technologies, like AI and machine learning, can be difficult to shape, anticipate and identify.

And the same thing can be said about the downstream effects of laws and regulations governing those technologies. References to experimentation are already being made in national AI strategies and in calls for regulatory sandbox approaches to the deployment of emerging technologies.

Yet how can we more systematically harness the potential of experimentation- to test and assess impacts in the development and deployment of technology and regulation, but also to foster openness and mutual trust through an inclusive, holistic governance framework?

Reflection #1

What would it take for testing and experimenting to become a go-to regulatory approach in tech governance, embedded in the different stages of policy and lawmaking processes?

Reflection #2

How can governments, technology companies, academia and civil society start engaging collaboratively in experimenting with regulation in tech?

Reflection #3

How can experiments in building policy and regulation foster open, trustworthy and evidence-based policies for emerging technologies?

Key Messages

- Emerging technologies – such as AI – are poised to enact great opportunities as well as changes within our societies. However, today **the crossroads of technology and society are at an impasse**: there is a lack of understanding on how to better nurture trust both in new technology and policy, and in those that develop and regulate them.

- One main reason behind this impasse is the **Collingridge dilemma**: a conundrum in which efforts by decision-makers at influencing emerging technologies are hindered by the lack of timely information about its future effects, and by the lack of control once they become embedded across society. As a result, the dilemma contributes to a **collapse in the levels of trust** not only towards technology and policy, but also between those involved in their development (tech companies, governments, etc.).

- Based on a recursive goal-setting and learning-based revision, **experimental governance** provides a potential solution to the dilemma in two ways: first, by acknowledging the iterative character of the innovation process and embedding it in decision-making; second, by providing a common ground for stakeholders to come together and improve the processes behind technology and policy making.

- Throughout the last century, experimental governance has been interpreted and applied across three main **'families' of approaches**: experimental lawmaking; policymaking; and design. Each is defined by a distinct relationship to the overall policy process, as well as peculiar strengths and limitations.

Experimental lawmaking showcased how greater adaptability can be embedded into rules that have traditionally been framed as rigid and definitive, hence codifying experimentation into policy implementation; yet, their uptake in policy practice has been rather slow and tendentially past the unfolding of critical innovation processes.

Experimental policymaking resulted in a wealth of techniques with strong methodological clarity to policy decisions; yet, they have rarely been capable of providing an effective common ground for stakeholders to convene around joint sensemaking and action.

Experimental design proved that policy can be framed, formulated and developed in much more inclusive ways than it has ever been traditionally; yet, it did not manage to upscale its relevance from the policy labs that championed it to the core of government.

- The three ‘families’ of approaches all highlighted strengths and gaps that need to be addressed in view of contemporary challenges; most notably, they showed a need for three shifts to take place in the experimental governance of emerging technologies:
  - From outpaced to **anticipatory lawmaking**;
  - From top-down to **stakeholder-inclusive policymaking**;
  - From piecemeal to **holistic design**.
- Based on this analysis, the second chapter aims to assess whether or not contemporary approaches to the experimental governance of emerging technologies embed these shifts, and how they can be drawn upon or be improved in order to bring them about.

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Content

01

What?
Framing Chapter 1

The nature and scope of the impact of emerging technologies can be difficult to anticipate and identify. Today, the premises and potential of artificial intelligence (AI) exemplify how emerging technologies are poised to facilitate significant societal changes and diverse opportunities, risks, and purposes. On the other hand, the same can be said about the downstream effects of the policies and regulations governing them, in which it is equally difficult to fully anticipate the consequences of such laws and how they advance the goals defined.

For this reason, technology and policy are now at a crossroads. There is a growing deficit of trust in technology — a disbelief in how innovation is used to increase the benefits and improve the welfare of society. [1] At the same time, there is a growing deficit of trust in policy — a disbelief in the possibility of directing technological change for the common good. [2] As a result, there is uncertainty about how different stakeholders can work together for a new social contract to make more trustworthy technology and policy come to life.

This poses a series of questions that need to be considered: What is wrong and what is right in the current technology and policy landscape? Where and how might they be improved? Seeking to enable purposeful innovation while preventing its related risks entails a complex balancing act, especially if, as with contemporary emerging technologies, there is no full visibility of their potential implications. If this is the case, how then can we navigate and address the many tensions brought about by technological change while reaping its societal benefits?

Technological change has often triggered sociotechnical transitions accompanied by corresponding governance and regulatory arrangements. In fact, this has been happening for centuries. In the late 19th century, the Second Industrial Revolution showed how major breakthroughs in the steel, coal, electric, and chemical industries were part of a broader process of institutional and social realignment. Indeed, the widespread adoption of major technological advancements, such as telegraphs, railroad networks, and gas and water supplies, would not have been possible without parallel transformations in policies, regulations, governance systems, and culture that enabled their deployment and supported societal change. [3] A continuous process of mutual adaptation and reimagination weaved together technological breakthroughs

1 Edelman, 2020; Kelly & Guskin, 2021; Allen & Fried, 2021 2 Prabhu, 2021; Wall Street Journal, 2022 3 Freeman & Louça, 2001

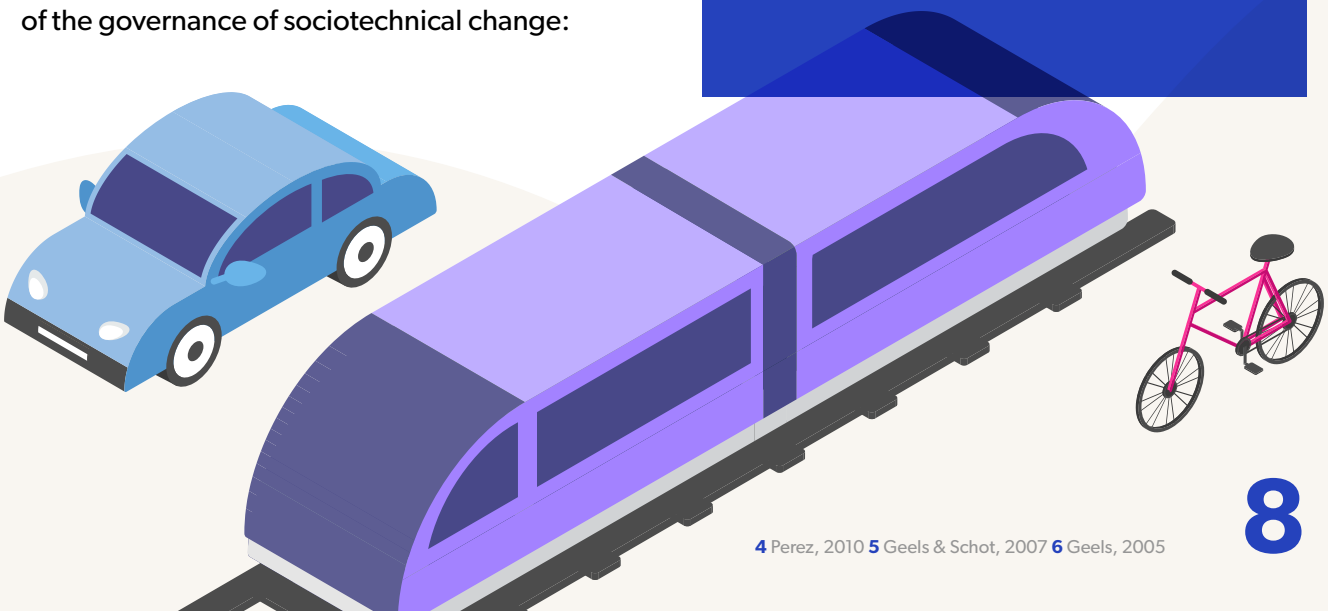
and societies through both upswings and downswings (see Box 1). Crucially, such dynamics matched institutions' capacity to learn how to seize innovation, for what purposes, and how to adjust accordingly.[4]

Our past provides plenty of illustrations linking technological deployment with sociotechnical transitions — transformation processes in which communities, emerging technologies, policies and regulations, and different types of knowledge come together, interact, and translate into ever-changing social and technological regimes.[5] Firms, entrepreneurs, and activists can discover new practices or technologies, while pressure groups and social movements may mobilize public opinion for certain policies and regulations — all of which constitute the transition toward a regime that governs society and technology.

Therefore, the societal transformations we are currently experiencing are not, in one sense, unique in historical scale. Yet, the impressive tide of groundbreaking technologies emerging nowadays — with AI being first and foremost among them — has been widely framed as key to societal progress. Once again, the stakes for society at large seem to be extremely high. Today, as in the past, the breadth and complexity of a new transition challenge contemporary institutions to rethink how they can best govern the mutual adaptation and reimagination of technology, policy, and society. Susana Borrás and Jakob Edler analyze this challenge in terms of the governance of sociotechnical change:

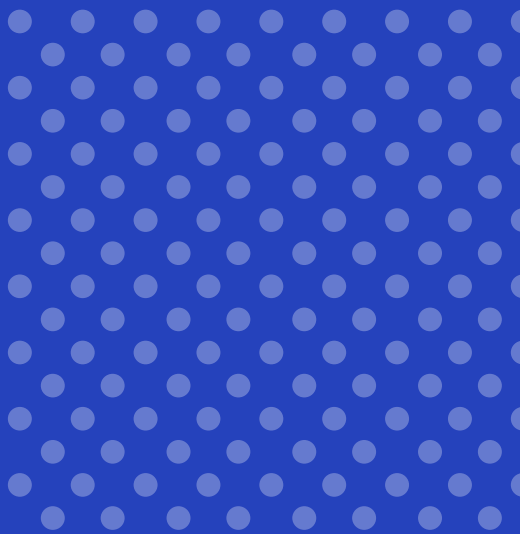
Box 1: Example of a sociotechnical transition

One example of a sociotechnical transition is that from horse-drawn carriages to cars or vehicles in the US.[6] Back in the 19th century, major political, social, and cultural changes were taking place in the form of urbanization, immigration, hygiene movement, electricity, and an expanding middle class. These led to new demands and solutions beyond horse-based carriages, which could no longer support what society needed. The landscape change created opportunities for innovations, such as electric trams, bicycles, and, finally, cars, which later became embedded in society and were supported by new institutions created around them, such as restaurants and shopping malls on the fringes of cities. At the same time, the transition brought new challenges (including new geographic, social, and economic inequalities) that in turn led to public demands for new solutions to be devised by the evermore critical action of local governments. The importance of these challenges remains to this date, testifying to the profound implications that sociotechnical transitions can bear in both the short and long terms.



4 Perez, 2010 5 Geels & Schot, 2007 6 Geels, 2005

> (…) the way in which societal and state actors intentionally interact in order to transform [sociotechnical] systems, by regulating issues of societal concern, defining the processes and direction of how technological artefacts and innovations are produced, and shaping how these are introduced, absorbed, diffused and used within society and economy.[7]

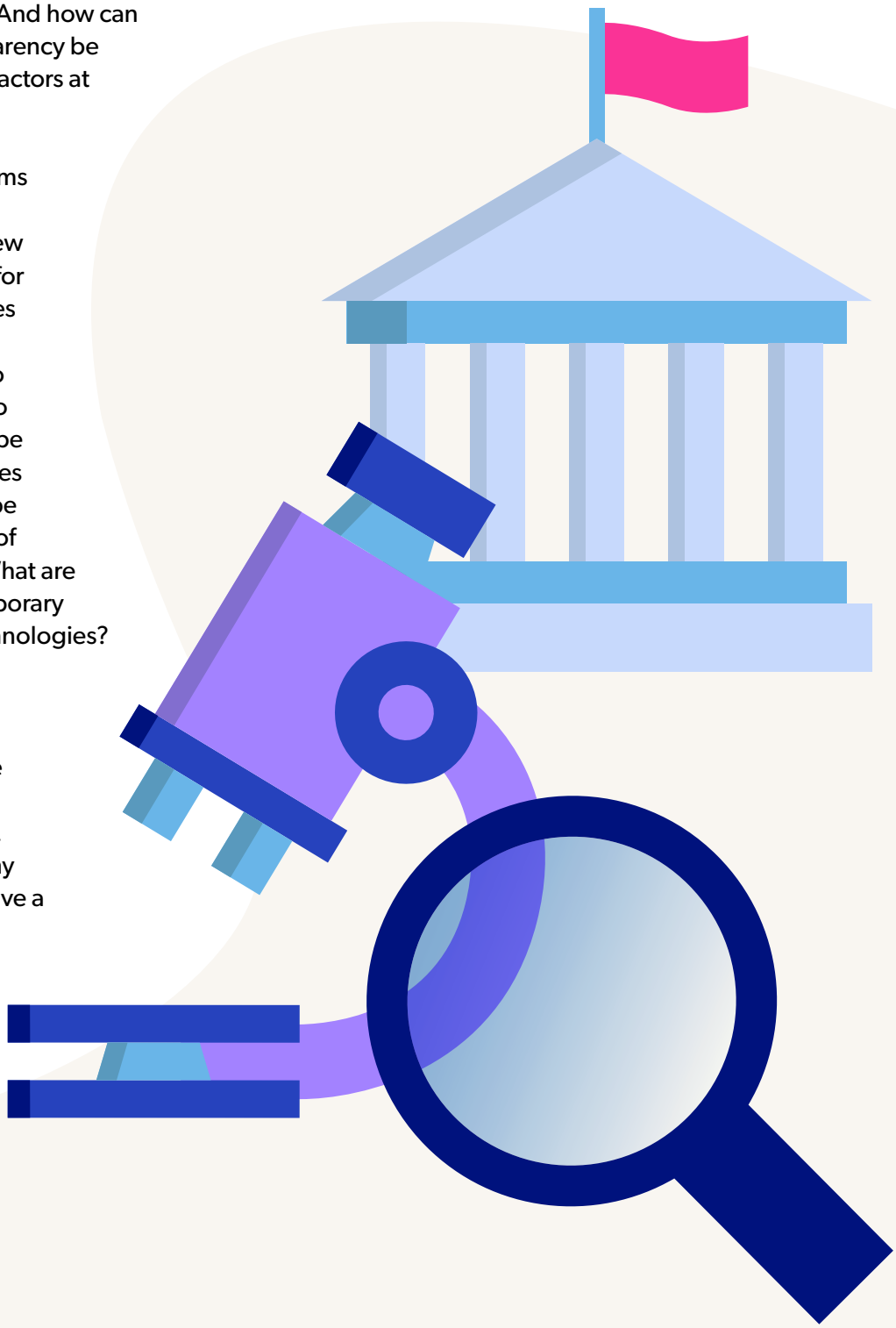


7 Borrás & Edler, 2014

Indeed, scoping, identifying, and developing governance solutions for the current sociotechnical transition can play a major role in addressing the tensions arising from emerging technologies. How can policymakers intentionally interact with technology and technology developers? How can technology innovation be interwoven with policy innovation and vice versa? How can societal actors be involved in these processes? And how can greater openness and transparency be fostered among the different actors at play?

In this respect, this chapter aims to show how experimental governance might help set new and more resilient standards for policy and innovation activities to come, and present not only how people can adapt to technological change but also how they can proactively shape it. To do so, the chapter focuses on two questions: What can be learned from historical cases of experimental governance? What are their implications for contemporary governance of emerging technologies?

The remainder of this section aims to develop a first and preliminary response to these questions and eventually point out initial ways forward. Section 2 aims to illustrate why technology and regulation have a difficult time evolving at the same pace, and identifies experimental governance as a strategy to address this problem. Section 3 assesses key examples from past experimental governance initiatives and reflects on their advantages and limitations. Based on this analysis, Section 4 highlights three main gaps in previous experimental governance initiatives. Finally, Section 5 concludes with three hypotheses, paving the ground for dialogue between relevant stakeholders.



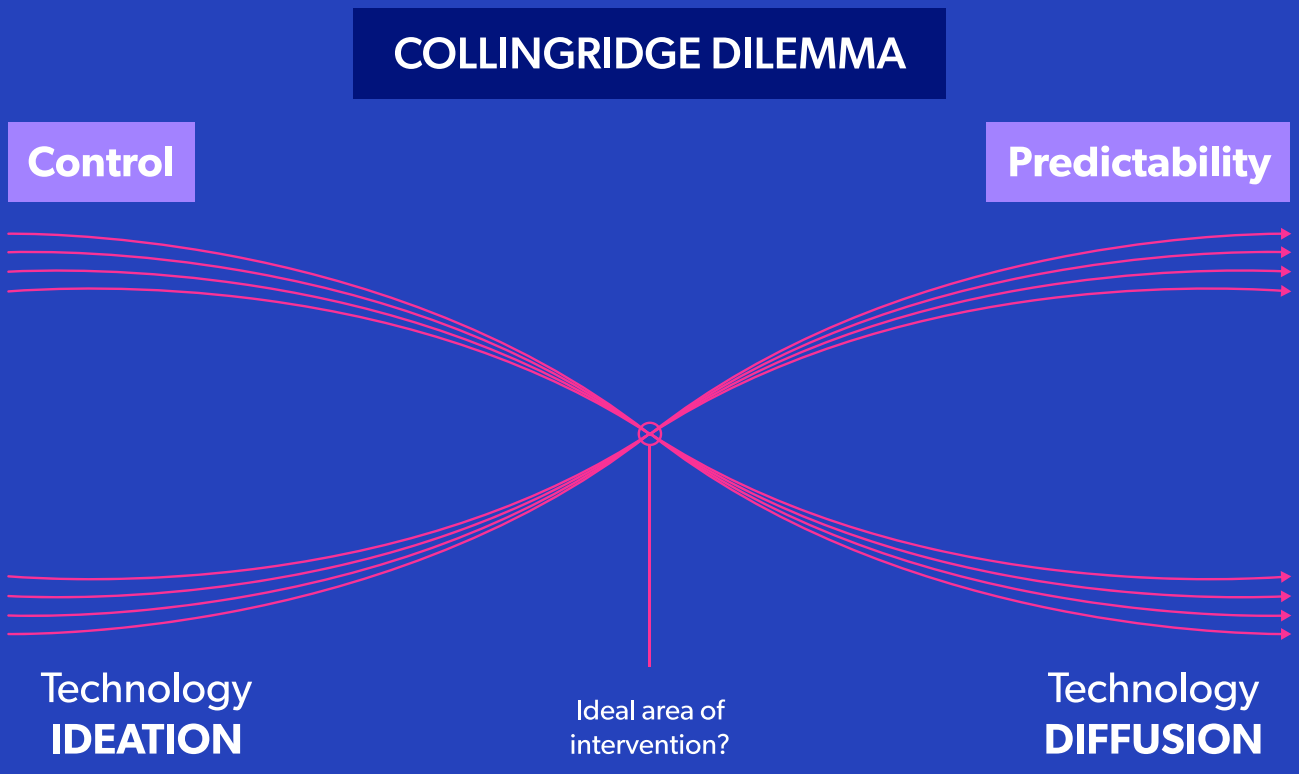
02

Why?
Explaining and overcoming the Collingridge dilemma

One key example of the challenges faced in the governance of sociotechnical transitions is represented by the Collingridge dilemma — a conundrum in which efforts to influence the development of emerging technologies are hindered by two opposing challenges.[8]

On the one hand, an information problem complicates the early regulation of emerging technologies — that is, when not enough is known about certain technological developments to understand how they might affect society and its stakeholders.
On the other hand, a control problem complicates the late regulation of emerging technologies — that is, when their designs, trajectories, applications, or societal uses become entrenched in our institutions, policies, regulations, and cultural norms.

As a result, decision makers are left in a genuine dilemma. Should they attempt to control early-stage technologies despite the risk of stifling potential breakthroughs? Should they wait for them and their effects to become more predictable, only to find themselves deprived of the chance to control them? And if neither of these options is palatable, how can contrasting priorities be balanced?



Adapted from Besti, F. & Samorè, F. (2018). Responsibility driven design for the future self-driving society. Fondazione Giannino Bassetti

Figure 1. A representation of the Collingridge dilemma

8 Collingridge, 1980

Box 2: An example of the Collingridge dilemma

The dilemma can be exemplified by the development of the internet. What started out as a defense project in the US Defense Advanced Research Projects Agency became a tool to decentralize and democratize information, which was an unforeseeable result that, in several respects, had a major, positive impact on society. However, while many thought that the advent of the internet would bring about positive spillover effects in the form of democratic freedoms and spaces, this has not been the case everywhere. Malicious state and non-state actors have used the internet and its related technologies to reduce democratic freedoms and spaces, whereas disinformation and misinformation have given rise to new problems that were not anticipated by governments or the wider public, even just 20 years ago.

Furthermore, the dilemma is rendered even more complex by concerns about the societal legitimacy of new technologies, including the impact they bear on stakeholders' own welfare, values, expectations, and desires. While emerging technologies may gain legitimacy from the resolution of societal problems, they can also become increasingly questioned in several circumstances, such as the following: (i) when a mismatch between emerging technologies and the pre-existing regulatory framework becomes apparent (e.g., digital platforms often have cross-cutting impacts that may not be fully captured by a traditional sector-by-sector policy approach) (Amaral, 2021),[9] (ii) when wide information asymmetries between technology developers and users become entrenched (e.g., the inner workings of algorithms using machine learning are only understood by a small number of technical experts), (iii) when increasingly conflicting interests over the societal deployment of technology do not engage with one another anymore (e.g., the disconnect between the need to provide energy, often using technologies reliant on fossil fuels, and the need to address the climate emergency), or (iv) when societal fear exceeds promises of rewards, as in the case of, for example, the Japanese nuclear industry after Fukushima.

These circumstances are often accompanied by the same byproduct—a steep collapse in the levels of trust not only toward technology and policy (see Section 1) but also between the actors primarily involved in their development, such as technology companies, governments, and their representatives. While high levels of trust among them would help nurture fruitful synergies among them, the Collingridge dilemma sets the scene for their breakdown, thus posing a major challenge both for the governance of currently emerging technologies and for the future of ongoing sociotechnical transitions at large.

The assessment of currently emerging technologies, such as AI, should not be expected to be any different; once again, the daunting task of enabling purposeful innovation

9 Amaral, 2021

while preventing its related and at least partially unforeseeable risks appears as critical and daunting as it can be. The Collingridge dilemma might not be new. However, its complexity persists today as a major barrier preventing regulation and tech from coming together for the appropriate, balanced, and timely governance of emerging technologies while sowing uncertainty and distrust toward the future of emerging technologies and their governance. If so, how could such a dilemma be tackled?

Two insights pave the way out of such a conundrum. The first concerns the Collingridge dilemma and its implicit interpretation of innovation. While useful in interpreting a major challenge for the governance of emerging technologies, the Collingridge dilemma may also suggest that the path from technology ideation to diffusion is a one-way street. However, this is far from true. In fact, the innovation journey is full of twists and turns shaped and interpreted by key stakeholders. Rather than linear, innovation is iterative—technology is a "product of continual choices made by humans in politically mediated settings throughout the innovation process.[10]

" This is why technology development and its governance should not be seen as siloed and sequential activities; the former is a continuous process rather than a discrete moment, one that is already in itself an act of technology governance based on choices that can be intentionally pondered, weighted, and assessed. While the Collingridge dilemma depicts a stark opposition between the beginning and end of the innovation process, an iterative view shows how pervasive and flexible the role of deliberate decision making is throughout the process. This iterative view provides a more realistic account of how the dilemma between early and late regulation can be overcome.

The second insight concerns the dilemma's most dangerous byproduct—the steep collapse in levels of trust among societal stakeholders. On the one hand, the dilemma seems to weaken the societal legitimacy of emerging technologies by complicating purposeful attempts at regulating them. This is implicitly based on the premise that regulators cannot have visibility of the technology development process, whereas developers cannot have visibility of the policy process. On the other hand, this is not inevitable. Indeed, acknowledging that innovation is an iterative process compounded by multiple occasions for decision making opens up the possibility for the active engagement of a more diverse set of stakeholders in both senses.

In this view, the Collingridge dilemma can be addressed by increasing the amount of information that is available early in the trajectory of a technology (e.g., through information sharing) and/or by preserving diversity in the trajectories explored as insurance against undesired outcomes (e.g., through collective deliberation). By providing room for doing so, principles of openness and transparency can indeed contribute to steering the purpose and increasing the legitimacy of the continual choices behind technology development and its regulation, and help nurture new synergies between society and technology at large. In this respect, the challenge posed by the dilemma is not inescapable; rather, it is limited only by stakeholders' own capabilities to imagine and implement new strategies for crafting such continual choices together.

10 Sarewitz, 2011, p. 95

Moving from there, we can better understand the nature of the relationship between governance and technology. The standard interpretation of technology development and regulation as fundamentally linear and siloed processes needs to be reassessed against the contemporary sociotechnical landscape in order to tackle the Collingridge dilemma.[11] One way to do so is to experiment with such processes, that is, to reassess and reimagine how we develop and regulate emerging technologies by testing out new solutions for their governance at different points in time and stages of the technology development and policy processes. Doing so entails developing approaches, tools, and methodologies that are capable of enabling a continuous evaluation of the societal impact and purpose of both technology and its regulation while also including public, private, and societal stakeholders interested in and affected by them. This can be achieved by embracing experimental governance — a mode of governance based on "a recursive process of provisional goal-setting and revision based on learning."[12]

On the one hand, the term "governance" points to the set of structures, processes, and institutions that guide and restrain the collective action of a group of stakeholders.[13] On the other hand, the attribute of "experimental" serves to identify the distinctive principle that such a set of structures, processes, and institutions can reflect — that is, experimentalism. From this perspective, experimental governance is poised to overcome the Collingridge dilemma on both of the accounts mentioned above: first, as a way to acknowledge the iterative nature of the decision-making processes behind innovation, and, second, as a way to provide a common ground for multiple stakeholders to come together and jointly assess the potential implications of both technology and policy development. On the basis of these premises, the next section assesses experimental governance tools from the recent past that have attempted to overcome Collingridge's dilemma. By doing so, it aims to provide a stepping stone from which to scope and prototype new solutions to current challenges.

11 Moses, 2017 **12** Sabel & Zeitlin, 2012, p. 170 **13** Keohane, & Nye, 2000

03

How?
Understanding past experimental governance initiatives

Calls for developing an experimental governance approach are certainly not new. In fact, they go back at least as far as 400 years, when English philosopher and politician Sir Francis Bacon first imagined the utopia of a New Atlantis governed by what he called Salomon's House, a government-backed center for experimentation in social and natural sciences.[14] His intuitions were brought even further by 19th-century European thinkers of the caliber of Auguste Comte, Henri de Saint-Simon, and John Stuart Mill, who also considered the ethical implications of societal experimentation for the first time.[15]

However, these seeds did not come to fruition until the 20th century, when the overall expansion of welfare states in the Western world contributed, on the one hand, to the development of a bureaucracy based on the values of efficiency and impartiality, and, on the other hand, to the design of large social programs, the effectiveness of which was meant to be tested and eventually used as hard proof of government success.[16] Via the work of thinkers, such as John Dewey, Roberto Mangabeira Unger, and Charles Sabel, experimentalism as a key principle is now broadly understood as "a recursive process of provisional goal-setting and revision based on learning."[17] Yet, the past 100 years have provided us with many different examples of how this principle can be applied to several policy dilemmas, such as those arising from the governance of emerging technologies.

To assess what these solutions may imply for the present of experimental governance, the remainder of this section presents three families of approaches, each representing a unique way in which experimental governance

Box 3: Policy process steps

Agenda setting: This step identifies how perceived societal issues become problems that governments commit themselves to addressing.

Formulation: This step involves the development of policy options within the government, which are designed to address problems that may be on, or expected to appear on, the government agenda. This also includes the legislative route, both in terms of whether laws should be pursued and, if need be, in terms of how such laws should look like.

Decision making: This step involves the decision by government leaders on which specific course of action that is expected to address a given policy problem should be pursued. This may consist in the pursuit of a given policy or law (i.e., a legislative proposal).

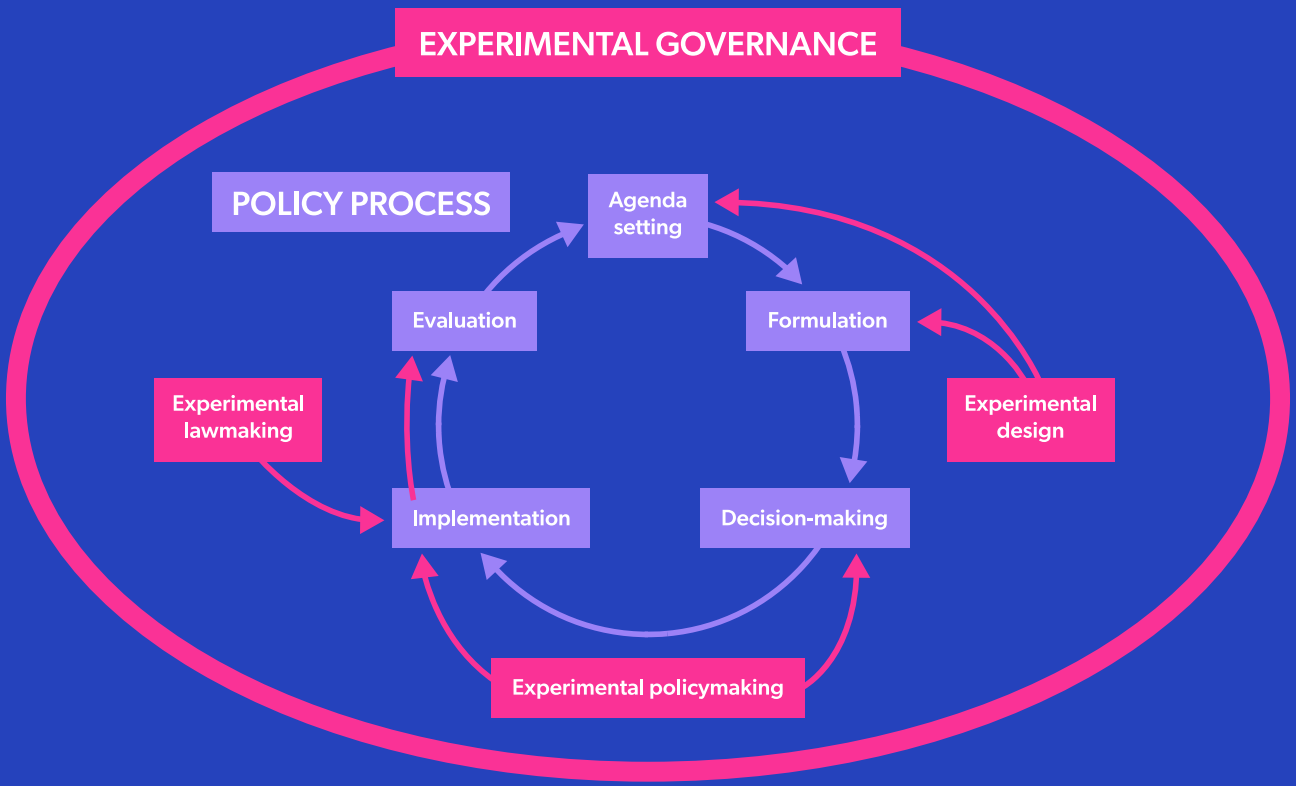
Implementation: This step involves giving the chosen policy or law form and effect, which means putting the chosen policy into practice or enacting and enforcing the chosen law.

Evaluation: This step involves assessing the extent to which a policy or law achieves its stated objectives and, if not, what can be done to improve it.

14 Bacon, 1992 **15** Coser, 1977; Taylor, 1975; Mill, 2011 **16** Dehue, 2001 **17** Sabel & Zeitlin, 2012, p. 170; Dewey, 1927, p. 223; Unger, 1998

has been interpreted and applied in the last century: experimental lawmaking, experimental policymaking, and experimental design. These three families are each characterized by a peculiar purpose, a different lead actor, and distinctive strengths and limitations. However, what makes them remarkably different is their relationship with the policy process, that is, the iterative performance of five activities leading to the creation (or reform) of policies or laws: agenda setting, formulation, decision making, implementation, and evaluation (see Box 3 for their definitions).[18]

The rest of the section shows how experimental lawmaking links to implementation, experimental policymaking to decision making and evaluation, and experimental design to formulation. As a result, the picture that emerges from the past of experimental governance initiatives portrays a fragmented landscape, one in which those families rarely feed into one another and thus do not piece up either into an experimental policy process or in a fully fledged mode of experimental governance (see Figure 2).[19] At the same time, while each family is characterized by an ascendency to certain



Source: Author's elaboration and integration of Wu, X. et al. (2018). The Public Policy Primer: Managing the policy process. NY: Routledge, Second Edition, p. 9

Figure 2. Three families of experimental approaches and the policy process

18 Wu et al., 2018 **19** Based on the definition of governance provided in Section 2 (a "set of structures, processes, and institutions"), the policy process is depicted as a critical but not all-encompassing element of governance. Instead, the policy process is seen as embedded in structures, concurrent processes, and institutions that contribute to shaping it and that are only indirectly influenced by it.

stages of the policy process, the lines between families and stages are not fixed. For example, the remainder of this section shows how experimental design techniques are increasingly being used to inform not only formulation but also implementation and evaluation. In this sense, analyzing the historical trajectory and past uses of each family of approaches can help identify the families' distinct characteristics and how the boundaries between them are gradually blurring and becoming increasingly intertwined, both currently and potentially even more in the future.

A. Experimental lawmaking

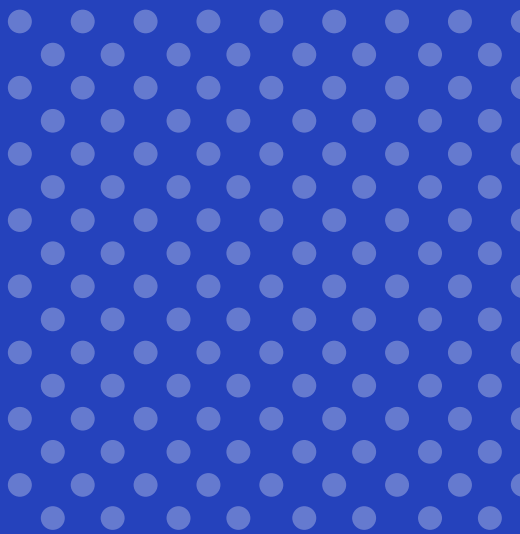
Experimental lawmaking can be defined as a family of approaches that aim to embed experimentation in policy implementation by codifying it directly into laws (i.e., legal documents approved by elected officials) and the regulations that stem from these (e.g., as formulated by executive agencies on their basis).[20] The idea of solving innovative problems through experimental lawmaking can be traced back to a 1932 US Supreme Court of Justice case: New State Ice Co. vs. Liebmann. In formulating his dissenting opinion, Associate Justice Louis Brandeis advocated for bringing about experimentation, stating that.[21]

20 Ranchordás, 2021 **21** New State Ice Co v. Liebmann, 1932, p. 311

“

There must be power in the States and the nation to remould, through experimentation, our economic practices and institutions to meet changing social and economic needs (…) it is one of the happy incidents of the federal system that a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.[22]

New State Ice Co v. Liebmann
1932



22 New State Ice Co v. Liebmann, 1932, p. 311

Box 4: The rise and fall of sunset clauses in the US

Justice Brandeis' metaphor of "states as laboratories" legitimized the view for which it would have been justified and even desirable to exploit the peculiar features of the US federal system in order to embed experimentation in state-level lawmaking. In part, this intuition was reflected in the sunset clause boom, which consisted in the adoption between 1976 and 1982 by 36 states of regulatory mechanisms that entailed their automatic expiration after a determined period and, notably, an ex-post evaluation. Ironically, sunset clauses emerged in the US not to preempt societal harm but to serve as solutions for containing excessive governmental growth; indeed, the executive or legislative would have had to affirmatively act to re-authorize them. Yet, even if this constraint bounded policymakers to adopting cyclical reviews and assessments of policies' effectiveness, sunset clauses have nonetheless been criticized for the political tendency to renew policies regardless of the final results.[23]

Yet, this experience also provided a keysource of inspiration for European countries to develop their own approaches to experimental lawmaking—a commitment that blossomed into new instruments adopted in Germany and the Netherlands during the past 60 years. Among them, some interesting approaches within this family include the following:[24]

Sunset clauses: These are regulatory mechanisms that determine the expiration of a statute after a previously defined period and often an evaluation moment. For example, the European Parliament and the Council have included sunset clauses in a series of regulations for data roaming charges and mobile networks.[25] In 2007, a regulation was passed for all European Union (EU) member states that capped the price of roaming charges. A sunset clause stipulated that the regulation would expire on June 30, 2010.

However, by 2009, it was determined that the regulation had not had sufficient impact, so it was amended to include greater restrictions on roaming charges, with an expiry date extended until June 2012. After this period, a similar regulation was introduced for the period 2012-2017, which reduced charges even further. Eventually, in 2015, the European Parliament and the Council decided to abolish roaming charges within the EU entirely. It is thought that the use of sunset clauses in this case helped ease the transition toward a fairer situation for consumers.

Experimental legislation: These are laws and regulations characterized by (i) derogation from the existing legal framework for a period determined ex ante, (ii) limited applicability to a group of citizens or territories selected on the basis of objective criteria, and (iii) conditionality of their renewal upon periodic or final evaluation of their effectiveness.

This experimental approach to legislation is evidenced by the inclusion in 2002 of an experimental clause about geriatric care within German legislation. The clause enabled the

23 Waller, 2009 **24** Ranchordás, 2014 **25** Kouroutakis, 2019

testing of new integrated forms of education and training to be delivered to care professionals working in the field (emerging by then) on a temporary basis; this approach was acknowledged by the German Constitutional Court as legitimate in that it helped meet the purpose of the derogated law by creating the possibility to gather more information on how best to do so in a novel context.[26]

Pilot projects and proeftuinen: Usually interpreted as a preliminary implementation of broader policy programs that imply major changes in the legal or societal order, pilots can also be designed as so-called proeftuinen, that is, small-scale experiments that are publicly funded, targeted at a specific goal, and designed to last for a short period in order to evaluate program scalability itself. In February 2010, the Dutch Government began a proeftuin inburgering project that sought to understand the most effective methods for educating immigrants in Dutch language skills. The project revealed important success factors and incentives for improving education by using 27 proeftuin alongside language schools and districts. This helped the project reach its broader goal of improving the integration of immigrants into Dutch society.[27]

Regulatory sandboxes: These are time-bound sandboxes that establish a safe, conducive space for experimentation and the testing of innovations within or even outside the current regulatory framework with the oversight of regulators.[28] A similar approach is represented by so-called experimentation clauses, that is, clauses that are included within regulation to provide regulators with higher flexibility in determining the suitable application of the law.[29] These can provide the legal basis for innovative technologies, which may arguably sit outside the existing legal framework's coverage, thus allowing for regulatory sandboxes. Furthermore, they give regulators insights into the early-stage development of technologies in real-world settings, helping them design appropriate evidence-based regulations.

The European Commission and Spain began a collaborative regulatory sandbox pilot initiative in June 2022 that looked to improve the European Commission's Artificial Intelligence Act based on the experiences of relevant innovative companies and regulators. The pilot initiative provides these collaborators with tools designed to help with the implementation of the Act, allowing them to test various factors (such as efficacy) with stakeholders.

In Germany, an experimentation clause was included in Section 2(7) of the Carriage of Passengers Act [30] specifying a four-year period during which new transport methods could be trialed, a stipulation that diverged from the law. Such familiarity with innovative transport means informed future passenger transport law.

There are two differences between these five instruments. The first is their degree of aspiration to permanence: sunset clauses are self-expiring by design, whereas the remaining tools, such as experimental legislation, pilot projects, and regulatory sandboxes (depending on the characteristics and objectives of the latter),[31] provide some preliminary steps toward permanent changes. The second is their role in different stages of the policy process, with

26 Ranchordás, 2014, p. 126 **27** Ranchordás, 2014, p. 79 **28** Jenik, 2020 **29** Federal Ministry for Economic Affairs and Energy, 2020
30 Federal Ministry for Economic Affairs and Energy, 2020, pp. 5-6 **31** While some regulatory sandboxes, namely, in the fin-tech context, waive or alleviate specific regulatory requirements during the course of their programs, other regulatory sandboxes, particularly in the context of privacy, do not alleviate or temporarily suspend regulatory requirements.

experimental legislation being the final result of proper deliberation, whereas pilot projects are expressions of agreed experimentation before scaling them based on their eventual effectiveness.

Experimental lawmaking can therefore be praised for the high degree of flexibility that its tools can leverage to perform tasks, such as tackling uncertainty by enabling systematic information gathering, regulating fast-changing policy fields, and advancing consensus on controversial issues by legislative means based on joint deliberation. However, despite these promises, experimental lawmaking has been underused because of barriers, such as the lack of awareness by decision makers about the potential of these approaches, the lack of political will to follow evidence rather than opinion during the policy process, and concerns over the risk of violation of legal certainty and equal treatment principles.[32]

Despite the hype generated by some of its most recent applications, such as regulatory sandboxes, experimental lawmaking largely remains under the radar of the global conversation around public governance. As a result, while it has contributed to the further diffusion of soft law tools, it has not come to improve legislation's capacity to anticipate the development of technology.

B. Experimental policymaking

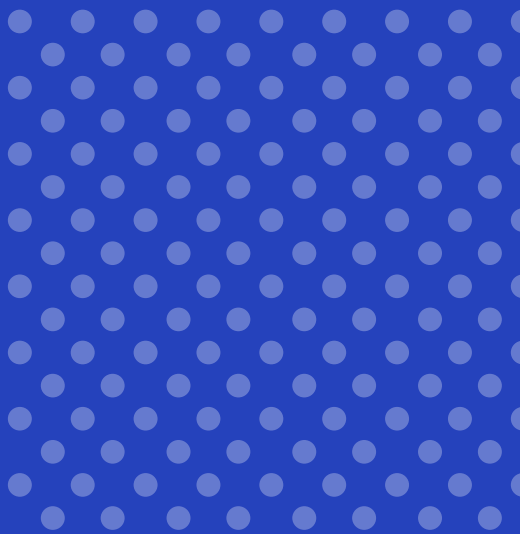
Experimental policymaking can be defined as a family of approaches that aim to embed experimentation in the core of the policy process — that is, decision making and evaluation. To do so, these approaches use experimental and impact evaluation techniques to test, learn, and improve specific policies and policy programs, understood as purposive courses of action taken to deal with a given societal problem or concern.

During the 20th century, the first relevant call for experimental policymaking came from US President Franklin Delano Roosevelt, who, in 1932 — right before the beginning of his first mandate and of his New Deal programs — claimed the following:

32 Ranchordás, 2013

The country needs and, unless I mistake its temper, the country demands bold, persistent experimentation. It is common sense to take a method and try it: if it fails, admit it frankly and try another. But above all, try something.[33]

Franklin D. Roosevelt,
32nd U.S. President
1932



33 Roosevelt, 1932

After his election, the claim turned into the enrollment of numerous social scientists in the federal government (around 8,000 by 1940) and, most notably, in the application of controlled and even comparative trials to governmental programs.[34] Enhanced by the first definition of randomized controlled trials (RCTs) in medicine after World War II, the interest in experimental policymaking grew throughout the Progressive Era of Kennedy's New Frontier and Johnson's Great Society, which resulted, for example, in the Food and Drug Administration mandating RCTs as preliminary to the authorization of new drugs and their use being expanded during the 1980s to the welfare and employment policy fields.[35]

Experimental policymaking attracted even greater interest starting in the 2000s, first, in international development — for example, through initiatives, such as Massachusetts Institute of Technology's Abdul Latif Jameel Poverty Action Lab (J-PAL) — and then across Europe. As the UK's Treasury advocated for experimentation as a gold standard for policy evaluation in 2003's Magenta Book, the British Government instituted in 2010 the Behavioural Insights Team to design and assess evidence-based and nudge-based policy.[36] A few years later, more governments followed; for example, in 2014, the US government launched the Social and Behavioral Sciences Team, whose work has been then streamlined into federal decision making, and in 2015, the Finnish government made experimentation a major political goal, adopting a framework deployed two years later to implement a one-of-a-kind, large-scale experiment on universal basic income policy.[37]

Drawing on such historical experience, Nesta's Alliance for Useful Evidence published an inventory identifying three approaches that are currently consolidated:[38]

Randomized experiments: Based on the random allocation of a large sample of the population into a control group and a treatment group, randomized experiments aim to test policy ideas by investigating the presence (or absence) of causal inference between the intervention and its expected outcome. Key examples of randomized experiments include RCTs[39], A/B tests[40], and multi-site trials.[41] Randomized experiments have been used extensively over the past few decades for policy purposes.

Since the early 2000s, the UK Education Endowment Foundation has run over 180 trials in English schools, whereas J-PAL has conducted more than 900 trials related to poverty reduction in over 75 developing countries.[42] In the UK, the Behavioural Insights Team — the first government unit in the world to use digital experiments for policy purposes — ran one of the largest RCTs in the country on organ donation, involving over one million people.[43] The experiments resulted in impactful changes at a small cost, as digital experiments often allow for a large sample size at zero marginal cost per sample member.

Non-randomized or quasi-experimental experiments: These are techniques that aim to create a control group when large-scale randomization is technically infeasible or politically difficult, as well as when the

34 Ross, 1993 **35** Baron, 2018 **36** For a definition of "evidence-based policy," see Glossary (Baron, 2018, p. 40). For a definition of "nudge-based policy," see Glossary (Thaler & Sunstein, 2008). More information on the use of both in the UK in Breckon, 2015. **37** Congdon & Shankar, 2015; Annala et al., 2015 **38** Hopkins et al.,, 2020 **39** For a definition of "randomised controlled trial," see Glossary (Hopkins et al., 2020, p. 25). **40** For a definition of "A/B test," see Glossary (Hopkins et al, 2020, p. 37). **41** For a definition of "multi-site trial," see Glossary (Hopkins et al., 2020, p. 46). **42** Hopkins et al., 2020, p. 12 **43** Hopkins et al., 2020, p. 38

tested policy is already in place. Key quasi-experimental designs include matching[44], regression discontinuity design[45], difference-in-difference[46], and synthetic control.[47]

An example of this was when researchers used synthetic control to study the attributes and trends of people smoking in California in order to determine whether legislation passed in 1988, which increased cigarette taxes by 25% per pack, worked to reduce smoking.[48] Using trend data that reached back to 1970, researchers found that the legislation caused a reduction of 26 packs per person by 2000. In the UK, Sure Start was introduced in 1999 as an area-based policy aiming to improve life chances for young children growing up in disadvantaged areas. The program formed and assigned local teams to work in a holistic way with the families of these young children and their communities. In this context, evaluators used longitudinal datasets to develop a propensity score matching design for evaluating the impact of Sure Start on children and families over time. Using data collected from 2001 onward, the program was shown in 2019 to have produced major health benefits for them; for example, hospital admissions were reduced by up to 19% by the time children were 11.[49]

Pre-experiments: These are strategies based on the comparison of the same sample group before and after the policy intervention and are usually deployed for exploratory aims and for shaping hypotheses to be tested more rigorously later. Examples include pre-post testing[50] or rapid cycle testing.[51]

Rapid cycle testing was used in the Family Nurse Partnership (FNP), the first evidence-based program for families taken to scale in the UK that focuses on providing support for first-time young mothers. In order to make it more flexible, personalized, and cost-effective, the FNP collaborated with the Dartington Service Design Lab on the FNP Accelerated Design and Programme Testing to identify changes needed to meet the current needs of families through an improved and adapted FNP program. It became the first evidence-based program for families that was scaled across England.[52] It supported first-time young mothers through nurses or midwives who would visit between pregnancy and the child's second birthday. In 2016, an evaluation of the FNP found minimal improvements over previous care delivery methods.[53]

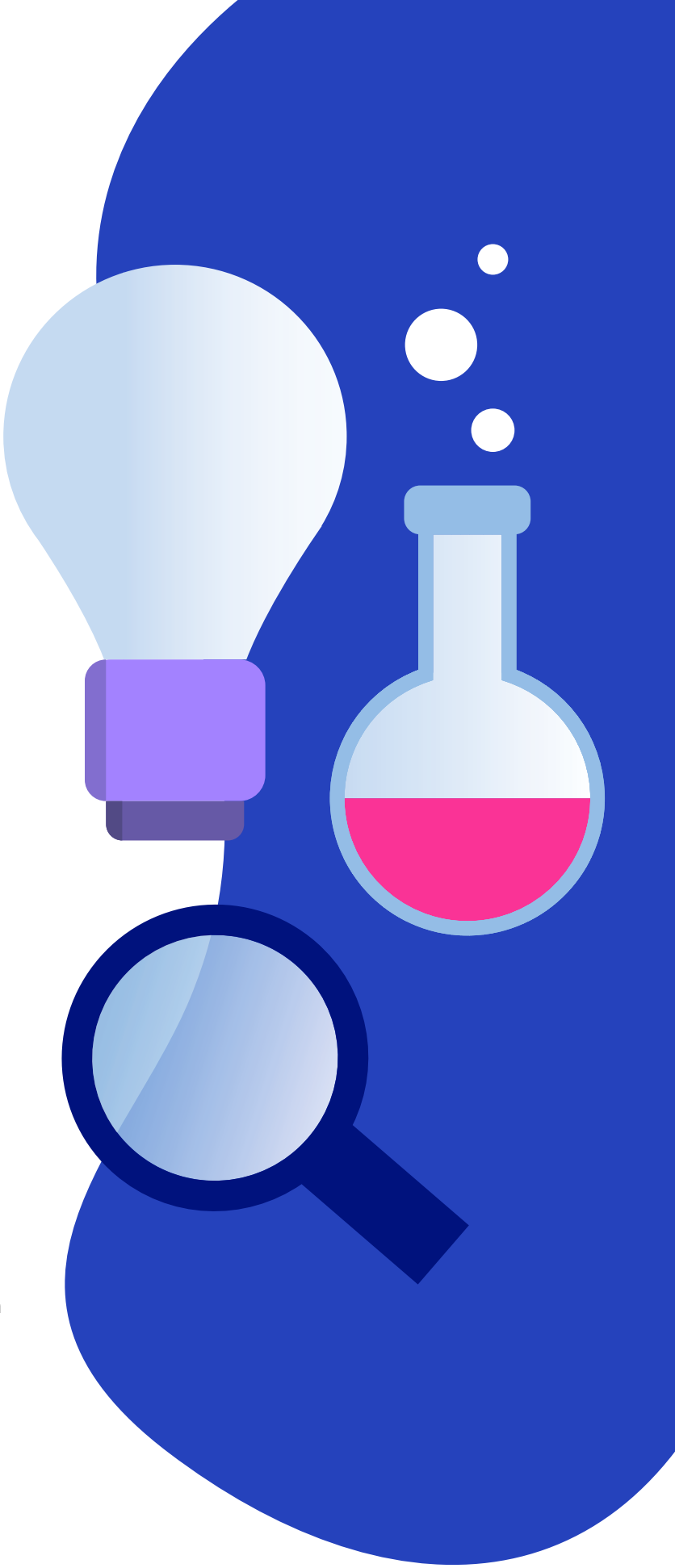
Notwithstanding the different degrees to which the three approaches can detect causal inference, they came to constitute the methodological backbone of the evidence-based policy movement, which, from the 2000s onward, sought to improve the quality of public decision making through sound policy evaluation.[54] Indeed, the strengths of experimental policymaking rely on its adherence to a solid methodological backbone—enabling both social scientists and civil servants to assess with a high level of granularity the impact and implications of the policies being tested.

However, the potential of experimental policymaking has also been contested on at least two different grounds. The first challenge is represented by the influence of power and cultural relations on policy expertise and evidence. Because of the plurality of ways in which evidence can be developed, power asymmetries among actors and decision makers may create an opportunity for the misuse of knowledge for political purposes.[55] This means that public or private policy elites might create and increase their strategic roles over a social

44 For a definition of "matching," see Glossary (Hopkins et al., 2020, p. 59). **45** For a definition of "regression discontinuity design," see Glossary (Hopkins et al., 2020, p. 55). **46** For a definition of "difference-in-difference," see Glossary (Hopkins et al., 2020, p. 62). **47** For a definition of "synthetic control," see Glossary (Hopkins et al., 2020, p. 65). **48** Hopkins et al., 2020, p. 65 **49** Hopkins et al., 2020, p. 60 **50** For a definition of "pre–post testing," see Glossary (Hopkins et al., 2020, p. 69). **51** For a definition of "rapid cycle testing," see Glossary (Hopkins et al., 2020, p. 71). **52** Hopkins et al., 2020, p. 73 **53** McBride, 2018 **54** Head, 2010 **55** Strassheim & Kettunen, 2014

problem, either by excluding the less powerful from the design and rollout of the experiment or by cherry-picking results.

The second challenge is posed by the quantification of social phenomena. The production and elaboration of data are not neutral acts; rather, the translation of complex societal phenomena into discrete data always entails value-laden assumptions and decisions that should be exposed and discussed transparently. In this perspective, the unchecked use of quantitative modeling and indicators may convey a misleading impression of precision, prediction, and control. Conversely, while complex, the integration of quantitative and qualitative methods would help bring more clarity to the use of these methods and increase their readability and transparency.[56]



C. Experimental design

Finally, experimental design can be defined as a family of approaches that aim to embed experimentation in policy formulation. To do so, they challenge the conventional ways in which the public sector frames public issues and ideates their relative solutions, notably by adopting human-centered design methods and tools and by increasing the openness and transparency of such processes. However, as shown below, experimental design approaches are now being used to affect the implementation and evaluation stages of the policy process, both outside its legislative route and, increasingly, within it.[57]

In the late 2000s and 2010s, experimentation teams and policy labs were set up in different parts of the world, including the UK, Denmark, Canada, Finland, France, Australia, and the

56 Saltelli & Giampietro, 2017 **57** Examples include Luma Institute, 2012; Hagan, 2021.

United Arab Emirates. Stemming from the acknowledgement that public sector innovation and design thinking would have been critical resources for success in the face of new, complex problems, these initiatives were set up within governments—be it in Prime Minister Offices, standalone agencies, or in government departments—to encourage experimentation in all forms, including with respect to the design of policies.

Soon, policy labs were recognized as environments conducive to innovation in the policymaking cycle. These included i) gathering diverse, transdisciplinary groups of experts to develop new ways of designing policy, ii) demonstrating how different approaches can upend how policy is crafted, and iii) encouraging new human-centered design methods and techniques[58] compared to traditional policymaking. Examples include the following:

2010-2015

almost 400 prizes and challenges were posted on the platform.

Policy prototyping: While this solution has been developed in product and industrial design processes, it has gradually been extended to the policy process, in which it is combined with design thinking. The focus is on delivering a product or policy that is tested through specific design tools and methods and is based on different perspectives, often including diverse stakeholders, to ensure that the policy serves the goals it aims to achieve.[59] Policy prototyping has been used by Singapore's Infocomm Media Development Authority since 2018,[60] and it has been applied as an approach to policy design by the UK Policy Lab since 2014.[61] Used in the period 2015-2018 in the field of social investment, this approach allowed the UK government to develop a new digital platform that significantly improved how charities and social enterprises access funding.

More recently, and by tackling specific draft laws, policy prototyping has also been used more deliberately to inform the implementation and evaluation phases of the policy cycle.[62] Initiatives around prototyping and testing proposed legislation have been put forward and conducted by a variety of stakeholders.[63] This is the case with Open Loop, a global strategic initiative that involves the participation of governments (regulatory authorities, ministries, etc.), industry, academia, and civil society. Open Loop leverages policy prototyping and human-centered design methods to test existing governance frameworks for emerging technologies (namely, draft laws)[64] or to co-develop and evaluate new governance frameworks (in the shape of technical guidance, playbooks, etc.).[65] Through this type of policy

58 Luma Institute, 2012 **59** Andrade & Kontschieder, 2021; Villa Alvarez et al., 2020 **60** Infocomm Media Development Authority, 2020 **61** Buchanan, 2018 **62** Attesting to the versatility of this methodology, "[p]rototyping then might have potential at a few different phases of policy-making work: as a tool for generating better ideas for new policies; as a tool for early testing and reconfiguration of proposals to decide which should move forward; and as a tool for agile, iterative development of an agreed-upon proposal," in (Hagan, 2021). **63** See the Open Loop strategic initiative and its various programs: https://openloop.org/lets-unlock/. See also (Chung et al., 2020). **64** See the Open Loop program on the EU AI Act: https://openloop.org/programs/open-loop-eu-ai-act-program/ **65** See the Open Loop programs in Mexico on AI Transparency and Explainability: https://openloop.org/programs/ai-transparency-explainability-mexico/, the Open Loop program in India on the operationalization of the AI ethical principle of human-centricity: https://openloop.org/programs/open-loop-india-program/, and the one in Uruguay on privacy-enhancing technologies: https://openloop.org/programs/open-loop-uruguay-program/

prototyping program, a number of different methods and tools[66] are used to test, learn, and improve a given normative framework before its definitive codification into law.[67]

Challenge prizes: Often associated with startups and enterprises, challenge prizes use awards to incentivize broad or targeted participation and deliver solutions that solve current issues, often linked back to society to inspire participation.[68] It is a way to crowdsource ideas and pitch them in an iterative process in order to find new solutions.

During the Obama administration, the Office of Social Innovation and Civic Participation, Office of Science and Technology Policy, and other federal agencies used this method to incentivize new policy solutions and innovations.[69] This eventually led to the creation of challenge.gov, a platform for the public to compete and test their ideas at the local and federal levels. In the period 2010-2015, almost 400 prizes and challenges were posted on the platform. For example, the National Institutes of Health released a challenge to create start-up businesses that would have been granted licenses for the development of emerging breast cancer technologies owned by the federal government, from early-stage inventions to commercial products. The challenge led to the creation of 11 start-ups with promising prospects in the fight against breast cancer. A key aspect to consider in both examples is the incorporation of stakeholders into the process.

While experimental design is used to test, analyze, communicate, evaluate, and refine policies before they reach further stages in the policy cycle, broad participation is incentivized and leveraged as a strategy to gather multiple perspectives that can help governments anticipate opportunities and risks. The multiple data sources, together with experimental design informed through a design thinking approach, help guide numerous stakeholders, especially decision makers, in deconstructing and reassembling problems, frames, and solutions in an attempt to foster out-of-the-box thinking.

Experimental design has the potential to solve complex problems through participatory processes or even idea crowdsourcing from a wider group of stakeholders. As with most design-related processes, however, design-focused policy experimentation has suffered two main drawbacks. The first is its low scalability; experimental design may not be appropriate for all policy contexts because of the intensity of resources it requires in terms of both time and level of engagement. This helps explain why, for example, design methodologies are widely leveraged to address discrete policy challenges but are only rarely standardized as go-to solutions for policy sectors as a whole; more often than not, the resources for extensive user testing, iteration, and internal and external collaboration are not available.[70] This drawback has its foundation in the second one — the lack of integration of experimental design into the political context and organizational practices of everyday policymaking.[71] The confinement of its methods to special units (e.g., policy labs) has been interpreted as an outcome of the inertia of traditional policy processes and a result of the reluctance of design practitioners to adapt themselves to the reality of policymaking.

To date, the main challenge of experimental design consists of finding a way to overcome these limitations and becoming sufficiently integrated within the core of government practice. The work of this family of approaches in informing and prototyping draft legislation can be seen as a step in that direction.

66 For an overview of Open Loop's methodology, see https://openloop.org/lets-experiment/ **67** This is the case, in particular, of the Open Loop program on the Artificial Intelligence Act (AIA). Through this program, Open Loop members test the clarity, feasibility, and costs of specific requirements of the AIA, a draft regulation proposed by the European Commission, along with new and different approaches to its current text. The testing is done before the AIA legislative proposal is approved and enacted, so stakeholders can better understand how well this forthcoming law will work in the real world before rules are codified through its lawmaking process. **68** Chan, 2016 **69** Gustetic, 2015 **70** Clarke & Craft, 2019 **71** Kimbell & Bailey, 2017

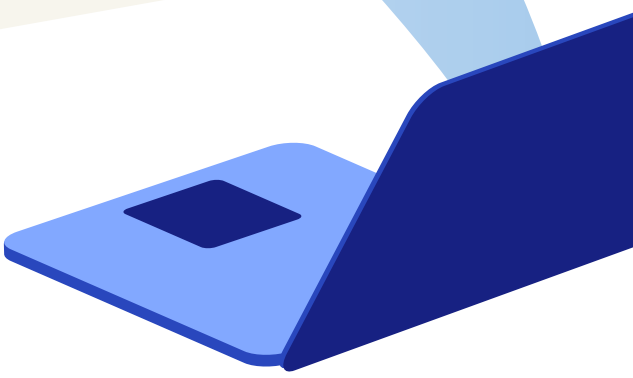
04

So what?
Uncovering gaps and potential ways forward

Given what we know and what we are still uncovering on the relationship between emerging technology and policy, there is a clear need to better connect existing yet scattered experimental approaches in order to improve the governance of sociotechnical systems. To do so, we need to learn from the past — not only where things went wrong but also where they were right — in order to actualize them in the present and build the future of experimental governance of emerging technologies. Summarizing the main characteristics associated with each family of approaches, Table 1 (see page 35) provides a starting point for doing so. Experimental lawmaking has showcased how greater adaptability can be embedded in rules that have traditionally been framed as rigid and definitive, thus codifying experimentation into policy implementation; yet, the uptake of these approaches in policy practice has been rather slow and tendentially past the unfolding of critical innovation processes. Experimental policymaking has translated into a wealth of techniques that provide strong methodological clarity to policy decisions; yet, these approaches have rarely been capable of providing an effective common ground for stakeholders to convene around joint sensemaking and action. Finally, experimental design has demonstrated that policy can leverage novel design tools and approaches and can be framed, formulated, and developed much more inclusively than it has ever been

A. From outpaced to anticipatory lawmaking

While tackling the uncertainty surrounding the lack of information around emerging technologies, experimental lawmaking rarely succeeded in addressing the so-called pacing problem of ossified regulation being systematically overcome by technological change.[72] An anticipatory approach capable of ensuring meaningful and timely guidance of technological change needs to be scoped and embedded in these legal instruments[73] in order to address the gap between emerging technologies and regulation. Accordingly, instead of playing catch-up as soon as the effects of new technologies make themselves known, traditionally; yet, these approaches have not managed to upscale their relevance from the policy labs that championed them in the first place to the core of government.



As a result, this review of past experimental approaches highlights a set of lessons learned, as well as critical challenges, that remain meaningful for contemporary attempts at developing experimental governance for emerging technologies. In particular, the review helps identify three shifts that emerge as key not only for those approaches but also — and most importantly — for their relevance to contemporary challenges. These are as follows:

72 OECD, 2019 **73** Marchant, 2011

governance needs to anticipate them and have the aspiration to shape the direction of technological development itself in more proactive ways.

B. From top-down to stakeholder-inclusive policymaking

Despite its promises, we have seen how experimental policymaking can be hindered by the contested production and use of evidence itself — be it in terms of the power dynamics animating it or of the quantification strategies used to define and frame an experiment. This drawback has been magnified in the COVID-19 pandemic, when data and their interpretation have been subjected to intense politicization in a very complex and uncertain environment, leading to stark divergences in governments' approaches and, at times, to social unrest.[74]

However, this does not necessarily have to be the end result. Rather, improving the capacity of these tools to consider different perspectives and concerns and to be more transparent and accountable may enhance the chances of multi-stakeholder alignment and consensual decision making. An example of this approach can be found in the UK, where the need to alleviate periodic flooding in the small town of Ryedale was addressed by leveraging the knowledge of both scientists and residents, resultlng in the modeling of a different forecasting analysis and intervention.[75]

C. From piecemeal to holistic design

While all the approaches reviewed above (i.e., experimental lawmaking, policymaking, and design) helped bring experimentalism forward, none of them elucidated a strategy to embed experimentation systematically and effectively in governance processes. The legislation approach provided brand new tools for regulation but did not succeed in keeping the pace of novel technologies. The policymaking approach afforded new methods to produce evidence but rarely provided actors with a common ground for shared decision making. The design approach explored new tools and stakeholder-inclusive processes to develop innovative solutions, but it remained secluded at the periphery of public administration. The adoption of each of these tools alone — what we term piecemeal experimentalism — seems to encounter great obstacles in overcoming the inertia of traditional decision-making processes.

74 Saltelli et al., 2020 **75** Lane et al., 2011

However, a shift from piecemeal experimentalism to a comprehensive and holistic experimental governance approach should not only draw upon and make the most of the tools, methods, and processes developed by these approaches. Most notably, the shift should also embrace openness and transparency in how the insights emerging from their use are more systematically and purposefully embedded in the policy process — both outside and within its legislative route — and more directly used in decision making. This effort would entail a commitment by all stakeholders involved to learn about experimental methodologies and find ways to apply them throughout the various stages of the policy process. Through these efforts, stakeholders can collaborate and nurture new synergies, for example, to explore new solutions together or smoothen information sharing. In turn, this would increase trust among them and ultimately redefine "the way in which societal and state actors intentionally interact in order to transform [socio-technical] systems."[76]

Overall, there are precedents to be followed at both the international and national scales. For example, despite the geopolitical instability caused by the Space Race during the Cold War era, largely opposing countries were able to come together and form a cooperation that led to the creation of the United Nations Outer Space Treaty.[77] Approaches such as that adopted by the UK Human Fertilisation and Embryology Authority provide a case in point. Bringing together scientists, theologians, social workers, and legal scholars to explore major legal and ethical questions on the subject, the Commission formed an arena where a deliberate approach to the pursuit of jointly agreed research pathways and technological trajectories can be developed. Its example demonstrates that if the governance of emerging technologies is addressed from a holistic perspective, "strict but permissive" approaches could be scoped more proactively in order to balance out different principles.[78]

In both instances, there was a certain inability to completely predict the futures of space and embryonic development. However, stakeholders were engaged and empowered to provide different perspectives throughout the policy process. As a result, their views were incorporated into holistic solutions. This also allowed such stakeholders, including the government, to anticipate the potential actions and consequences of emerging technologies.

Even today, an experimental approach to their governance has the potential to pose new questions and find new solutions — be it trying and testing different regulatory angles — or to assert their implications for technological development and impact in society. However, in order to effectively empower and convene all interested parties around joint diagnosis, exploration, and experimentation, we need to move from outpaced, top-down, and piecemeal approaches to anticipatory, stakeholder-inclusive, and holistic approaches.

The only way to address the major policy questions that still surround emerging technologies, such as AI, is to create new spaces and tools for open, transparent dialogue about our shared future. This is what the adoption of an anticipatory, stakeholder-inclusive, and holistic experimental mindset would help us achieve.

76 Borrás & Edler, 2014 **77** Harding, 2020 **78** Coyle & Harding, 2021

Characteristics	A. Experimental lawmaking	B. Experimental policymaking	C. Experimental design
Definition	A family of approaches that embed experimentation in policy implementation To do so, these approaches codify the principle of experimentation into laws (i.e., legal documents approved by elected officials) and regulations (i.e., formulated by executive public authorities on the basis of laws).	A family of approaches that embed experimentation in policy decision making and evaluation To do so, these approaches apply experimental and impact evaluation techniques to test, learn, and improve specific policies and policy programs.	A family of approaches that embed experimentation in policy formulation To do so, these approaches challenge traditional routines through which public issues are framed and their solutions are devised by increasing the openness and transparency of such processes.
Purpose	Codifying experimentation into laws and regulations	Streamlining evaluation into traditional policymaking	Challenging traditional ways to frame issues and solutions
Policy stage	Implementation	Decision making and evaluation	Formulation (while also increasingly informing implementation and evaluation)
Lead actors	Legislative bodies	Executive bodies	Policy labs
Strengths	Adaptability	Methodology	Inclusivity
Limitations	Slowness	Manipulability	Scalability

Table 1. Comparing the three families of experimental approaches

05

Moving ahead: Lessons from the past

Emerging technologies are opening up new opportunities and posing new challenges to society. Yet, in the current historical moment, the crossroads of technology and policy are at an impasse — a deficit of trust towards both of them and a disbelief in our collective capability to orient technological change are now preventing new solutions from emerging and being tested.[79] As a result, the tensions surrounding emerging technologies exacerbate the challenges posed by the Collingridge dilemma — a conundrum in which, again, decision makers face the daunting task of enabling purposeful innovation while preventing largely unforeseeable risks. Meanwhile, widespread disbelief about the very possibility of technology companies, governments, and societal actors working together to overcome it looms over our collective future.

As a stepping stone toward a solution to these challenges, this chapter reviewed past strategies that aimed to overcome the Collingridge dilemma by experimentalism, that is, by tools that used "recursive process[es] of provisional goal-setting and revision based on learning" in different ways.[80] The three families of approaches all highlighted strengths and gaps that need to be addressed in view of current challenges; most notably, they showed a need to approach the experimental governance of emerging technologies from outpaced, top-down, and piecemeal approaches to anticipatory, stakeholder-inclusive, and holistic approaches.

A key goal to achieve this is to build a joint common ground for exploring

79 Edelman, 2020; Kelly & Guskin, 2021; Allen & Fried, 2021; Prabhu, 2021; Wall Street Journal, 2022 **80** Sabel & Zeitlin, 2012, p. 170

where and how forward-looking and stakeholder-inclusive policy experimentation may contribute to more trustworthy technology and policy. Doing so would provide an opportunity to embrace reciprocal openness among involved actors and help foster mutual trust among them, which is a key precondition for collectively building new solutions for the governance of emerging technologies.

Importantly, in the exploration of new ways of governing emerging technologies, the goal should not be to merely keep pace with technological change but also — and even most importantly — to consider the demands of societal welfare and progress. Today, there is certainly a dire need for solutions capable of harnessing the full potential of the experimental approach toward better governance of emerging technologies.

However, for their effective implementation, reciprocal trust and collaboration among all stakeholders need to be nurtured in order to empower their contribution to such a development. This may not only bring us closer to unlocking the potential of emerging technologies but also make it possible for them to become custodians and stewards of the technology we create, the society we are part of, and the future of the world in which we live.

Moving from the analysis of the past to that of present sociotechnical transitions and experimental governance applications, this chapter concludes with three takeaways on the societal need and premises for the experimental governance of emerging technologies. The three takeaways are as follows:

TAKEAWAY 1: To unlock the potential of emerging technologies for the common good, all the involved stakeholders in the contemporary innovation ecosystem must acknowledge the reality of contemporary sociotechnical transitions, that is, the continuous realignment of mutually co-evolving institutions, technologies, and societies.

TAKEAWAY 2: To overcome key tensions emerging from sociotechnical transitions, stakeholders must reimagine how we govern emerging technologies. Doing so requires finding new ways to harness the potential of experimental governance and — as a precondition for making it work — mutual trust between them.

TAKEAWAY 3: To harness the full potential of experimental governance in the context of emerging technologies, its tools need to be better leveraged in at least three main respects: from outpaced to anticipatory, from top-down to stakeholder inclusive, and from piecemeal to holistic.

The three takeaways serve two purposes. On the one hand, they constitute initial prompts to engage interested stakeholders in an open conversation about the past, present, and future of the governance of emerging technologies. On the other hand, they constitute tentative premises for further exploration of how a model of experimental governance might look like for such a purpose. As such, they open up the ground for the next chapter of this report: How are governments grappling with the tensions borne out of new emerging technologies? How are they building on the rich arsenal of past experimental approaches? Have they been able to embed anticipation, inclusion, and holism in experimental governance? If not, how can they do better?

06

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