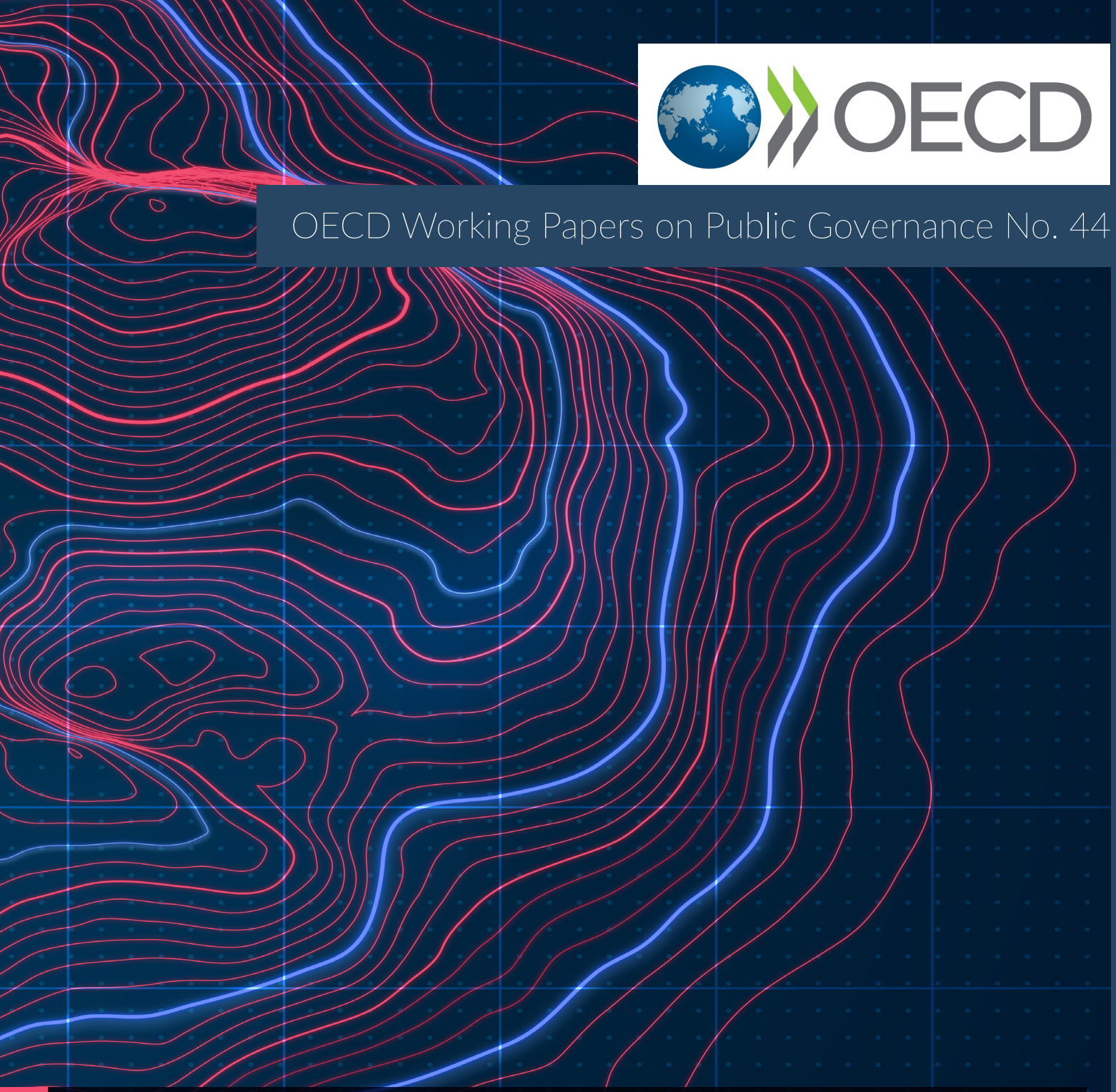

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Anticipatory Innovation Governance

Shaping the future through proactive policy making

PIRET TÕNURIST
ANGELA HANSON

Foreword

Today's challenges – such as automation, climate change, ageing populations, pandemics, and deployment of artificial intelligence – have unpredictable and unintended consequences at both global and individual levels. Complex systems have become the norm rather than the exception. In this environment, "reactive" approaches to policy making have increasingly proven ineffective. Waiting until a crisis has struck to start imagining a way out of it can be far most costly (in both human and financial terms) than anticipating and preparing for the crisis before it occurs. As the health crisis due to the spread of COVID-19 has clearly demonstrated, we need to invest in anticipation. .

To bridge this gap, governments need a new approach to policymaking that enables them to effectively address complex problems and uncertainty with new tools and instruments. This approach should be future-oriented, but also involve an action-oriented, innovation function based on anticipation. Despite the fact that foresight tools are increasingly integrated into policymaking, governments often lack a practical understanding of how to anticipate uncertain futures but also how to act on them today to achieve desired outcomes. This paper introduces the concept of anticipation and discusses the emerging practice around anticipatory innovation governance as a broad-based capacity governments can use to spur on innovations (defined as novel to the context, implemented and value shifting products, services and processes) connected to uncertain futures in the hopes of shaping the former through the innovative practice. This makes it different from traditional anticipation approaches: the aim is to not only create knowledge about what might happen, but also shape and prepare for it through innovation.

This paper provides an initial overview of anticipatory innovation governance within the context of academic and policy discussions on the future of policymaking. It discusses how such an approach turns the policymaking process on its head. Rather than policy determining the activities of individuals and groups within a system, individual experiments contribute to shaping policy and its effectiveness. This is done by outlining the parameters around which policymakers wish to make change and then by conducting one or more series of experiments testing and iterating on these parameters continuously with individuals or groups that would be affected and in a real world setting. As a result, governments are able to move towards their ideal future not by simply anticipating potential outcomes and developing innovative policy approaches to address them, but by taking action to ensure that these policy approaches work.

This paper builds on an extensive literature review on complexity and policymaking and OECD work in the area of policy innovation, system thinking, anticipation, emerging technology and foresight. The paper also draws on the discussion with experts from national governments and inter-national organisations conducted by the Observatory of Public Sector Innovation.

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Executive Summary

The impact of autonomous vehicles, artificial intelligence, bio-technology and other fast-paced innovations is hard to predict. Nonetheless, it is clear that they will profoundly affect not only which public services are offered (and how), but also how services are consumed. Such innovations are not contained to the realm of technology, but can transform societies as a whole, producing tectonic shifts in public values (e.g. transparency, privacy, and accountability) associated with both public and private services. For example, the impact of autonomous cars on the future of public transportation will involve security, privacy, insurance, and health considerations.

This has important implications for governments, who are called upon to proactively adapt to high levels of uncertainty linked to unforeseen events and new opportunities. Traditional approaches, based on targeted interventions in specific policy areas or an overreliance on prediction and scenario-based mechanisms for planning, have proven inadequate for addressing the scale and complexity of emerging challenges. Not all crises can be foreseen, but governments can work in new ways to recognise early signals and be prepared in time.

Foresight techniques have highlighted the importance of creating knowledge about the future (i.e. anticipation) by drawing on a range of factors, values, assumptions and scenarios. Today, there is a growing need to build new methods, structures and capacities for anticipation in the public sector, not only to capture key trends and define visions for the future, but also to influence socio-technical shifts and start realising those visions now (i.e. anticipatory innovation). This working paper addresses the conceptual underpinning and the evolving field of anticipatory innovation as part of a broader public sector innovation model developed at the OECD. It explores what the governance of this type of innovation looks like in practice (i.e. anticipatory innovation governance or AIG) and provides initial examples.

The key assumption of any AIG approach is that proactively entering the “uncertain” space is key to understanding and governing it. AIG is not just about innovation through uncertainty, but the idea that innovation is one of the ways to navigate unknowable terrain. One of the characteristics of complex problems is that any attempted solution can change the problem itself and anticipatory innovation governance is a way to be intentional and systematic about doing so.

Chapter 1 makes the case for a new policy-making approach in a context of complexity and uncertainty, outlining the limitations of traditional policy-making; Chapter 2 describes anticipatory innovation as part of a public sector innovation portfolio model and introduce the anticipatory innovation governance model flowing from it. It also a selection of examples. Anticipation is the act of creating knowledge about .an uncertain future. Uncertainty can be caused by complexity of policy problems, variety of actors with different viewpoints, fast-paced technology development, and unforeseen and cascading events. The key is to link anticipation with action – experimentation, innovations, reform agendas, etc. Chapter 3 provides an initial outline of the mechanisms of governance (agency and authorising environment) that influence or enable anticipatory innovation. With respect to agency and operationalisation, as well as the capabilities in place to allow for anticipatory innovation, the following mechanisms are of interest: alternatives exploration and experimentation; sense-making; tools and methods, data and measurement; organisational capacity; and institutional structures. Connected to the authorising environment, the

permission and purpose required for anticipatory innovation, the following mechanisms are currently are discussed in this paper: vested interest and cognitive biases; public interest and participation; networks and partnerships; legitimacy; evidence and evaluation; and learning loops. Chapter 4 illustrates several future research areas for anticipatory innovation governance.

1 Need for change in policymaking

Policymakers face the difficult task of maintaining the continuity of and public confidence in the public service, while rapidly adapting it to respond to a new environment characterised by fast-paced change and new demands. Existing approaches have proven ill-suited to maintain an equilibrium between exploitation (of current systems) and exploration (of future possibilities) amid complexity and uncertainty. This chapter argues that a new policymaking model is needed that allows governments to better capture anticipate and engage with the future. This will require governments to develop new capabilities to govern innovation and will enable policymakers to respond proactively to unforeseen events and technological change in real-time, instead of reacting to change when it occurs.

Governments are increasingly faced with complex, 'wicked' challenges characterized by diversity, complexity and uncertainty. These features are clearly captured by the acronym VUCA (Stiehm and Townsend, 2002: 6) – which refers to a world that is increasingly volatile, uncertain, complex and ambiguous in nature. The complexity can result from both up and downstream challenges, from the global scale in which challenges manifest (e.g., the spread and cascading effects of the Covid-19 crisis) and the localised impacts and contextualised issues of production, jobs and public services. The awareness about these fundamental uncertainties has increased in society, industry and policymaking circles (Kuhlmann, Stegmaier and Konrad, 2019).

In these conditions, governments are called on to take decisions also when an understanding of the direction, future developments and impacts of change are unclear and cannot be predicted. The commoditization of GPS and mobile devices created the conditions for peer-to-peer economies and platforms while the impacts on social security, housing markets, tax gaps, and fuel emissions took years to take effect. This is especially true in the deployment of new and disruptive technologies such as the Internet of Things (IoT), gene editing, neuro-technologies, blockchain, platform technologies, advanced robotics and machine-to-machine learning etc. These technologies are transforming the production and distribution of goods and services, with significant impacts on society and individuals (OECD 2017; 2020). Digitalisation and the operating models it creates (such as platforms like Uber, AirBnB, SocietyOne, and WeChat) are fundamentally challenging to the status quo of both economies and societies alike. This process is not only characterised by the creation of new services and products, but also creative destruction (Schumpeter, 1934, Schumpeter, 1942). New technologies will introduce new inequalities in society (e.g., Bertot, Estevez, and Janowski, 2016) which are as complex and uncertain as the underlying technological change. Thus, future employment, skills, income distribution, trade, well-being will look substantially different, which are all challenges governments need to deal with and prepare for.

Technologies themselves do not have a normative stance, yet, they have their own 'design' limitations that may not only positively or negatively influence individuals and society, but also change them at their core. The potential impact of genetically modified organisms or the effect nuclear energy has had on society are two examples. Governments have to deal with not only the effects of these changes, but also unexpected societal reactions and societal impacts of the latter. Here the past may not be a good predictor of the future. Long-standing trends may cease and incremental change may be superseded by non-linear transformations: disruptive technologies, systemic financial failures, natural disasters or pandemics, or abrupt climatic changes. These shifts may fundamentally alter a nation's trajectory (Boston et al. 2019). The uncertainty and risks created by rapid (technological) change cannot be directed by the private sector alone: governments must evolve and take an active role in the change process, create partnerships and share risks.[1]

Governments are slow to respond to fast changing and complex environments for a number of reasons. First, the structures and operating models that have historically allowed governments to operate at nation-scale are not adapted to respond to the current global context in which problems are framed (e.g. global warming). Second, it can be difficult for governments to invest resources in proactive management of a problem space before it is widely understood by the public, exacerbated by the fact that scientific and technological progress is becoming increasingly niche and specialised at the edges where progress is being made. Third, traditional governmental planning and policymaking is future-oriented in nature, but it involves significant investment in up-front analysis, based on past information, in order to deliver a comprehensive and effective response to the issue at hand with little room for experimentation or iteration. Fourth, government's reliance on specialisation has morphed into rigid "siloisation" of public policies,

[1] See for example in the field of regulatory policy the OECD (2019) the brochure entitled "Regulatory effectiveness in the era of digitalisation" available at: https://www.oecd.org/gov/regulatory-policy/Regulatory-effectiveness-in-the-era-of-digitalisation.pdf)

hindering its ability to gain a complete picture of a complex challenge that cuts across multiple subject domains, further dulling their capacity to respond successfully.

For example, climate change requires the expertise and coordination of policymakers involved not only in issues related to agriculture, water, and food security but also immigration, diplomacy, and defence (Kaufman, 2012). Changing one factor cascades into changes in other systems and creates uncertainties around outcomes. Global communications infrastructure and the social media environment that sits on top of it, raise issues not only around traditional utility and telecommunications regulation, but also thornier questions of cultural cohesion, individual rights, national security, and information warfare (e.g., Venre, 2016). Questions surrounding the creation, storage, and ownership of the massive amounts of data being generated through modern business and consumer technology require expertise not only in commerce and trade but also privacy, autonomy, and criminal liability (Braun et al., 2018). Ongoing advances in artificial intelligence and augmented reality systems will have considerable impact on what (and how) public services are delivered while also introducing entirely new, as yet unknown challenges for the public sector (Berryhill et al., 2019). Not to mention the uncertainty around future of work and technological changes under way with biotechnology, IoT, nanotechnology and the like.

Failing to embrace and respond to complexity can come at a high cost for governments. Simplistic answers or quick fixes have been recognised not to fit with the changing reality (Burrows and Gnad, 2018). The more change is accelerated, the less certain and difficult it becomes to forecast. This creates the necessity to understand the potential consequences and implications of change, and feed this back into decision-making (Ramos 2014). As technology (especially digital technologies) tends to develop much faster than policy, there is a risk that the structures and operating models are not synchronised with the fast changing nature of the problems they are trying to address. This calls for a shift towards a more ex ante, real-time and iterative policymaking to influence the design of solutions themselves (i.e. anticipatory innovation).

The following sections address the gaps in the current policymaking systems and discuss the need to develop a comprehensive understanding of reflexive practices needed for uncertain futures in the public sector. Ultimately, this will help governments face socio-technical disruption at a time of rapid change.

As such, it is not surprising that policymakers' interest in futures thinking and foresight methods has intensified over the last decade (Minkkinen, 2019). Futures thinking has been integrated into policy processes in one way or another – through explicit foresight or more implicit anticipation practices (Chapter 2 outlines these concepts in more detail). Academically there has been a lively debate around the issues of anticipation, anticipatory governance of emerging technologies over the last ten years (Barben, Fisher, Selin, and Guston, 2008; Guston 2014) and responsible research and innovation (Sutcliffe, 2011; Owen, Macnaghten, and Stilgoe, 2012; Von Schomberg, 2013; Zimmer-Merkle and Fleischer, 2017; Lösch, Heil, and Schneider, 2017; Stilgoe, Owen, and Macnaghten, 2013). This is couched in the broader discussion around pre-emptive governance and risk (Beck 1992; 2002), where considerations around anticipatory ruination are not far behind (Paprocki, 2019).

At the same time, there seems to be a fatigue and criticism of simple "futures talk" (Nordmann and Schwarz, 2010) and future as an object of technical design (Nordmann, 2010), as well as the ability to "future-proof" in practice. Consequently, an early consensus is emerging that there is an increasing need to be more proactive and to improve the government's ability to act in the face of change. However, it is unclear what will work in practice.

The governance approach of governments facing substantial socio-technical disruption in an environment of rapid change and high levels of uncertainty needs to be nuanced. The OECD, through the Observatory of Public Sector Innovation (OPSI), has developed a multi-faceted innovation model differentiating between enhancement-oriented innovation, mission-oriented innovation, adaptive innovation and anticipatory innovation. Yet, one of the least developed of these is anticipatory innovation, i.e. there is no comprehensive understanding of reflexive practices needed for uncertain futures in the public sector.

Gaps in governance systems

Understanding and tackling uncertainty in the public sector

> "(…) known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know," Donald Rumsfeld (2002)

Across a broad spectrum, the characteristics of policy problems can be explained through three dimensions that are closely interrelated: diversity, complexity and uncertainty (Head 2008; Head and Alford 2008; 2013). Diversity indicates the pluralism of involved actors, viewpoints and inherent values; while complexity refers more specifically to the multifaceted interdependencies between policy fields and various subsystems (e.g., multiple causation models – e.g., how intrinsically linked community health outcomes are to education and economic systems, even though those are considered different "fields" and, typically, different government ministries). However, complexity could also be distinguished by political (competing interests in a policy area) and substantive/programmatic terms (underlying characteristics of wicked problems, technical content) (Peters, 2005). For example, the higher the substantive complexity the more difficult it becomes for non-experts to be part of the process, which also affects political complexity. With the popularity of the field of 'complexity sciences' the various definitions and approaches are of course more extensive than presented here. The third dimension, uncertainty denotes "a situation in which there is not a unique and complete understanding of the system to be managed" (Brugnach et al. 2008, 4). The core definition of 'uncertainty' stems from the fact that policy problems and their solutions become unquantifiable surprises where risks cannot be calculated (whereas with risk the probability distribution is known or predictable (OECD 2017; Knight 1921; Ahmed and Skogh 2006, 183)). Uncertainty can also stem from different frames around which policy problems originate (for a classification of the subfields of uncertainty see Box 1.1.).

Frames are in essence 'sense-making devices' (Brugnach et al., 2008), but they also make problems dependent on context and cognitive comprehension (there can be several deductive or inductive paths to the same problem, multiple moral reasoning, multiple realisation of models, etc. (Boschetti 2011, 149; OECD, 2019)).

Box 1.1. Sub-fields of uncertainty

Uncertainty can be also classified from a knowledge perspective ranging from:

- total ignorance (unknown unknowns),
- recognised ignorance (awareness of lack of knowledge),
- qualitative uncertainty (uncertainty cannot be statistically characterised),
- scenario uncertainty (probabilities of outcomes are not known),
- statistical uncertainty (uncertainty can be described in statistical terms, e.g., measurement error)
- to determinism (the absence of uncertainty) (Refsgaard et al. 2007).

Uncertainty can also be classified as *epistemic/substantive* (lack of knowledge of a system or gaps and conflicting understandings in the knowledge base) and *ontological/strategic* (unpredictability and variety of the system; multiple frames and actors) (Walker et al. 2003; Koppenjan and Klijn 2004). Both ontological and epistemological uncertainty can stem from the natural, technical or social context (van der Keur et al. 2008, 1681-1682).

Source: Refsgaard et al. 2007, Walker et al. 2003; Koppenjan and Klijn 2004, van der Keur et al. 2008.

The existence of uncertainty in policymaking runs counter to the traditional model of policy design and the overall 'evidence-based policy' movement: namely uncertainty denotes a situation where inputs, outcomes (or both) are unknown to a degree that even risks become incalculable. For this reason, OECD works with an evidence-informed policy approach (OECD, 2015; Acquah, Lisek and Jacobzone, 2019; OECD, 2020). Furthermore, due to nonlinear causal relationships the efficacy of policy interventions can become difficult to measure. Decades of research has shown that policy reform efforts do not result in intended, linear outcomes. At the same time, traditional policy design revolves around models of causation, instrumentation, and evaluation. For example, more knowledge and R&D can help with epistemic uncertainty (lack of knowledge about a given policy or technological problem), but it may not diminish ontological uncertainty (the variety of involved stakeholders for example; see further in Jensen and Wu 2016, 115). Assumptions about potential futures are often based on the implicit and are rarely acknowledged by policymakers (Vervoort and Gupta, 2018). Thus, there is a tendency to simplify and consider one potential future to be more likely than others – thereby creating a false sense of certainty, rather than acknowledging uncertainty in planning processes. Or alternatively, policymakers may revel in the complexity of the policy field as this allows them to pivot according to political winds. True certainty, evidence-based policymaking or even rigorous experimentation can be deeply constraining from a policy perspective, which is usually problematic for the political process.

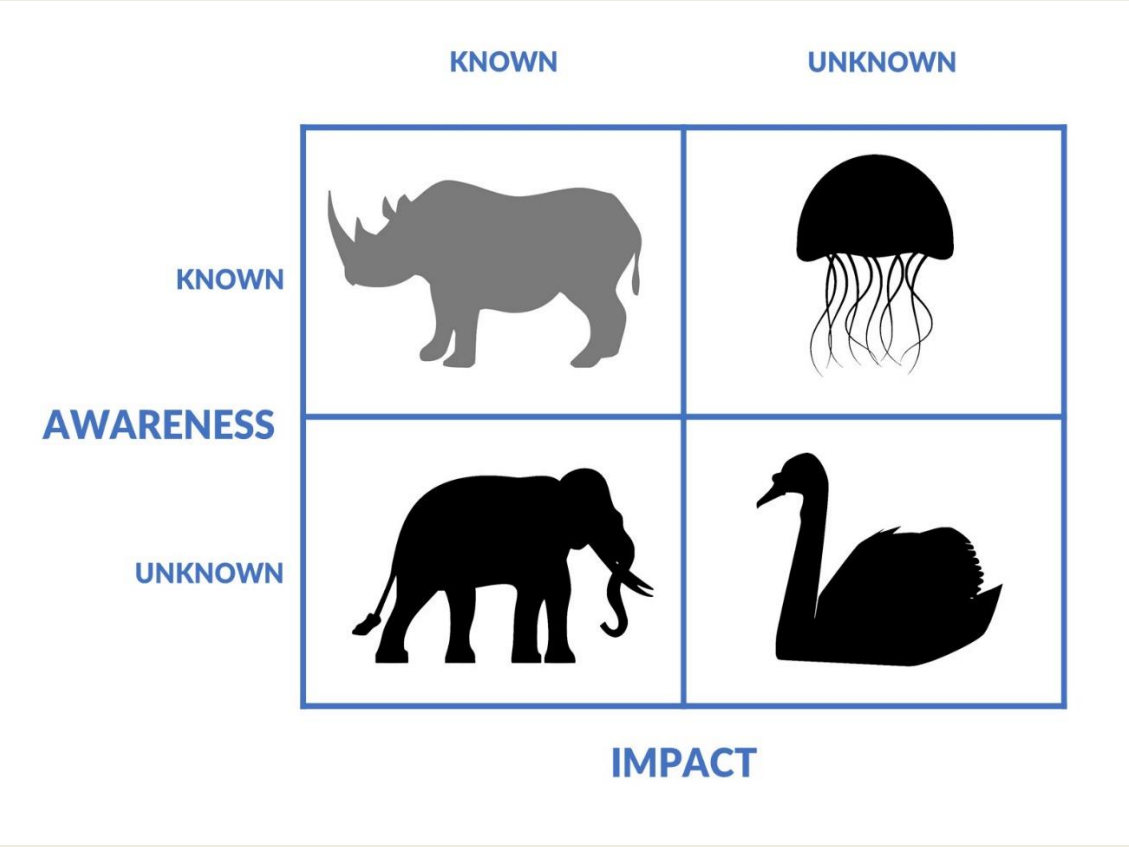
Many of the methods used to address uncertainty such as sensitivity analysis, decision-tree analysis, system dynamics modelling and Monte Carlo simulation, etc. rarely fulfil the conditions in real life and also require specification in probability distributions, which disregard the possibility of multiple and unknown futures (Jensen and Wu 2016). Predictability decreases substantially when novelty is on the table and lack of reference cases or extreme events cannot be included in the standard models (Goodwin and Wright, 2010). This means that policymakers can become paralyzed by uncertainty (Koppell 2005) and focus on short-term successes rather than long-term goals. This can also be seen during the recent Covid-19 crisis. Especially in expert-driven domains, there seems to be a mental bias to downplay complexity thus making complex problems "complicated" (assuming that their causes and effects are known) and subject to reductivism (see discussion in OECD, 2017). As such, there can be problems with evidence-based policymaking as it exchanges knowledge between experts and policymakers linearly and does not pool and utilise knowledge by policymakers themselves as well as the policy context in a continued process.

Evidence can be used in an argumentative, evaluative or strategic manner (Howlett 2015; Landry, Lamari and Amara 2003) to help to choose among options, clarify the strengths and weaknesses of alternatives or boost positions already chosen. Nevertheless, politicians often like to present themselves as decisive (Head 2008b) and thus pursue policy solutions even if they are associated with high levels of uncertainty. Consequently, policymakers can latch onto specific angles of the problem rather than approaching issues holistically or in a dynamic manner. This may also happen when framing issues around future potentialities. There are certainly a number of metaphors to choose from (Box 1.2), while these actually denote very different types of uncertainty.

Box 1.2. Metaphors for the future

Futurists tend to love animal metaphors for what is referred to as the "menagerie of post-normal potentialities" (Sardar and Sweeney, 2016).

Figure 1.1. Futures menagerie



Note: The representation of known-knowns, known-unknowns, unknown-knowns, and unknown-unknowns (in terms of awareness and impact) by the animal-related metaphors frequently used by futurists.
Source: authors, concept by Day One Futures, 2020 https://www.dayonefutures.nz/blog/

Black swans

The term "black swan" refers to unanticipated, unpredictable events with large impacts (unknown unknowns), such as the September 11, 2001 terrorist attack on the United States. Black swans are outliers that usually appear out of the blue. This was popularised by a book published by Nassim Nicholas Taleb in 2007 of the same name, which refers to unanticipated events with big impacts.

Black jellyfish

Also a term for unknown knowns exemplifying how small changes within complex systems can lead to large impacts, such as increased life expectancy or human migration. Usually meant to describe 'normal' phenomena that becomes abnormal or post-normal due to positive feedback, which accelerates change (Sardar and Sweeney, 2016). The metaphor comes from the effect of unusually

warm waters and changing acidity, which have caused jellyfish populations to rapidly increase, and led to blocked water inlets of coastal power stations (Gershwin, 2013).

Grey rhino

The term “grey rhino” refers to highly likely, high impact events (known knowns). The term was suggested by Michelle Wucker (2016) for obvious events that people largely are not aware of, such as a global pandemic like covid-19.

Black elephant

Having a “black elephant in the room” is a metaphor for events that either no one can see or they choose to ignore (known unknowns) (Sardar and Sweeney, 2016). They can be widely predicted by experts, but once they begin to materialise they are likely to be framed as black swans (Gupta, 2009), such as Covid-19.

Source: Taleb, 2007; Gupta, 2009; Gershwin, 2013; Sardar and Sweeney, 2016; Wucker, 2016.

It is important for policymakers to know which type(s) of uncertainty they are dealing with (Box 1.1), before deciding on a strategy of action. As such, betting on the most likely future scenario or a limited range of plausible futures may result in failure – ‘policy misfit’ (Bunce et al. 2010) – when the right degree and type of uncertainty (among other factors) is not accounted for (Walker et al. 2013; Hallegatte et al. 2012; Nair and Howlett 2014). Clarifying the nature of a problem and the type/degree of uncertainty associated with it is therefore key to identifying appropriate policy solutions.

For example, political cycles can add to the uncertainty within a policy field with continuous changes in the goals and types of interventions.

Complex, wicked and quickly evolving problems may require different kinds of knowledge, diverging ways to identify problems, to approach policy design in original ways, and especially an enhanced capacity to learn (e.g., Peters 2005; Schneider and Sidney 2009) that currently do not exist in the public sector. While the issues of governance and policy design under uncertain conditions are plentiful, little empirical research has been done on the strategies for how policymakers should, in practice, deal with uncertainty (e.g., mechanisms, tools, and techniques) (Jensen and Wu 2016)) and what kind of capacities are needed on both the system and individual level.

Dealing with long-term trends

Policymakers today are often driven by events rather than visionary or forward-looking practices (Burrows and Gnad, 2018). Crises sometimes can act as 'focusing events', which can allow for major policy resets. In addition, significant events can provide the political coverage to take more strategic or visionary policy decisions. Yet, this is ad hoc and not a systematic practice dependent on chance rather than a well thought through process.

There is a continuous pressure to seek out quick wins towards political imperatives and manage crises rather than preparing for uncertain futures. Governments are struggling with handling long-term trends – including climate change, rising world population, demographic changes, urbanisation, non-sustainable consumption patterns (for which there is already a substantial evidence that change is needed) but no decisive action has emerged (Burrows and Gnad, 2018). Whether because of political or perception concerns, election pressures, or the pressing nature of routine political activity, short-term decision-making structures are the rule rather than the exception in policy environments. Yet, some countries have been pioneering future oriented approaches ranging from Finland to Singapore, the Netherlands, France or the

US. Those countries have embraced the application of strategic foresight or futures studies (Habegger, 2010; Kuosa, 2016) to address the need for a more proactive approach to policy planning in complex problem environments.

Strategic foresight, as such, is a method and practice used to create functional and operational views of possible futures and the possibilities that exist within them with a view towards influencing today's decisions. While no one can predict the future, foresight allows organisations and institutions to gather and process information about their future operating environment by creatively examining their current landscape for meaningful trends and then leveraging those insights to extrapolate or explore multiple potential outcomes that can then be used for planning purposes (OECD High Level Risk Forum, 2017). This approach can be well-suited to address complex systems because it intentionally takes into consideration developments in multiple interrelated spheres, including the political, economic, social, technological, and legal environments within which organisations operate. Yet, the practice is far from fully institutionalized with different public sector organisations using different methods and are on very different maturity scales (Greenblott et al., 2019) nor has it been very inclusive over the last several decades (Loveridge and Street, 2005). Furthermore, how the foresight function is integrated into the organisation of government is not always clear. There is no typical organisational location for a foresight function nor is it always clear how capacity for foresight inside the public sector is developed. OECD Government Foresight Community (2019) has outlined that there is a lack of awareness about the need for foresight and futures thinking and a lack of access to user-friendly foresight products, tools, guides, and training.

In the absence of a foresight practice, most institutions, including governments, develop at best an understanding of the short-term trends facing them. If any longer-term thinking is done, it often contents itself with examining the continuing trends affecting the society at large rather than narrowing onto any specific organisational context. In order to address the specific complex challenges facing policymakers, neither of these are sufficient. But this limited approach is understandable, as without a framework to guide the process looking beyond – not to mention acting on – a two- to three-year time horizon can be daunting. When an organisation looks deeper into the future, the number of possible futures increases. Governments, being some of the longest-lived organisations (even if subject to election cycles), and presumably may continue well into the future, have a greater imperative to take futures and foresight-informed action at an organisational level.

Strategic foresight as a discipline has been around for decades, though its application within a government context has been somewhat sporadic. However, governments that have embraced strategic foresight practices have seen myriad benefits. Developing the ability to imagine a wide range of inputs to support the creation of policy requires governments to promote greater integration across subject areas, breaking down pre-existing organisational silos. The practice of strategically imagining futures encourages governments to collaborate internally, to share knowledge widely across their organisation, and to infuse future-oriented thinking into every facet of their work, from individual service delivery to high-level strategic planning. Yet, the systemic effects are not the only reasons why governments engage in futures and foresight activities: it sometimes helps to focus on problems rather than politics, but it can also be used to deflect urgent and politically contested decisions (Green, 2014; Jordan and Turnpenny, 2015; Vervoor and Gupta, 2018).

Consequently, when it comes to the specific goal of shaping and setting policy based on the outcomes of strategic foresight work, results have been more mixed. Strategic foresight methods are designed to imagine possible futures, so that decisions can be made today, not to ensure that any particular future results from the process (i.e., attempting to 'shape' the future). These methods do not inherently provide policymakers with the efficacy to take action. Nonetheless, looking to understand how strategic foresight has operated in practice when used by governments to guide policy development can be useful for understanding both the strengths and weaknesses of the practice within a government context. In addition, it also helps governments to learn how to better shape policy development to be able to take advantage of the insights provided. Hawaii has demonstrated both the potential and the difficulty of using traditional

policy practices as the primary lens through which to apply strategic foresight in a government context (Box 1.2.).

Box 1.3. Case study: Hawaii 2000

Hawaii 2000

Hawaii launched one of the first strategic foresight processes in government beginning in 1970, when the state ran a year-long set of futures-oriented activities intended to guide its future development, collectively described as “Hawaii 2000.” The “Hawaii 2000” process was implemented both at the state level, and for the larger islands individually. Individuals and institutions alike embraced this state-sponsored attempt to imagine the potential paths Hawaii might traverse over the next 30 years, with a wide range of activities including a formal public lecture service, radio and television shows, newspaper articles, and public classes. The dominant theme of the overall exercise was "quality of life," and included a state-wide publicity campaign declaring "Hawaii 2000: Somebody better care about tomorrow."

Over the course of the year that “Hawaii 2000” was underway, 500 citizens, supported by numerous consultants, worked collaboratively across ten separate task forces to prepare individual reports on ten critical areas in which Hawaii was concerned about its future. The issue areas addressed included the economy, the environment, education, health and lifestyle, and culture. At the close of the process, the state held a three-day “Hawaii 2000” conference to present and debate the content of the reports.

The report’s concluding chapter, and one of the most pressing points of conversation regarding the project as a whole, was a study of “alternative Hawaiis,” which imagined eight different possible futures for Hawaii, based on strategic foresight work that drew on the extensive reporting undertaken by these task forces. The futures imagined ranged from “Hawaii as Ideal State,” a “*dream come true*" portrait of a Hawaii "*without racism, poverty, unemployment, crime, slums, pollution, mental illness, moral degradation, and family disintegration*,” to “*Hawaii as Coconut Republic*,” “a clothing-optional playground of amusement and gambling [where] all the chemical euphorias of the world would be readily at hand; the finest medicines would restore health, obliterate venereal disease, and control births,” to “Hawaii as National Park,” where “*Hawaii either petitions for federal assistance in becoming a national park, or the whole state might be deeded by action of its own citizens, with national concurrence, to the United Nations as the first major 'world park'*”.

James Allen Dator, a professor and Director of the Hawaii Research Center for Futures Studies in the department of political science at the University of Hawaii at Manoa, actively participated in the development and execution of “Hawaii 2000,” and was tasked 29 years later, in 1999 — on the cusp of the actual year 2000 — with delivering a report examining how the government of Hawaii had done relative to the ideal futures the state had developed. “*Sadly*,” he wrote, “*The current situation in Hawaii is not very good compared to what was envisioned in 1970 or by comparison with other states in the United States*” (Dator 1999). He continued:

> *It appears by some measures that there has been a decline in the standard of living in Hawaii since 1970. The education system has not lived up to the aspirations envisioned in 1970. Environmental degradation is more of a concern today than it was in 1970, and the state is devoting fewer financial resources to resource management than other states. By some measures, the standard of living has declined in financial terms and financial security for Hawaii’s people has also declined. (ibid.)*

Understanding why the programme failed to reach its goal of a more sustainable, liveable Hawaii, Dator (1999) claimed, was not an issue of a failure of foresight. “*If we examine what their aspirations were in 1970,”* he argued*, “We can learn some lessons about how to envision the future more effectively. But even more importantly, we might learn some lessons about the difficulty in creating it*.”

Ultimately, he concluded, the reason for Hawaii 2000’s failure was that no mechanism was established to guide Hawaii toward the preferred future. A number of initiatives were developed as a result of Hawaii 2000, but few have endured. If the quality of life in Hawaii is to be improved in the face of the global

trends emerging now, a broad-based continuous effort similar to Hawaii 2000 will be required, and a commitment must be made by those involved in the process to ensure the preferred future is realised.

Hawaii 2050 and 2060

The government of Hawaii has run two more Hawaiian futures events since "Hawaii 2000,"inlcuding "Hawaii 2050," which took place in 2006, and "Hawaii 2060," which happened in 2011. Both of these events were designed not only to imagine new futures for the state but also to overcome some of the limitations that held Hawaii in 2000 from becoming the state described in "Hawaii 2000."

One of the key themes involved in "Hawaii 2050", and the key theme invoked for "Hawaii 2060," was dealing with climate change, which by 2011 had already begun to reach an inflection point in Hawaii, at least in terms of public perception and concern. As part of the participatory futures process for "Hawaii 2060" and as a corrective to the failure to successfully apply the outcomes of "Hawaii 2000", participants were asked to develop and share policy recommendations as part of their futures exercise. This crisis of climate change was a significant factor in the state's willingness to undertake once again the process of developing potential futures for the state, but even within this framework, participants found it challenging to imagine that these policy recommendations would carry weight or be implemented in any meaningful way. The organisers of the "Hawaii 2060" policy development event observed that even given the structures put in place to encourage a stronger connection between the insights developed and the policies that would result, "*There was unanimous agreement between groups that current forms of governance are reactive rather than anticipatory, and as a result issues are often not addressed until they become big problems*" (Frey, Yim and Troumbley, 2011). In other words, the individuals responsible for using foresight processes to help set policy believed that, in the absence of a major crisis event, it was unlikely that any meaningful action would be taken. This perspective was the case despite the event organisers' attempts to create an environment that would make action more likely, and even though this kind of crisis was exactly what strategic foresight work is intended to anticipate and address. As a result, the participants' perspectives were bleak — not the ideal vantage point from which to make future-oriented policy decisions.

Source: OECD; Dator 1999. Frey, Yim and Troumbley, 2011.

When governments try to address complex problems, the methodologies associated with futures practices and strategic foresight are not sufficient in and of themselves to address the challenges given and complexities of our hyper-networked era. Strategic foresight allows governments to proactively develop policy based on what could happen, not what has happened, but because the tools and structures developed to create and implement policy were designed primarily to react to recently occurring events, governments have not always proven capable of taking full advantage of the insights developed through foresight practice. In most traditional policy settings, the future can be an awkward fit (see e.g., Ramos 2014) and ill-suited as an input into the policymaking process, as most policy processes are structured with this reactive model in mind and expect inputs from the past rather than the future to guide them.

The best examples of capacity-building based on foresight may be military exercises or peace processes, training people in "plausible" scenarios; it also reveals the organisations' strategic readiness for any scenario and leads to different designs, purchases, plans. Beyond the former, the field of science, technology and innovation (STI) is by and large the area where the oldest formal foresight approaches have been applied (Georghiou, 2011: 243); yet, their predominant use has been to set broad aims and select priorities for research investment and little else (Georghiou and Harper, 2010). While strategic foresight practices can play a critical role for policymakers in anticipating critical situations before they happen, it is clear that governments need a better mechanism for taking meaningful governmental action in response to the futures laid out in front of them. Generally, methods and approaches that help to deal

with long-term goals exhibit a lack of sustained engagement with the question of how and why they need to be integrated into governance, policy and planning processes.

Implementing the institutional mechanisms that encourage short-term approaches to crafting policy responses to critical situations is outside the scope of traditional strategic foresight efforts, which are designed to inform policymakers but not to support them in engaging with a deliberative process. Strategic foresight activities can help gain a fuller understanding of the potential future impacts of the problem under consideration, and can further provide a set of scenarios and potential approaches to addressing the problem. So, it can inform short-term decisions, but cannot tell whether these decisions will be successful in the future. Thus, the link between foresight, planning and driving policy change is missing and the very prospect of relying on foresight in the present to steer largely unknowable futures should be critically examined (Vervoort and Gupta, 2018). Addressing these gaps should be taken up as a separate but equally critical challenge to which governments and policymakers should respond.

Complexity of modern policy mixes

> "One cannot understand the problem without knowing about its context; one cannot meaningfully search for information without the orientation of a solution concept; one cannot first understand, then solve. Moreover, what "the Problem" is depends on who you ask – different stakeholders have different views about what the problem is and what constitutes an acceptable solution" (Conklin, 2006: 8)

Additional policy challenges governments need to address is the complexity of policy interventions and governance measures themselves. Not only are the policy problems complex, the policies themselves are also varied and layered. Thus, the research around policy mixes and policy portfolios and policy patching has recently picked up (e.g., Margo and Wilson 2013; Howlett and Rayner, 2013; Kern, Kivimaa, and Martiskainen, 2017). In these environments there are issues with policy consistency and coherence: the ability either for multiple policy tools to reinforce each other or for multiple goals to co-exist in a logical manner (Howlett and Rayner, 2013).[2] In practice, most new policy instruments are layered atop of policy instruments imagined under previous models of causality (Peters 2005). This contributes to how policymakers see the future – the future being 'open' or 'closed' (Box 1.2). If policies are reductionist, each intervention addressing specific interest and policy patchwork can produce a non-resilient governance context, where complexity and adaptive quality of variables within the system are not accounted for properly. This adds considerably to the ontological or strategic uncertainty described above. The complexity of layered policy mixes also adds to the number of vested interests that need to be tackled when truly transformative change is addressed. With so many conditional variables, it is not surprising that most predictions about the future, and thus policies, fail.

Box 1.4. Causality and the understanding of future

"The future is opaque − and it's plural." (Schwartz, 1991)

Understanding uncertainty in combination with causality will lead to different understandings of the future be it open or closed.

Linear causality and closed futures

Linear causality draws on the dominant pattern within the policy field and pushes towards closed futures. Closed futures connect policy problems to specific reference points, they tend to extrapolate from past events and help maintain specific values and norms, trying to push out possibilities that do not sustain the latter.

Multi-causality and open futures

Multi-causality assumes a pluralistic, inclusive and participatory approach to causality where multiple future possibilities exist and are approached as layered and contextually diverse. This understatement pushes policymakers towards open futures (i.e. multiple and open-ended understanding of future possibilities).

Source: Bussey, 2014.

Modern policymaking exhibits a growing reliance on model-based simulations and predictions that tend to take linear causality model at its heart (e.g., Henriksen, 2013). Policy choices stabilise "when a sufficiently large part of the macroeconomic discipline is in agreement over the causal relationships between instrument and target variables, as well as over the way in which the former should be used by policymakers" (Braun, 2014: 51). They give a fixed frame in which policy problems are identified and discussed, and solutions deemed conceivable. Under the auspices of scientific neutrality, which may not always be true, socioeconomic modelling narrows future choices (e.g., Beck and Mahony, 2018; Aykut, Demortain, and Benboudiz, 2019.). They are useful until the underlying normative assumptions made by the architects of these models cease to hold, which is unfortunately the case with complex problems and radical change. Thus, there is a need to go beyond method-led approaches, implicit biases and lock-in into pre-selected causality models.

The alternative model of thinking in based on *reflexivity*. Reflective thinkers start from the perspective that there cannot be hard facts connected to all policy problems which make solutions 'confusing messes' (Head 2010). The approach assumes that static policies in a dynamic environment tend to fail. The idea of 'reflection-in-action' (Schön 1987) is rooted in the practice dissertation, i.e. continuous learning. Meaning that in a continuously changing world we rely increasingly on the 'reflexive monitoring of action' (Sanderson 2009). This approach uses 'soft' types of knowledge, (social) learning between stakeholders compared to 'hard' monitoring and evaluation (Nair and Vreugdenhil, forthcoming), which makes the process more open-ended. These approaches are usually described under the label of 'adaptive' policymaking (see e.g., Nair and Howlett 2014). Adaptive policymaking tries to avoid irreversible interventions, facilitate constant monitoring of outcomes, participation of multiple voices in policymaking and reflexivity in understanding the knowledge behind policy choices (Cooney and Lang 2007, 524). This is adopted in the much-discussed 'complex adaptive systems' (CAS) approach (Dooley 1997) which opposes itself to linear decision-making. The approach is based on hypothesis testing, monitoring, evaluating and revision of policy based on this process (Hurlbert, and Gupta, 2019). In a reflective, adaptive governance perspective, decision-makers

need to have an agnostic attitude and be open to the possibility of alternative scenarios (Ogilvy 2011). At the same time, there needs to be a balance between unplanned exploration and planned exploitation (Uhl-Bien et al. 2007). Yet, the approach does not outline in detail how this state can be achieved in practice and how big, visionary changes can be obtained on the ground.

In some situations, more organisational variety coupled with different capacities and tools/methods may be the necessary condition inside the public sector to succeed. It is possible that in some cases more coherence and centralised control is needed. Different contexts may require different responses. However, it is not enough to layer policies on top of one another, maximally diversifying the 'policy mix', if the commitment and strategic intent of measures do not match the purpose of the policies.

Risk avoidance and the cost of doing nothing

Governments are generally known to be risk-averse and not open to discussing failure (Albury, 2004; Brown and Osborne, 2013). The sheer resourcing and time-pressure most modern governments are under explain why. It also means that there is little time for mutual learning and negotiated risk-taking and innovation (Klijn, 2014; Agger and Sørensen, 2014). Governments by design are rule-driven, based on stable structures and predictable decision-making – they tend to strive towards procedural rationality. Avoiding risks is often justified for both political and reputational reasons (Rhodes, 2011). However, this does mean that governments are not able to – by design – take action quickly when confronted with new challenges or explore alternative possibilities on the go. This means that governments tend to be late to react and act when hazards have already emerged and they are also missing out on opportunities that new developments and technologies may offer them (Cohen and Cavoli, 2019). Hence, governments are currently more on the passive and reactive side of future thinking; on occasion, they are 'pre-active' (building resilience or antifragility into existing systems), but rarely proactive.[3] Hence, government attitudes tend to be on the passive, reactive and occasionally pre-active side insuring against hazards, but rarely on the proactive management side (see Table 1.1). Yet, already in 2014, OECD recommendations[4] on the governance of critical risks was adopted by ministers that called for a comprehensive, all-hazards and trans-boundary approach to country risk governance, a better understanding and raised public awareness of critical risks, improved adaptive capacity in crisis management, and greater transparency and accountability (OECD High Level Risk Forum, 2017).

Table 1.1. Attitudes towards the future

Attitude	Example
Passive	Ostrich
Reactive	Firemen
Preactive	Insurer
Proactive	Manager

Source: Godet and Roubelat, 1996.

So far, however, governments' response to transformative change has generally been reactive at best. They often take a 'wait and see' position or are called forward when 'hazards' (moral, ethical or even physical) materialise or they are called upon to sort out relationships between industry incumbents and new business models. Think for example about the government response to platform economies in

[3] There are of course exceptions in different sectoral areas: e.g., countries like Denmark, Germany and the Netherlands are an exception to this rule since they make for instance vast investments in wind energy.

[4] *Recommendations of the OECD Council on the Governance of Critical Risk*, developed through the High Level Risk Forum and adopted at the OECD Ministerial Council Meeting in May 2014.

transportation and housing (e.g., Stein. and Head, 2020) or how self-driving cars have been tested in some instances (e.g., DeArman, 2019) or how the government has been reacting to cyberspace threats (Guler and Demir, 2020). When faced with uncertainty, in some cases laissez-faire rather than intervention is easy: it frees authorities from having to justify risky or uncertain interventionist policies. This may work until the future catches up with policymakers and negative outcomes occur (ibid). Yet, society needs governments to take action in a timely manner. Thus, the opportunity costs and the negative side effects of doing nothing should be also considered. Governments may not always be able to write off the cost of doing nothing.

Traditional policy instruments often fail to address issues until well after a shift has occurred. One common case is the question of whether to make social media platform providers responsible for the content shared on their media and to which extent they can sell their users' data. On 10 April 2018, Mark Zuckerberg, CEO of Facebook stated during the U.S. Congress hearing, "My position is not that there should be no regulation. [..] I think the real question, as the internet becomes more important in people's lives, is what is the right regulation, not whether there should be or not" (CBC, 2018). With the advent of autonomous cars, researchers predict that governmental inaction will lead to an increase in traffic volume as a result of a growing population of "drivers" and a probable increase in kilometres driven per passenger. Despite claims that self-driving cars will enhance network efficiency, these gains are not likely to occur without appropriate government intervention (Cohen and Cavoli, 2019).

Thus, traditional policy instruments meant to deal with uncertainty – such as risk assessment, product-based standard setting, or accountability – tend to kick in only after the fact as 'end-of-pipe' interventions, and often fail to anticipate or address long-term systemic implications. This, however, is insufficient as the effects of technologies, once adopted, can at times be difficult to control, correct or mitigate if negative effects emerge. Yet, governments now are having trouble with even articulating the right questions (discussing the potential value shifts under deep uncertainty), let alone exerting appropriate oversight or actively participating as 'technology makers and shapers,' in rapidly changing environments.

Relationship between technology and governance

Last but not least, today's governance models suffer from insufficient interaction between governance issues and technology (e.g., few central public administration theorists have drawn upon the role and function of technology in organisational change). Hence, public administration scholars often fail to understand technological change and vice versa, technology experts rarely go deep into the operationalisation of policies and policy implementation from the viewpoint of public policy. When the literature has addressed transformations, research has usually looked at them from a specific angle: either as a governance for transformations (i.e. governance that creates the conditions for transformation in socio-technical-ecological systems to emerge); as governance of transformations (i.e. governance to actively trigger and steer a transformation process), or transformations in governance (i.e. transformative change in governance regimes) (Burch et al. 2019). Rarely if ever are these processes addressed in a mutually-enforcing manner. The ability to govern influences the development and technology influences how something is governed. This is most evident when it comes to the digital transformation and the cooperation of ICT in government.[5] Public administration scholars, both in the public sector and academic, seem to ignore the significance of the topic (see the critique in Pollitt 2011; Andrews 2018; Dunleavy and Evans 2019), while e-governance and other digital governance streams (e.g., smart governance) tend to concentrate on processes, rather than governance itself (Gil-García, Dawes, and Pardo, 2018). Notwithstanding a few exceptions (e.g., Bannister and Connolly, 2015), this is quite a startling observation as governance is constantly being confronted by new technologies. Centralised governance structures are

[5] See further OECD Recommendation on Digital Government Strategies.

challenged all the time by emerging technologies, especially with decentralised functions (e.g., in the case of bitcoin – Trump et al., 2018).

This is not a new observation. Already as early as 1922, the sociologist William Fielding Ogburn pointed to the cultural lag of immaterial changes behind technological changes and the possibility of 'future shock' as too many things may change in a short timeframe (see overview of relevant literature in van der Duin, 2019). Technology seems to outpace governments and, as the latter do not examine their relationship with technology, its ability to adapt itself in a timely manner or on behalf of future generations is hampered. Consequently, governments are facing a "pacing problem" (Marchant, 2011): given the speed of innovation especially in the digital economy, regulatory challenges can evolve and change during the policy cycle.

Box 1.5. OECD's work on emerging technologies and regulation

OECD works across its different directorates on emerging technologies and their effects. One of the leading projects underpinning the former effort is Going Digital. The former effects of digital technologies including AI, platform technologies are examined across different policy fields (OECD, 2020; Lane, 2020; etc.). In addition, the OECD has identified 40 key emerging technologies for the future including digital technologies, biotechnologies, energy and environmental technologies and advanced materials (OECD, 2016). The ability to influence the development of emerging technologies is addressed through the broader concept of "technology governance", which has been defined by the OECD as the process of exercising political, economic and administrative authority in the development, diffusion and operation of technology in societies (OECD, 2018).

Under the umbrella of emerging technologies, OECD is analysing the key challenges for public policy that are created by digitalisation and also other emerging technologies, including the functioning of the international tax system (OECD, 2018), competition policy, antitrust tools, etc. Specifically the OECD (2019) works on regulatory challenges posed by emerging technologies:

- Pacing problems;
- Dealing with uncertain technology trajectories;
- The design of "fit-for-purpose" regulatory frameworks;
- The regulatory enforcement challenge;
- The institutional and transboundary challenge.

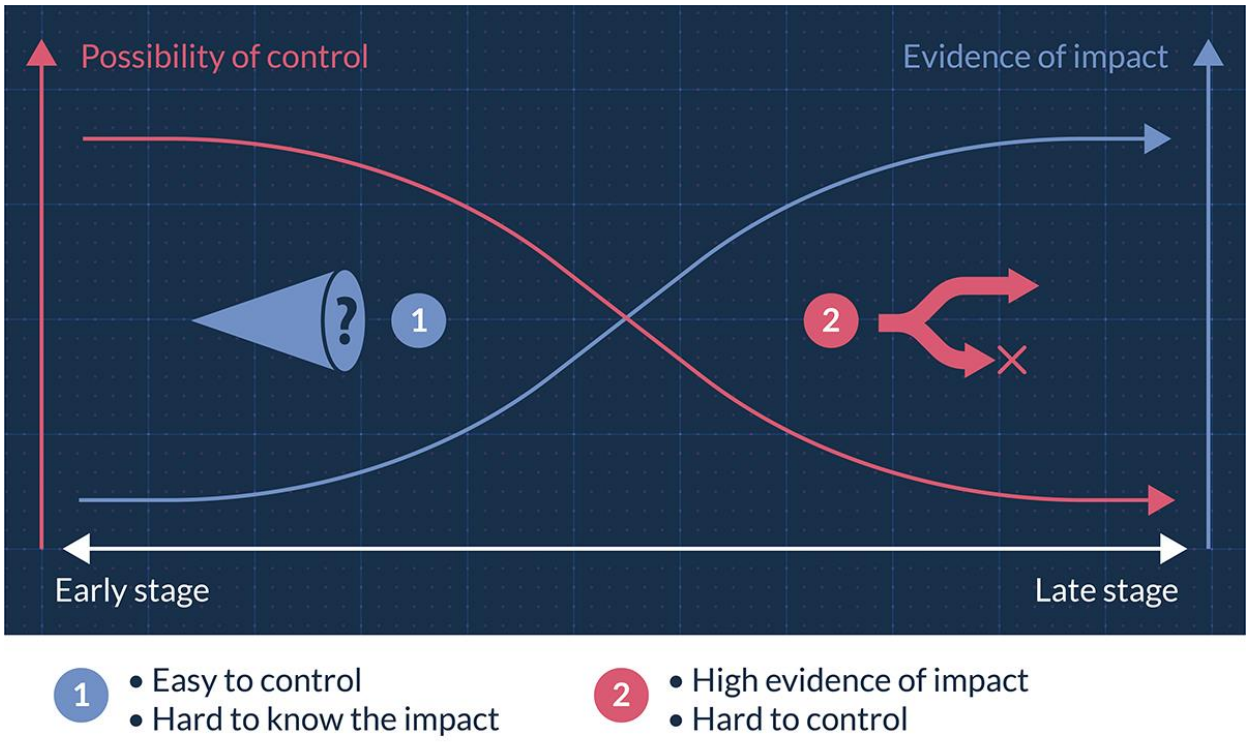
The OECD is considering a variety of regulatory approaches from outright or effective bans, prescriptive or technology-based regulations (i.e. prescribing the standards of use of the digital technology); management-based regulations (i.e. requiring to maintain a range of processes, systems, and internal management practices to achieve goals defined in the regulations which could be outcome-based); self-regulation and co-regulations (i.e. group of economic agents voluntarily developing rules or codes of conduct that regulate or guide the behaviour, actions and standards of those within the group); and regulatory exemptions (e.g. regulatory sandboxes) for specific uses of the digital technology.

Source: OECD, 2016; 2018; 2020; OECD (2019), Regulation and IRC: challenges posed by the digital transformation, OECD, Paris, https://one.oecd.org/document/GOV/RPC/RD(2019)2/en/pdf.

In 1980, David Collingridge, a professor at the University of Aston in the UK, described a theoretical situation that has since become known as "The Collingridge dilemma" (see figure 1.2 below). He posited that there is always a trade-off between clearly understanding the impact of a given technology will have on society and the ease with which interested parties are able to influence the social, political, and innovation trajectories of this technology. "When change is easy," according to Collingridge, the need for it cannot be foreseen; when the need for change is apparent, change has become expensive, difficult and

time consuming" (Morozov, 2012). From a governance perspective, this means that the point at which it is simplest and most likely that a new technology can be effectively regulated through policy is also the point at which the least is known about the potential impact of that technology, or the act of regulating that technology. This is also guiding OECD's work behind technology governance and regulating emerging technologies (e.g., OECD's principles on AI and the Recommendation on Responsible Innovation in Neurotechnology).[6] Hence, governments are in a double "blind" situation where they lack information on the future impact of technology (as it cannot be easily predicted until the technology is extensively developed and widely used) and power to change course as technology becomes increasingly difficult to control once it has become entrenched. For example, governments are currently attempting to steer how facial recognition technologies and algorithmic biases are used before they become ubiquitous (e.g. Grace, 2019). However, governments lack the insights into how these technologies will impact their own structures and activities. So how can governments analyse and work with these different issues? How should they choose between different policy options?

Figure 1.2. Technology and the Collingridge dilemma



It is very difficult to control technological development once it is widely adopted, yet, before its effects are widely unknown.
Source: OECD.

Furthermore, while new technologies offer opportunities, they also create unintended consequences and new risks. Usually the benefits and new risks of these technologies do not fall on the same people. Thus, governments have to consider what kind of public values are important to protect in the change process and how public value is changing through technological developments. For instance, the way in which security is provided to citizens under car-sharing regimes via a digital transaction footprint despite resistance to using cameras in taxis (OECD, 2017; see further OECD, 2010)). While increased complexity/uncertainty *per se* does not necessarily disqualify traditional policy tools, it is difficult to rely on

traditional policy tools in these situations, where and when it is unclear which direction technological innovation will take. Thus, new tools such as normative codes of conduct, regulatory sandboxes and real-time technology assessments etc. are needed (Silgoe et al., 2013). For example, regulatory sandboxes have been adopted in their various forms in Australia, Hong Kong, Malaysia, Singapore, the United Arab Emirates, and the United Kingdom especially for financial technology (FinTech). For this to happen, governments must operationalise foresight better and engage upstream with technology developers and lead users. Furthermore, international cooperation is needed as many technological developments go beyond single jurisdictions and government is increasingly confronted with transboundary challenges to technology development (see Box 1.5).

Box 1.6. Institutional and transboundary challenges in addressing technological change

Technologies can span multiple regulatory regimes, with no regard to national or jurisdictional boundaries. Digital technologies has intensified cross-border flows and transactions. This feature enables technology developers, companies at large and different stakeholders to "forum shop" or to avoid compliance when it comes to their physical presence, their internal tax policy, and their policy for data protection or other regulated areas. The mismatch between the transboundary nature of technology and the fragmentation of governance (and specifically regulatory frameworks) across jurisdictions may undermine the effectiveness of action and therefore people's trust in government. It may also generate barriers to the spread of beneficial innovations.

Responses to the trans-boundary challenges are emerging, notably through the development of an architecture of international and regional organisations and greater awareness at the domestic level of the limitations of unilateral action. For example, Canada has enshrined the key principle of International Regulatory Co-operation in its new Cabinet Directive on Regulation. Furthermore, some jurisdictions have developed a range of institutional mechanisms to tackle fragmentation internally, including in the United Kingdom the Ministerial Group on Future Regulation and the Centre for Data Ethics and Innovation. Governments have also recognised the importance of multilateral and multi-stakeholder where stakeholders can to some degree engage in self-regulation (e.g., the Internet Corporation for Assigned Names and Numbers (ICANN) and the Internet Engineering Task Force (IETF)).

Source: GOV/RPC/RD(2019); OECD (2019) Brochure on "Regulatory effectiveness in the era of digitalisation" available at: https://www.oecd.org/gov/regulatory-policy/Regulatory-effectiveness-in-the-era-of-digitalisation.pdf

In an environment where the pace of technological change is ever-increasing and where technology is becoming the base of almost every element of society, from healthcare to communications to transport, Collingridge's Dilemma is increasingly relevant to policymaking (and to companies and technology developers) in a wide variety of contexts. As Collingridge's Dilemma takes hold within most policy domains, the traditional governmental response of waiting until the effects of systemic changes have been made apparent in order to determine policy has proved entirely insufficient. While the theoretical arguments around the Collingridge's dilemma need a more critical approach to understanding social shaping of technology and the dual role of governance in the former,[7] it does provide a compelling justification for a new form of governance of not only emerging technologies, but also radical transformations they inflict (Ribeiro and Shapira, 2019). Taking no action in these situations, as Collingridge has warned us, has proven to be a decision in and of itself. Thankfully there are continued attempts to better understand future technologies and to predict the ethical issues they are likely to raise through policy, regulation and design

[7] OECD has tackled some of these issues under the discussion of the principles for the good governance of evidence.

choices (Mittelstadt, Stahl, and Fairweather, 2015) and also in some cases link it back to core governance issues themselves (Lember, Kattel, and Tõnurist,, 2018; Lember, Brandsen, and Tõnurist, 2019).

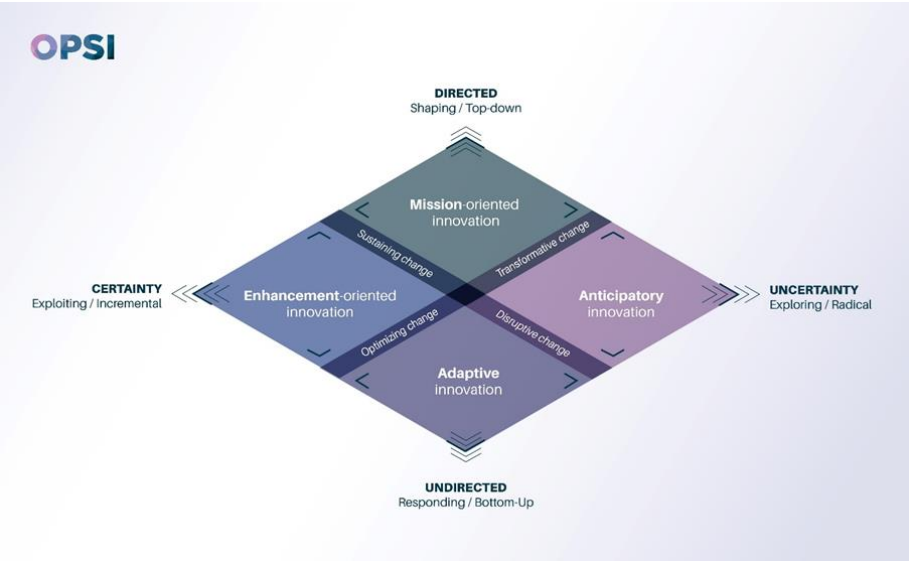
Critical need for a new approach

A new approach to governance and policymaking needs to be developed that allows governments to address challenges beyond traditional policy tools and jurisdictional silos. Governments need to start working with the complex effects of rapid technological changes that are on the way regardless if governments do something about them or not. We need to introduce radical uncertainty into governance systems to increase our understanding of complex socio-economic and ecological systems to also start to account for counter-intuitive effects innovations sometimes may bring. Governments can address these problems only by moving towards an approach where policy is evolved rather than informed, because this requires an *open* understanding of the future. A complex, changing world does not perform in line with our discrete number of assumptions and linear causality models. Hence, the best way to understand it better is through careful, persistent experimentation. Unfortunately, we cannot as of yet recognise the factors that predict effective organisational resilience to future conditions (Linnenleucke 2017; Turner et al. 2018). Flexibility in new organisational models should be part of the process in government. The new approach to policymaking should be action-oriented and pragmatic in nature and go beyond the silos of policymaking and foresight in which the public sector has currently invested.

Defining a new approach: directionality and uncertainty

Where should one look when considering a new innovative model for the government? Innovation is multi-faceted and can manifest itself in a variety of forms for different purposes. The Observatory of Public Sector Innovation has developed an innovation model along two central characteristics – uncertainty and directionality. Based on these characteristics four different facets of innovation emerge, one of which is anticipatory innovation (see Figure 1.3).

Figure 1.3. OPSI multifaceted innovation model



Note: The multifaceted nature of innovation requires different interventions and strategies. The model has been developed as part of OPSI's public sector innovation systems review process.
Source: OECD.

All the different facets of innovation require government attention as we want simultaneously to have more effective and efficient products and services (enhancement-oriented innovation), directed innovation to solve societal challenges (mission-oriented innovation) while allowing for undirected entrepreneurial discovery (adaptive innovation). Anticipatory innovation sits among this broader portfolio of innovation activities that governments must support and 'do' differently. Thus, anticipatory innovation governance is not synonymous with mission-oriented innovation policy or agile government. Furthermore, it should not be the sole focus of governments' innovation activity, yet it is an important component to balance out the broader innovation portfolio and avoid lock-in.

There must be a working mix within the governments' innovations activities and different toolboxes for different types of innovation. Currently there is an impetus to usher in a new era of "mission-oriented" innovation policies, with governments looking to work more closely with the business sector and civil society to steer the direction of science and technology towards specific goals. Yet, effective as it might be, a singular mission-oriented innovation focus may also cause lock-in and myopia. Thus, we also need to explore how anticipatory innovation governance fits in with other government innovation activities and how diverging strategic intents do not crowd out different parts of the innovation portfolio. Part of this issue relates to the 'Innovator's Dilemma' described by Clayton Christensen (1997) where even incumbents (including governments) are the ones to spot and develop new technologies and yet they fail to value them properly because incumbents attempt to apply them to their existing value networks (customers and product architectures). This is a core challenge for creating space for anticipatory innovation: to create alternative value networks under innovation portfolios that may prioritise other goals and values based on the current paradigm, not the future.

As mentioned earlier, there are streams of literature around adaptive governance and transformative governance which have a large, but not a total overlap (Pickering 2018). The latter is less frequently used and looks at the governments' capacity for transformation. Thus, not directly the government's own role within the process. Also literature around experimental governance has sprung up (Overdevest and Zeitlin, 2014: 25) to denote a continuous process of learning and testing that leads stakeholders to alter their preferences, goals, frames, and commitments (Ansell and Bartenberger 2016: 70). Yet, not only the experimentation, but also deliberation, leadership and other core governance values are important to respond to these challenges (Pickering 2018). Consequently governance must involve a broad set of stakeholders, including non-experts, and develop processes related to innovation policymaking that are productive, accountable and emancipatory (Lehoux, Miller, and Williams-Jones, 2020). This may well lead to anticipatory innovation governance.

2 Anticipation, Innovation and Governance

A new wave of “future-readiness” is entering policymaking through the increased importance of foresight activities and futures thinking. Yet, this is not going to be enough to make a difference on the ground. Governments need to learn to anticipate but also make such anticipation actionable through implementing real innovation on the ground. For this to work, governments need a new governance approach to support future-oriented learning that is based on empirical experimentation. This chapter defines the core definitions of anticipation and anticipatory innovation and outlines how these concepts are connected to other governance approaches and futures thinking.

> "Responsible development becomes, at least in part, understanding the role of one's own decisions and one's own position in the innovation process" (Guston, 2014).

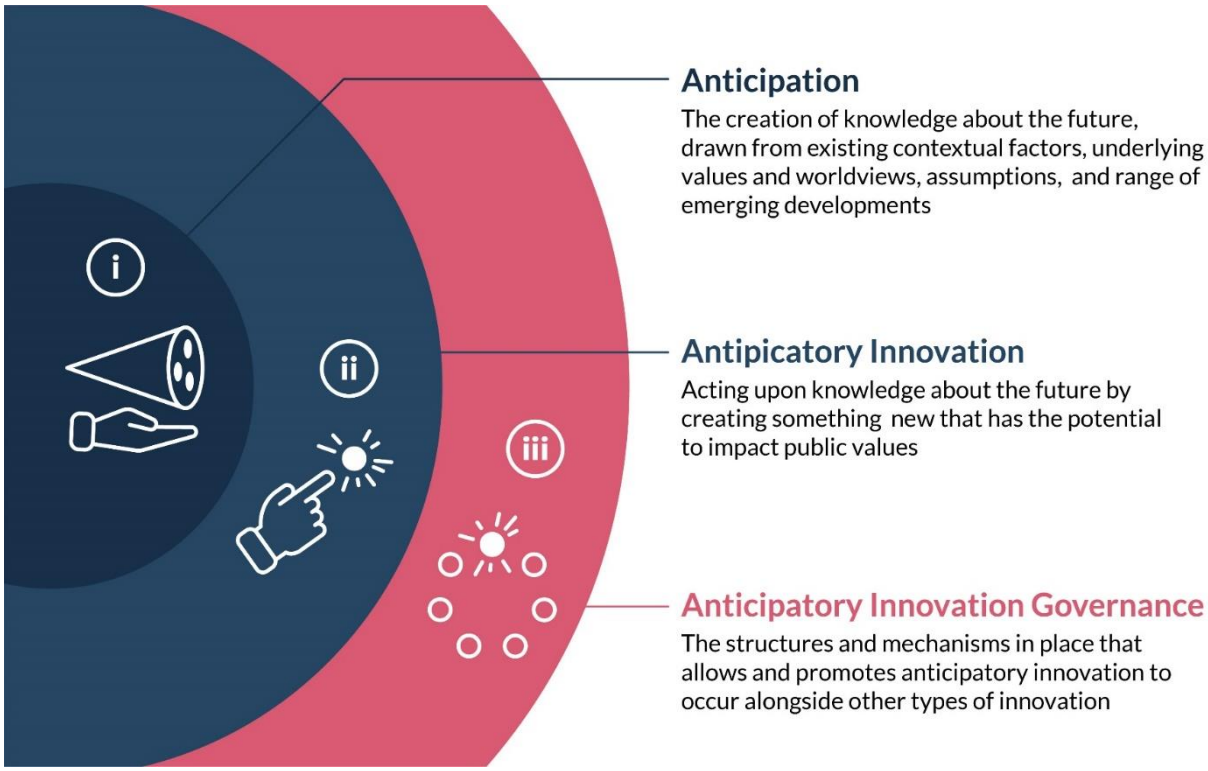
There has been a lot of talk and hype around visions for the future, but the follow-through and policy measures have not always gone hand in hand (Urueña, 2019). Yet, recent bushfires in Australia with brushfires and around the world with the Covid-19 outbreak, have shown that countries are inadequately prepared for new type of challenges that they need to face. Many such complex and fast moving challenges include a "cascading sequences of events" that cannot be predicted or concretely modelled due to social, environmental and technological issues (OECD, 2011; 2015; Low, 2017). Thus, these systems are not quick to respond to unforeseen challenges. Creating knowledge about the future is not enough; acting on this knowledge in a timely manner with adequate mechanisms in place is the key question. We may "anticipate" the future, but are we also ready to act and innovate based on it?

Anticipation is more about "practicing, rehearsing, or exercising a capacity in a logically, spatially or temporarily prior way than it is about divining a future" (Guston, 2014). Anticipation does not mean predicting the future, but rather it is about asking questions about plausible futures so that we may act in the present to help bring about the kind of futures we decide we want (Guston, 2004). In that lens anticipation and anticipatory governance are difficult to distinguish from strategic foresight. It is a capacity connected to engaging with alternative futures, based on sensitivity to weak signals, and an ability to visualize their consequences, in the form of multiple possible outcomes (Fuerth, 2009: 16 and testing them out, that makes anticipatory innovation governance different). Yet, perspectives on anticipation vary based on the extent to which experts assume that the future can be knowable or steered (Burch et al., 2019). This can be quite confusing, as in practice, anticipation can be sometimes assumed to mean foresight, preparedness and planning (Boyd et. al., 2015: 52). These classifications try to retrofit the concept into governments' "business-as-usual" approach and this can be rather harmful as it tries to solve the uncertainty challenge within the current government constructs which (as was shown in the previous chapter) are not always working.

Anticipation encompasses modelling, temporality and the present to the design, ethics and power of the future. Change agents – which governments invariably are – should recognise their responsibility in introducing new technologies and innovations that can help them grapple with upcoming challenges. The main contribution of anticipation, hence, lies with the ability to shape people's perceptions about the future and develop their capacity to make sense of novelty (Miller et al., 2013: 2). Yet, even this is not enough. This knowledge and sense-making must also translate into government activities and actions with some disposition toward the future – be it predictive, precautionary, deterministic, or preferred (ibid, Lehoux, Miller, and Williams-Jones, 2020). This is the domain of anticipatory innovation (see Figure 2.1 and Box 2.1 on core definitions of concepts). Here, innovation can provide the 'seeds of change' that can, over many years, grow to become significant change factors (Ramos 2017). Innovation (becoming a proof of concept) can make the case for systemic change among previously fragmental decision-making entities and leverage (desirable) long-term social change (Smits and Kuhlmann, 2004).

This paper not only addresses anticipation and innovation, but also the governance that enable these to occur alongside other core government functions and types of innovation. This paper also explores the relationship between anticipation, innovation, and governance and suggests ways policymaking can incorporate mechanisms that embed an anticipatory approach.

Figure 2.1. Anticipation, anticipatory innovation, and anticipatory innovation governance



Source: OECD.

Box 2.1. Core definitions

Anticipation is the process of creating knowledge – no matter how tentative or qualified – about the different possible futures. This may include, but is not limited to developing not just scenarios of technological alternatives, but techno-moral (value-based) scenarios of the future (Normann, 2014).

Anticipatory innovation is the act of creating and implementing new, potentially value-shifting innovations in environments of deep uncertainty, particularly for the purpose of exploration and with emergent issues that might shape future priorities and future commitments (OPSI, 2019).

Anticipatory governance is the process of acting on a variety of inputs to manage emerging knowledge-based technologies and socio-economic developments while such management is still possible (Guston, 2014). This may involve inputs from a variety of governance functions (foresight, engagement, policymaking, funding, regulation etc.) in a co-ordinated manner.

Anticipatory regulation is a function of anticipatory governance, which uses regulatory means to create space for sandboxes, demonstrators, testbeds, etc. for various technology options to emerge. This requires an iterative development of regulation and standards around an emerging field (Armstrong and Rae, 2017).

Anticipatory innovation governance is a broad-based capacity to actively explore options as part of broader anticipatory governance, with a particular aim of spurring on innovations (novel to the context, implemented and value shifting products, services and processes) connected to uncertain futures in the hopes of shaping the former through the innovative practice (OPSI, 2019).

Source: Authors based on OPSI, 2019; Normann, 2014; Guston, 2014; Armstrong and Rae, 2017.

The origins of anticipation

Anticipation, anticipatory innovation and anticipatory innovation governance are relatively new concepts that have emerged during this millennium. They turn the future into an object of enquiry and potentially political intervention (Aykut, Demortain, and Benboudiz, 2019). Thus, anticipation and anticipatory governance, have entered into a variety of academic fields in recent years including sociology of science (Borup et al., 2006) and sociology of future (Selin, 2011), adaptive governance (e.g., Boyd et al., 2015), risk management and resilience (Gupta, 2011; Linkov, Trump and Hynes, 2019), not to mention technology assessment around responsible research and innovation (e.g., Guston, 2014). Yet, these concepts did not emerge into policymaking from a blank slate.

Anticipation has its origins in biology and the work of Robert Rosen (1985). It, in essence, encompasses thinking ahead and incorporating unavoidable, unexpected events into the system, so, the responses from the system are both in accordance with long-term plans and responses to unforeseen circumstances (Bali, Capano, and Ramesh, 2019).

> *An anticipatory system is a system containing a predictive model of itself and/or its environment, which allows it to change state at an instant in accord with the model's predictions pertaining to a later instant. (Rosen, 1985: 341).*

In social sciences, this approach mostly connects to the extensive literature on risk management, resilience and the interconnected nature of its various dimensions (i.e., economic, social, infrastructural, institutional, environmental and cultural) (Boston et al., 2019; Jacobzone et al., 2020). Looking at systemic risks (see IRGC, 2018) over longer periods of time, requires rigorous risk management tools – some areas of study

have adopted these with more rigorously than others (Hynes, Lees and Müller, 2020; Tõnurist et al., 2020). Anticipation has been mostly applied in areas of socio-ecological systems where human behaviour contributes to extremely complex functioning of ecological systems (e.g., Baltzegar et al. 2018; Turnheim et al., 2018). More recently, the financial sector has been trying to design anticipatory techniques via stress-testing to ensure preparedness for low-probability, high-impact events (Langley, 2013). What tends to become an issue is that often these methods say that they can render the future knowable, as risks as well as the possibility to quantify those risks in some way or another. This implies accuracy, precision, impartiality and impersonality – a scientific method to deal with the future. Stress testing policies and systems is one thing, but yearning for false certainty is altogether another. When confronted with truly radical change, quantitative methods and the extrapolation of existing data and past experiences are not sufficient or accurate for decision-making (Burrows and Gnad, 2018). When uncertainty is treated as risk, in practice anticipation tends to become synonymous with resilience – the ability to adapt to new situations without losing sight of the main aims and characteristics of the system as early as possible. A diverging stream here is the anti-fragile systems, which thrive and improve with shocks (Taleb, 2012). Thus, there are two different approaches (Nordmann 2014): preparing for the unexpected in the world as we know it (adaptive resilience or anti-fragility) and preparing for and shaping the unexpected world (anticipatory innovation).

Adaption has become an umbrella term for changes made in response to environmental change in the system (Biermann et al., 2009: 45). There are some that see anticipation as a tool for adaption (Quay, 2010), while others see it as a mechanism of anticipatory governance – especially when dealing with emerging technologies – in line with foresight, integration, engagement and feedback (Guston, 2014; Ribeiro and Shapira, 2019). Anticipatory innovation is more predictive and proactive than adaption (Nuttall, 2010). It invites governments to explore and take action towards desired futures, rather than adequately predicting or reacting to them. Yet, anticipatory innovation governance needs to also be connected to adaptive management as there are always opportunities for risks to emerge overnight and governments need to act just-in-time. This has been the premise of most anticipatory governance literature over the past decade (e.g., Fuerth, 2009; Quay, 2010; Karinen and Guston, 2010; 2012; Quay, 2010). However, there is a downside as it discounts the possibility that truly transformative change may in the future transform our systems and make them unrecognisable. Anticipatory innovation governance is broader than that; it is about looking ahead with a long view, reading precautionary signals and exploring options on the ground…options that may also challenge the current systems and how they function.

There are also other governance perspectives dealing with change (outlined in Box 2.2.) that anticipatory innovation governance could draw upon. Some of these approaches are more in line with adaptive change and iterative and experimental approaches (e.g., agile, experimentalist governance); others press on the need to learn and keep policy issues and solutions open (e.g., reflexive and tentative governance). These different concepts are used in various formats and they of course overlap to a degree. For example, tentative governance has some good heuristic tools to deal with uncertainty, such as influencing openness, flexibility, and temporally-limited and re-examined approaches (Kuhlmann, Stegmaier, and Konrad, 2019), but the same could be said for experimentalist and agile governance streams. Also the field of strategic agility (OECD, 2015)—especially when connected to resourcing for anticipatory innovation—could be useful here.

Box 2.2. Dealing with change: variety of approaches to governance

As change has sped up considerably, the search for an alternative governance model is currently underway. Governance here is understood in the broadest terms from the structures and processes needed to steer and manage societies (be it hierarchies, networks or markets), institutions or the 'rules of the game' that lay out the act of governing. From different starting points to change – learning, rapid action, alternatives exploration, experimentation, uncertainty - a variety of proposed governance models are proposed:

Reflexive governance

Based on a problem-solving ethos, reflexive governance seeks to address contingencies and alternatives and governance 'reflecting' back on the initial situation (Voss, Bauknecht and Kemp, 2006). It recognises the possibility of unintended effects and engages with core concepts such as heterogeneity, ambiguity, error and lack of control. The approach assumes that that thinking and acting with respect to an object of steering also affects the subject and its ability to steer (Voß and Kemp, 2015).

Adaptive governance

Based on transition management and resilience scholarship, adaptive governance prioritises the capacity or necessity to adjust and progress to a better state (Chaffin, Gosnell, and Cosens, 2014). This assumes managing rapid change and high uncertainty in flexible, polycentric institutional arrangements in cooperating on continuous learning and experimentation (Rijke et al., 2012).

Agile governance

Based on ICT and digital transformation and the increased rate of change the latter has introduced, the approach aims to react to changes in its environment faster than the rate of these changes. This involves strategic planning (have a prospective view), control (mechanisms ensuring accomplishment of the strategic plan) and multiskilling (developing dynamic capabilities to sense and respond to change) (Luna et al. 2016; Alexandre, Marinho, and de Moura, 2019).

Experimentalist governance

Grounded in the regulatory governance theory, the approach is based on a recursive process of rulemaking and provisional goal-setting and dynamic revision through recursive review of implementation experience in different local contexts. (Sabel and Zeitlin, 2012). The experimentalist governance approach is dynamic in nature and emphasises reversibility and flexibility. The approach is associated strongly with some of the European Union policy vehicles (e.g., Zeitlin, 2016).

Tentative governance

Is an approach that acknowledges the persistent role of uncertainty in policymaking and thus, assumes that policies are designed, practiced, exercised in a non-finalising way. The approach evolves as a dynamic process to manage interdependencies and contingencies and is based on trial and error, incrementalism, learning and is preliminary (e.g. temporally limited) rather than assertive and persistent (Kuhlmann, Stegmaier, and Konrad, 2019; Lyall. and Tait, 2019).

Source: Kuhlmann, Stegmaier,.and Konrad, 2019; Lyall and Tait, 2019; Voß and Kemp, 2015; Chaffin, Gosnell, and Cosens, 2014; Rijke et al., 2012; Sabel and Zeitlin, 2012; Zeitlin, 2016; Luna et al. 2016; Alexandre, Marinho, and de Moura, 2019.

The question is how to see beyond the existing system and the options that are currently available? There are various academic fields that contribute to anticipation: sociology of expectation (Borup et al., 2006), socio-technical imaginaries and dreamscapes (Jasanoff and Kim, 2015), technology assessment (Grunwald, 2018) and visions (Low and Schäfer, 2019; Konrad and Böhle, 2019; Grunwald, 2019). These methods contribute to sociotechnical imaginaries: "collectively held, institutionally stabilized, and publicly performed visions of desirable futures" (Jasanoff, 2015). All of the former approaches tackle ways in which expectations and concepts around the future are used (Ramos 2017). This has an important role in mobilising resources both at the levels of policymaking and within working teams that search for solutions on the ground. The manner in which the case for the future is made will influence the avenues of search and investment. The effects of self-fulfilling prophecies have been known for a very long time (Merton, 1948). In this sense, the future is not something outside the human experience. Rather, it is connected to the human capacity to cognise consequence, change, difference, and temporality. Thus, it becomes a principle of present action (Slaughter, 2004). As such, the core of our approach to anticipatory innovation recognises that the future is constructed in the present. Hence, it is important to understand how different societal groups interact with time, and how human consciousness and culture mediate decisions and action (Ramos 2017), and what role path-dependencies play today in the decisions we make.

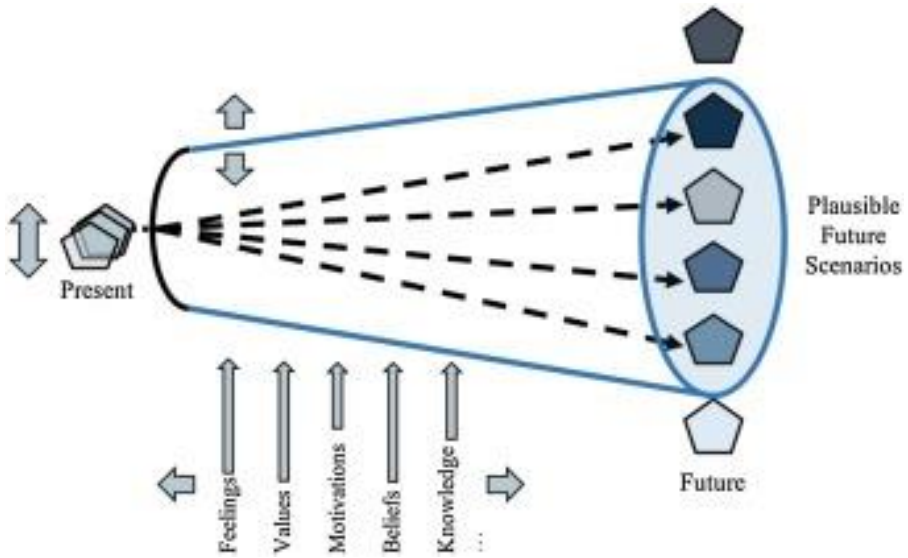
Foresight and anticipatory innovation: adversaries or friends?

> *"It is impossible to forecast the future, and it is foolish to try to do so. Most of the time, forecasts are quite good, and this is what makes forecasts so dangerous. […] The danger of forecasts is that usually they are right. Forecasts fail you just when you would need them most. Forecasts fail to anticipate major changes and major shifts […]. Shifts that make whole strategies obsolete." (Wack, 1986)*

In areas of complexity and uncertainty, no amount of problem framing or sense-making is going to answer the critical questions necessary to set proper policy. In some cases, only real-world experience through innovation — testing ideas against a complex system, observing and gauging the results, modifying the parameters of the experiment, and testing again — can provide the level of information and feedback necessary to successfully address the full range of unpredictable outcomes that result from the interactions of the many players involved in a complex system. This also highlights why anticipatory innovation governance is not foresight. Yet, there are some who view it as just the "*cultivation of a societal capacity for foresight*" (Barben et al., 2008); while others see futures thinking and foresight are forms of anticipatory action learning (Bussey, 2014).

Foresight has, of course, progressed over time and has had its own development phases with the importance of diversity of approaches underlined (e.g., Könnölä, Brummer, and Salo, 2007; Jemala, 2010). Foresight has over time moved from predictive models towards more systemic, critical and participatory processes (Ramos, 2017). Here, it needs to be acknowledged that foresight analysis is also not about predicting the future, but usually entails the generation of a set of scenarios for a range of plausible, possible, and probable futures (Burrows and Gnad, 2018; OECD High Level Risk Forum, 2017). This is especially useful in situations too complex and uncertain to trust a single prediction or forecast. There can be a variety of factors that contribute to these scenarios (Figure 2.2). By and large, scenarios can be both explorative (what could happen) and normative (what should happen). Normative scenarios are more prevalent in connection to disruptive change (e.g., discussions around black swan events, etc.) where the question tends be 'where do we want to go in the case of…'.

Figure 2.2. Plausible future scenarios



Note: As an adaption of the Hancock and Bezold (1994) 'Futures Cone' concentrating on one aspect of the future from possible, plausible and probable futures, the figure helps to limit the field of analysis by adding to the time axis a variable of potentialities, in this case scenarios that are shaped by people's feelings, values, motivations, beliefs and knowledge.
Source: Urueña, S., 2019.

There are some foundational differences between approaches that should be brought out especially in terms of the exploratory or normative nature of the process (see Box 2.3). When looking at the future, one can have predictive or prescriptive policy stance (Patton, Sawicki, and Clark, 2013: 23). The first aims to project different future alternatives (exploratory foresight) and the latter argues for taking action towards a particular result (normative foresight) (ibid.). Both are problematic in their own way. In practice, most foresight is a hybrid process in which trends are identified on emerging issues (exploratory/predictive), scenarios developed (from a systems and normative basis) and critical voices introduced to the process to balance the invariable biases in the process (Ramos, 2017). Recently, more action-oriented approaches have also been emerging through a collective process that aims to help to set priorities, network and build common visions. How these approaches can be transformed into action beyond the collective sense making is usually more fuzzy.

Box 2.3. Different perspectives of foresight

Exploratory foresight…

…is a foresight approach in which the future is a forthcoming state or a process , which can be described through probabilistic analyses (Nikolova, 2014). Foresight practitioners usually distance themselves from what is happening in the aim to foresee as many characteristics of the future and maintain a state of preparedness whatever may happen. The classical global trends analyses are usually part of exploratory foresight. Both qualitative and quantitative methods can be used from trend extrapolation, expert methods, scenarios, grand social theories, etc.

Normative foresight…

…is a foresight approach in which practitioners interfere with current developments in order to re-direct them in accordance with some idea, goal or norm that is desirable or suitable for future action (Andreescu et al., 2013). As the idea is to change the very context of the future, it is akin to planning and is heavily dependent on resources and power. Hence, they tend to be effective in the hands of actors with such resources (think, for example, about the Manhattan project or Apollo programme).

Participatory foresight…

…is a foresight approach that aims to include different stakeholders – both experts and social actors – into a dialogic or deliberative process around the future (Nikolova, 2014). It encourages different disciplines to communicate with each other, triangulate data and focus around a theme and understand a specific question better (Kaivo-oja, 2017). In a social process, the aim is not to predict the future, but understand the possible and preferable futures better and create natural ownership and commitment around the latter.

Strategic foresight…

…is a systematic approach to foresight that looks beyond current expectations and takes into account a variety of plausible future developments in order to identify implications for policies today (OECD. 2019). It usually aims to develop different scenarios and alternatives, often markedly different from the status quo, and foresee their consequences. In addition to detection of trends, it also facilitates reflexive social learning processes so common visions can emerge (Habegger, 2010; Bootz, 2010).

Source: Nikolova, 2014: OECD, 2019; Habegger, 2010; Kaivo-oja, 2017; Andreescu et al., 2013.

Strategic foresight, in the anticipatory innovation model, is a critical driver of insight and knowledge to inform this kind of experimentation and innovation, but alone it is not enough. Foresight can be used to generate the insights necessary to set the conditions for experimentation, and to help interpret and contextualise the results of each experiment in order to better inform the design of the next. Yet, alone it is not enough for anticipatory innovation to happen effectively. The innovation approach is more action-oriented in nature and allows us to ask under which conditions and in what ways innovation can be best promoted (Könnölä, Brummer, and Salo, 2007). With anticipatory innovation we want to emphasise the importance of acting in the present with a future-mindset (Mallard and Lakoff, 2011). In that sense, it is relatively promissory (full of promise and indicative) or purposeful in nature as certain normative choices about which ideas get explored in action (Anderson, 2010; Wienroth, 2018). The aim is to steer development and technology, while analysing and testing out the boundaries of ethical, legal and social aspects of change (McGrail 2012). Consequently, anticipatory innovation governance should consider uncertainty (not risk) over extended timeframes, and develop the capacity to mitigate the former adaptively by changing actions today.

> *"It is not necessarily about anticipating the big future (futures of society) through scenarios. It is more about what would be great, possible and socially needed now and in the emerging futures (future fit), what can be done with existing and emerging resources / technology, and the kind of future people want to live in (preferred future and values / ethics based)." (Ramos 2017)*

Anticipation in practice (so far)

Foresight informs decision making in a variety of settings; however, it is – if not fully institutionalised in the public sector – not integrated into the activities of public sector organisations or it is done in pockets and disconnected from policymaking in general. The same cannot be said about anticipatory innovation or anticipatory innovation governance. There are only a few examples where a more systemic approach to anticipating the effects of technologies has been undertaken and a whole system built around that (see Box 2.4). The OECD has also built a stream of work around it looking at anticipation and emerging technologies, in particular nanotechnology (OECD, 2012; 2013)

Box 2.4. U.S. National Nanotechnology Initiative (NNI)

The National Nanotechnology Initiative has been one of the key examples of anticipatory governance in the realm of emerging technologies. There are numerous scholarly articles about the NNI as a significant landmark in research and innovation policy (e.g., Karinen and Guston, 2009; Roco 2011; Guston, 2014). The NNI increased stability in the sector during a period of high uncertainty (Anderson and Slade, 2013). The role of the NNI was initially to fill major gaps in fundamental knowledge of matter and to pursue the novel and economic applications anticipated for nanotechnology (Roco, 2011).

The NNI was established in 2000 in the US as a Government research and development (R&D) initiative involving, at present, the nanotechnology-related activities of 20 departments and independent agencies. The initiative has a socio-technical integration mandate (Fisher, 2019). The Initiative focuses on transformative and responsible development of nanotechnology.

As an interagency effort, the NNI informs and influences the federal budget and planning processes through its member agencies and through the National Science and Technology Council (NSTC). The NNI brings together the expertise needed to advance this broad and complex field—creating a framework for shared goals, priorities, and strategies that help each participating federal agency leverage the resources of all participating agencies. With the support of the NNI, nanotechnology R&D is taking place in academic, government, and industry laboratories across the United States.

Source: https://www.nano.gov/about-nni; Fisher 2019; Karinen and Guston, 2009; Roco 2011.

Expectedly, anticipation has been especially undertaken in research and innovation communities, which have a lot in common with participatory foresight – they both want to mitigate risks of innovation and seek anticipatory forms of governance to do so (Lehoux, Miller and Williams-Jones, 2020). Consequently, most examples of anticipation and anticipatory governance come from the social studies of nanotechnology (e.g., Barben et al., 2008; Guston, 2014; Shapira et al., 2015), synthetic biology (Ribeiro and Shapira, 2019) and other high-tech led fields. Hence, it is not surprising that from the policymaking side, most approaches that mix foresight with socio-economic design can be found in in the field of research and innovation including:

- Science, Technology and Innovation Foresight (STIF) approaches,
- Futures Commissions,
- Foresight Informed Strategic Planning,

- Transition Management,
- Integrated Governmental Foresight and
- Network Foresight. (Ramos 2014)

Box 2.5. Canada's Policy Horizons: distributed foresight capabilities

Policy Horizons Canada has built up distributed capabilities for using foresight knowledge and insights. It uses foresight methodologies to produce research, products, experiences, training programmes, and communications to help federal government policymakers and operations designers create more resilient policies and programmes. They do this by giving policymakers a rich view of the different ways the future might turn out and working with policymakers to help them understand and shape their presence and future plans relative to these possibilities.

Issues are sourced from individuals working across the government at all levels and in all departments, though the ones selected for deeper study are those that the team determines are most relevant broadly across the government landscape. Once the research agenda has been determined, it is validated by a steering committee of deputy ministers that meets quarterly, which also reviews work in progress and helps guide the department's future operational plans.

Policy Horizons provides foresight services across the federal landscape. To this end, they convene and support a network of foresight practitioners throughout the government, with the goal of ensuring that as many civil servants as possible can make use of the insights they have derived from their own projects, as well as foresight methodologies generally, to fulfil their agencies' missions. This network currently consists of approximately 80 people from across the federal government who then support individuals within their own agency in applying foresight insights and methodologies themselves. Policy Horizons also has a formal partnership with Canada's School of Public Service, an agency whose mission is to educate and support public servants in advancing their career, to provide foresight materials and training to public servants.

Source: Ward, 2020, personal communication.

Yet, these approaches usually do not shed the light on the act of governance itself, what the processes inside the government look like (Burch et al. 2019), and how futures knowledge will be used in practice. They fail to address who governs (for whom and why) or examine how the content of anticipation processes is created, how this becomes the object of anticipatory innovation, and how this shapes and limits thinking around what is possible? The closest to this is Riel Miller's work with UNESCO in futures literacy and the connected futures literacy labs (Box 2.6). In addition, some countries use more systemic approaches towards distributed foresight activities are emerging (Box 2.5).

Box 2.6. Futures Literacy

Futures Literacy is an anticipatory field which aims to develop cognitive and analytical futures thinking by 'the sophistication of our anticipatory systems' by using 'the future to question, unpack, invent what is going on and what is doable now' (Miller, 2007: 27–28). Futures literacy is defined as "the capacity to think about the potential of the present to give rise to the future by developing and interpreting stories about possible, probable and desirable futures" (ibid). It is cumulative in nature and consists of three levels: awareness, discovery and choice (Miller, 2015).

Source: Miller, 2007; 2015.

Nevertheless, public policy and the actions of policymakers have not yet been at the centre of attention when taking about either innovation, technology or sector policies in general. This is also the case in the field of anticipation and anticipatory governance with some recent exceptions (DeLeo 2015; Bali, Capano and Ramesh, 2019). As argued above, policies tend to influence the future and thus, the presence and role of the policymaker should be acknowledged (Minkkinen, 2019.). Anticipatory innovation can lead governments purposely into unknowable futures and assist in directing outcomes.

3 Mechanisms of Anticipatory Innovation Governance

The previous chapter outlined the origins of anticipation and the necessity to tie it with an innovation approach. This chapter presents anticipatory innovation governance and mechanisms that support it. These mechanisms need to be flexible and dynamic in nature. There is no one-size-fits all governance model or best practice to deal with the future – it is novel and different every time. Consequently, it is more illuminating to look at different mechanisms of governance and see what kind of questions and challenges these pose to anticipatory innovation. The chapter describes two core components of any governance system: agency and the authorising environment—as well as connected mechanisms that play a role in effective anticipatory innovation governance. Agency involves alternatives exploration and experimentation, tools and methods, institutional structures, organisational capabilities and availability of data and resources for innovation. The authorising environment involves issues such as legitimacy, vested interest, public interest and participation, networks and partnerships, evidence and evaluation, and learning loops. The idea here is to not provide definite answers, but pose questions by which these mechanisms should be examined.

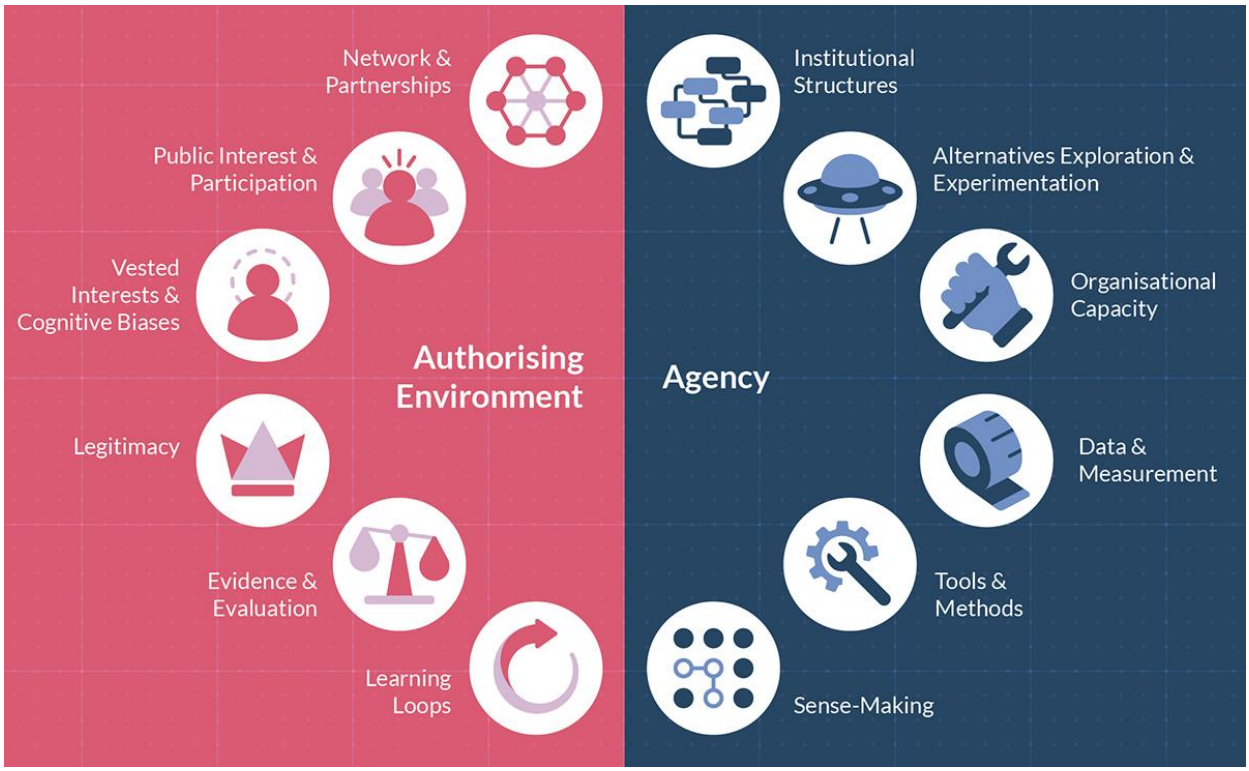
Embedding the future in the present is no easy task. As argued before, anticipatory innovation governance should act on a variety of inputs to manage emerging challenges – technological, socio-economic or environmental –, while such management is still possible. It requires government foresight, engagement and reflexivity to facilitate public acceptance of new solutions and approaches, while at the same time assessing, discussing and preparing for their (intended and unintended) economic and societal effects. But even that is not enough. Predicting technological and socio-economic trajectories is notoriously difficult especially when disruptive innovations happen. In these circumstances, traditional foresight mechanisms tend to fall short, not to mention prescriptive regulation, which is not effective in rapidly evolving, complex environments (Roca et al., 2017). The public sector needs to become reflexive in action to be anticipatory. So, how can governments achieve this ideal state while they also have daily goals, cost savings and missions to fulfil?

This requires new combinations of governance mechanisms inside the government that can make room for anticipatory innovation, inside the public sector innovation portfolios and inside government's core architecture (Biermann et al., 2009: 31). Anticipatory innovation governance could become a systemic approach of an interlocking web of widely shared principles, institutions and practices that shape decisions at all levels (ibid). This system should function effectively over time and adapt to changes. Hence, operationalising anticipation is no easy feat – it is a moving target.

The effectiveness of public policy and policy systems generally depends on the 'appropriateness' of policymaking, which can be seen along three dimensions: analytical, political and operational (Bali, Capano, and Ramesh, 2019). Across these dimensions, policymakers need *agency*[8] to do things differently (ways to operationalise their action and the belief that they can do it (see Hitlin and Edler, 2007)) and an *authorising environment* that gives them the authority and legitimacy to undertake anticipatory innovations that challenge current values (Alford, 2008). These make up the general frame for anticipatory innovation governance mechanisms (Figure 3.1) that will be outlined below.

[8] Agency is 'the socio-culturally mediated capacity to act' (Ahearn 2001, 112).

Figure 3.1. Anticipatory innovation governance mechanisms



Source: Authors

Authorising environments can be internal to the organisation and informal in nature, but also extremely formal or external in nature (McLennan et al., 2020). These environments in many cases overlap and interact to produce authority and legitimacy in complicated ways. The role and significance of authorising environments has been discussed thoroughly in public value debates (e.g., Moore 1995; 2013; Alford, 2008; Alford, and O'Flynn, 2009). It sets the legitimate limit of autonomy to shape what is meant by public value and thus, it can constrain what is possible in terms of anticipatory innovation in the public sector. Institutions (i.e., the authorising environment) provide meaning and understanding of different problems, they offer normative templates to validate a specific behaviour, and regulate actions by rewarding or sanctioning action (Choi and Chang, 2009). Consequently, to be effective, public sector innovation needs both a powerful authorising environment and an effective framework in which to operationalise action (Adams and Hess, 2010).

From the side of agency and operationalisation, the following mechanisms are of interest:

- alternatives exploration and experimentation,
- tools and methods,
- data and measurement,
- organisational capacity,
- sense-making, and
- institutional structures.

Connected to the authorising environment, these mechanisms are currently under examination:

- vested interest and cognitive biases,
- public interest and participation,

- networks and partnerships,
- legitimacy,
- evidence and evaluation, and
- learning loops.

Agency for anticipatory innovation

Having agency – the capacity to act and reflect on potential and past actions – is a complicated term. It is partially based on actual competence available (e.g., tools and methods used; skills and capabilities present), but also the collective belief in their usefulness in specific situations. Thus, agency can be very situation-specific: perception of efficacy can depend on specific constraints, resources and opportunities in a given setting, which determine public managers' belief that they can act. Hence, one of the key starting points are: **who are the agents within the anticipatory innovation governance system, what roles do they play, and what are their perceptions and attitudes?**

First and foremost, people have to be aware that they are facing uncertainty, not to ignore it, and be able to act. This relates to being conscious about the future (see Box 3.1 below) meaning that policymakers actually engage with the future in a productive way. Having a future consciousness (or a prospective attitude) is linked to five general dimensions (Ahvenharju, Minkkinen, and Lalot, 2018):

1. Time perspective: length of time horizon, time orientation.
2. Agency beliefs: assumptions about being able to influence the future.
3. Openness to alternatives: consideration of alternative futures, dealing with uncertainty.
4. Systems perception: perceiving systemic interconnectedness.
5. Concern for others: ethical consideration of the futures of others beyond one's own reference group.

Box 3.1. Heightened futures consciousness

Future consciousness

Future consciousness means "being conscious of what is possible, probable, and desirable in the future" (Johan Galtung through Lombardo, 2007: 2). Future consciousness is part of people's general awareness of time, consciousness of past, present, and future. It is the human capacity to have thoughts, feelings, and goals about the future (Lombardo, and Cornish, 2010). Future consciousness covers everything in human psychology that pertains to the future: it is the integrative set of psychological abilities, processes, and experiences that humans use to understand and deal with the future (ibid).

Heightened future consciousness

Heightened future consciousness includes an expansive sense of time, of past and future linked together (Lombardo, and Cornish, 2010). It encompasses an evolutionary or progressive optimism about the future; an expansive and informed sense of contemporary trends and challenges; creativity, imagination, and curiosity regarding future possibilities; courage and enthusiasm in the face of the adventure and uncertainty of the future. It is linked with a strong sense of ongoing personal growth and purpose involving long-term, goal-directed thinking and behaviour and a future-oriented self-narrative; and a strong element of self-efficacy and self-responsibility in determining one's future (ibid, Lombardo, 2016). The following characteristics denote a heightened futures consciousness (Lombardo, 2011):

- Self-awareness, self-control, and self-responsibility (an empowered personal narrative)
- Realistic idealism (the belief in and pursuit of excellence)
- Self-growth (a progressive personal narrative)
- The skill and love of learning (including honesty, wonder, curiosity, humility, and the quest for truth and understanding)
- The skill and love of thinking and multiple modes of understanding (including self-reflectiion, intuition and insight, and the virtues of critical thinking)
- Expansive temporal consciousness (a rich and thoughtful integration of history and the future—imaginative and visionary foresight—an evolved grand narrative)
- Cosmic consciousness (including awe, ecological and global consciousness, and a sense of reciprocity, justice, and transcendence)
- Hope, courage, and optimism
- Love (including gratitude, passionate appreciation, and compassion)
- Deep purpose and tenacity (including discipline and commitment)
- Ethical pragmatism (practical wisdom—knowledge and ethics in action)
- Creativity and the adventuresome spirit
- Balance and temperance (the integration of multiple values and virtues).

Source: Lombardo, and Cornish, 2010; Lombardo, 2011; Lombardo, 2016.

This gives insight into what kind of individual level perceptions, beliefs and attitudes are needed to have a futures oriented approach, but it does not denote in its entirety the organisational and processual basis for futures thinking and innovative action. Hence, we are also interested in who has agency to act towards future-oriented aims. And most importantly, how is agency construed and created around anticipatory innovation from processes to structures that support action beyond the individual? For this, we also need

to know how organisations and teams explore alternatives, which tools and methods they use and which structures and resources they have in place to support taking action.

Alternatives exploration and experimentation

> "If posterity reads [this futuristic stuff] at all it will probably be to marvel at our want of knowledge, imagination and hope. And no doubt our posterity too will write their own futuristic stories and no doubt they too will be just as transitory as ours." H.G. Wells (1938: 246-47) "Fiction about the Future"

How can governments identify and act on the issues that need attention in the future? If we accept that the future cannot be predicted, then we need a different kind of knowledge to help us make sense of what is reasonably possible or plausible (Nordmann, 2013). Preparing for the unexpected requires us to make judgments about what plausibly may happen in the world as we know it (ibid), but also how the world as we know it could possibly change. These judgements can be informed by precedents, experience or by history, and by analysing the functionalities and internal design of transformative technologies (Nordmann 2014; Lember, Brandsen and Tõnurist, 2019). Different events and new technologies can become the game changers or potentially 'black swan' events (Taleb, 2007; refer back to Box 1.2, but note that most black swans are game changers, but not every game changer is a black swan). If people do not entertain the possibility of such events, explore these options, then they can become over confident and thus act in ways that harm the system and make it fragile in the face of change. This also goes for black jellyfish and especially black elephants (see Box 1.2 in Chapter 1). Absence of evidence is not evidence of absence of uncertainty (Terzi, 2010). Hence, a working anticipatory innovation governance system should take an active alternatives exploration mind-set and avoid quick solutionism (for example, experimenting with various forms of welfare services as the setting for future of work is evolving).

What does alternatives explorations look like in practice? It has various phases involving discovery, examination, evaluation and framing alternatives. This is dependent on diversity of viewpoints and ideas and the ability to actually onboard conflicting ideas and solutions at the same time. This entails generating as many different possible futures and solutions and experimenting with the former. Alternatives can be explored in many ways including:

- Screening and sense-making techniques;
- Safe-to-fail probes
- Trial balloons,
- Sandboxes to allow for isolated but real-world exploration of options:,
- Parallel authoring via teams working independently on the same issues or challenges.
- Multiple-frame approaches: actively having multiple scenarios open during information exploration.
- Chaos engineering and other approaches.

The goal here is again not hit upon the one, correct solution, but by focusing on a range of alternatives, the ability to prepare for uncertainty, or even to an extent embrace uncertainty improves (Inayatullah, 2008). This means that alternative forms of the future, alternative technological, social or economic solutions should be explored and tested at the same time. As uncertainty can derive both from lack of

knowledge (epistemic uncertainty) and unpredictability and variety in a complex system (ontological uncertainty), complexity must be handled in a variety of ways (Asby's Law of Requisite Variety; see also Box 1.1 in Chapter 1). When it comes to alternatives exploration and experimentation, governments could benefit from inter-departmental integration of strategic forward engagement methods in the policy planning processes, intra-governmental networks for orchestrating and implementing holistic governance approaches, institutionalised assessment processes and effective monitoring and feedback systems that continuously question requirements, expectations and political performance. This would create a self-learning system (Burrows and Gnad, 2018). At the same time, inter-departmental integration of foresight may also lead to bureaucracy and common blind spots. Open networks including business, NGOs, consultants and researchers can be very helpful in addressing these challenges.

Box 3.2. Exploring alternatives for children's futures in Finland

The Itla Childrens Foundation is a Finnish parliamentary foundation created in 1987 to guarantee children a socially, economically, and ecologically sustainable future and an equal starting point in life, regardless of background. Embedded in this mandate around children is a multi-stakeholder and future-oriented approach. While raising an individual child is an inherently complex process with many uncertainties—raising a nation of children is exponentially so. The evaluation of its success will only be known completely in hindsight. This institutional investment in the future of Finnish society creates legitimacy around exploration of uncertainty and alternatives exploration. The topic also forces cross-sector collaboration among traditionally siloed and expert-driven domains, such as education and healthcare. Crucially, beyond a focus on evidence and knowledge creation, Itla prioritises anticipatory innovation as the means to explore and learn from regional innovations in order to advance reforms. Each year, Itla holds a challenge-oriented innovation competition to fund innovative projects.

The cities of Oulu and Vantaa received awards in 2019. Oulu, a city in the far north of Finland, is testing and redesigning alternative service models for families and children with a focus not only on early-intervention but also on anticipation through the detection of weak signals around at-risk youth. Vantaa, a suburb of Helsinki, has experienced large waves of immigration, especially since 2014, and consequently is the most multicultural municipality in Finland. This also poses integration challenges for children and families. Vantaa is exploring alternatives for promoting integration via experimental and unconventional services.

The lessons learned through Itla's work in exploring creates a pool of knowledge about alternatives, which can be drawn from our future national reforms and policy, such as the National Child Strategy.

Source: Authors based on Itla Children's Foundation.

What types of alternatives should be explored or tested? How should questioning the status quo be structured? Here the rule of insufficient reason and precautionary principle (Box 3.2) can play a role: spreading investments across alternatives can be a wise strategy when confronted with true uncertainty. While in some cases bold bets have to be made even if the outcomes and causal relationships are not clear yet (precautionary principle).

Box 3.3. Decisions under conditions of uncertainty: from the rule of insufficient reason to the precautionary principle

> *Should I stay or should I go now?*
>
> *If I go there will be trouble*
>
> *And if I stay it may be double*
>
> *So come on and let me know*
>
> *Should I stay or should I go?*
>
> *(The Clash)*

The rule of insufficient reason

The importance of exploring alternatives and keeping options open for longer period of times under uncertainty has been studied for some time. The "rule of insufficient reason" (Laplace rule) or "the principle of indifference" (Keynes, 1921) maintains that if no distinction between the probability of outcomes can be made (e.g., risks calculated), then possibilities should be treated equally. While critiqued over the years, this has led to research on various decision rules amid uncertainty and the "diversification theorem", which advocates diversifying investments when the returns are uncertain (Mittelstadt, Stahl and Fairweather, 2015).

Precautionary principle

Since the Rio Declaration of 1992, facing fundamental changes due to climate change the precautionary principle has risen its head (Wingspread Statement, 1998):

> *"When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."*

This raises another paradox – the paradox of precaution – as harm is avoided by eschewing risky but potentially beneficial technologies, while people may continue to suffer due to technology today (Harris and Holm, 2002). Unfortunately, there is no good mechanism for evaluating the precautionary principle in terms of various potential outcomes (Mittelstadt, Stahl and Fairweather, 2015). While criticized, due to its nebulous operationalisation (Gardiner, 2006), it has led to an ethical assessment of emerging technologies (e.g., Brey, 2011). This has been applied, for example, in the work of the International Risk Governance Council (IRGC) (Jensen et al., 2018).

Source: Keynes, 1921; Harris and Holm, 2002; Gardiner, 2006; Brey, 2011; Mittelstadt, Stahl and Fairweather, 2015; Jensen et al, 2018.

It was established long ago that people's judgement amid uncertainty are to a degree impaired (Tversky and Kahneman, 1974). This can be described through three cognitive heuristics: availability of information, representedness and anchoring of information (Goodwin and Wright, 2010). This means that people tend to gravitate to recent, available and vivid reference cases, because they are easier to recall. Yet, this has little to do with the probability of an event occurring. Furthermore, people tend to pay particularly close attention to the distinguishing features of the problem and treat problems as unique and tend to reject analogies to other instances of the same general type as superficial. They anchor their decisions in current values and do not take sufficiently into account the effect of future conditions. Hence, an increase in diversity and imagination is needed and different tools and methods have emerged that allow people to

co-produce new knowledge with benefits and trade-offs (Vervoort and Mangnus, 2018). Unfortunately, most methods that allow people to explore options and help anticipate the future, also have a downside: they reduce future openness to what is possible in terms of social of political influence (Schulz, 2015: 132). This is often referred to as 'frame blindness' (Wright and Goodwin, 2009). How we think about what future frames are possible will influence present-day policymakers, their resource allocations and other societal choices, which also have cascading effects (Jansen and Gupta 2009; Vervoort and Gupta, 2018). Hence, all the various paradoxical influences and effects must be kept in mind when exploring options and alternatives, especially the practitioners' (ant its institutions') own bias (see for example Box 3.2).

Box 3.4. Bussey's principles of futures thinking

Based on a practitioner perspective, Bussey (2014) outlines some principles of futures and foresight work:

1. The future is a principle for present action.
2. The future can be studied by its effects.
3. All futures work is partisan: it seeks to realise preferred futures.
4. All futures work is personal: it seeks to expand human potential/identity.
5. There are two kinds of future: open and closed futures.
6. Futures work is open ended and multiple: causality is not linear.
7. Futures work is process oriented not goal oriented – the focus is on patterning but not on a specific pattern.
8. Futures work involves a quest for alternatives.
9. Futures work is a form of practical imagination.
10. Futures work challenges habit, making the present remarkable.
11. Futures thinking, and the foresight work it inspires, involves nested relational networks and a relational logic to navigate these.
12. Futures thinking and foresight are forms of anticipatory action learning.
13. Any useful idea about the future must at first appear to be ridiculous (based on Jim Dator's challenge)

Source: Bussey 2014.

Experimentation

Policymaking amid uncertainty is akin to gardening insofar as it is "muddy, attentive and experiential, because we really do not know what growing conditions will prevail" (Swanson et al., 2010: 927).

If uncertainty is inherently a part of complex systems, then action learning is a necessary part of anticipatory innovation governance. Action learning involves asking questions in conditions of risk and taking action based on that, rather than finding the answers to questions that have already been precisely defined by others (Revens, 1982). It is experiential, scientific and critically reflexive (Marsick and O'Neill, 1999).

This requires an experimental approach to complex and uncertain systems- To learn is to act and evaluate the effects on a continuous basis. Furthermore, often when dealing with very emergent changes, the general public, stakeholders or even experts in the field may struggle to visualise concrete effects in the future – technological or otherwise. Hence, debates around truly 'blue sky' thinking can become unproductive. Consequently, experiments are also needed to deal with upstream research and to put technology or other emerging developments into a social context depicting possible trajectories of change (Davies and Selin, 2012). In the context of anticipatory innovation governance, experiments and even prototypes can become pedagogical tools that shed light on the myriad socio-economic or technological dimensions of innovations (Selin and Boradkar, 2010). This is very much also in line with the responsible innovation narrative referenced in chapter 1. Experimentation is, thus, an important part of anticipatory innovation governance and active alternatives exploration and experimentation and it can be done in a systematic manner.

One example of the use of experimentation for alternative exploration is health. Within developing countries, there is a critical need for health interventions that can be tested on a subset of the population and then successfully deployed across the population at large, or "scaled up" in medical terminology. While historically the policy approach to scaling up medical interventions has followed universally-applicable best practices, there is an increasing recognition that the operating environment for health interventions in low-to-middle income countries is a complex system that requires more nuanced forms of intervention in order to be successful (e.g., Jamison et al., 2006). The case described in Box 3.4 shows how China has managed change processes and policy development through considered experimentation within the health system (see e.g., Box 3.4).

Box 3.5. Experimentation in Action in China

Beginning in the early 2000s, the Chinese government gave around 300 local governments a range of broadly defined implementation choices in designing mechanisms, or schemes, with which local governments could attempt various health interventions, with variation in economic, institutional and political economic factors creating different incentive structures for different local governments to choose which set of schemes they wished to try. This range of experimental processes produced a wide range of approaches and practices of varying degrees of usefulness, including different fundraising approaches, cost control measures, and payment reforms, as well as different schemes targeting different populations, including urban residents, rural residents, and migrant populations.

Schemes were tracked and measured at the local level to understand their relative success and failure using a wide range of methods including site visits, meetings, and formal evaluations, in order to identify the most useful practices. The Chinese government operated as a centralised authority across these schemes, encouraging debate about which practices were most effective and articulating and disseminating useful information as it was discovered. When appropriate, the central government also used the more successful efforts to codify health policy at a national level, though sometimes successful local efforts were codified at a regional level first.

This approach to policy development was criticised by some as not "optimally efficient" by traditional policymaking standards, and it is true that numerous attempts at setting health policy using this model were deemed either ineffective or failed to propagate out from their initial environment. However, taking this approach of allowing local experimentation proved quite effective in identifying and scaling up a number of successful health interventions, and in particular a number of solutions that displayed "contextual fit" within their surroundings even after scaling up beyond their initial local environment. Many of these solutions further proved to be well-adapted not only to the starting conditions in which they were introduced but also robust enough to adapt to changes in their environments that occurred after these interventions were introduced.

Source: Husain, 2017.

In previous research, the OECD (2017) has covered the systemic approach to experimentation in Finland and pointed to the need for more experimental approaches in R&D and innovation studies (OECD, 2018). Yet, experimentation is far from an integrated part of government actions (Maurits, Martijn and Jorrit, 2019; Soe and Drechsler, 2018), while it is known to enhance the likelihood of innovative activity especially around breakthrough innovations (Albury, 2011; Sahni, Wessel, and Christensen, 2013; Demircioglu and Audretsch, 2017). As argued by Sahni, Wessel, and Christensen (2013: 29): "Without the ability to develop experimental infrastructure, fundamentally new and different approaches rarely emerge." The ability to experiment has also been connected to the intrinsic motivation of employees as they can influence how and on what they work. This cornerstone of the self-determination theory (Ryan and Deci, 2000) and is an important part of the feeling of agency.

Experimentation also helps to understand very complex issues in fields in which government response has often been reactive rather than proactive. Technology-aided financial innovation that occurred in response to computational complexity has put government regulators under severe stress as they try to anticipate its possible development and impact. Yet, forms of co-creation and co-experimentation between the state and corporate actors can help mitigate the associated risk (Box 3.5).

Box 3.6. Reduction of uncertainty in financial governance: regulatory sandboxes

The 2008 financial crisis highlighted the need to deal actively with new technologies within the financial sector. Hence it is not surprising that the financial sector has been one of the first sectors to embrace regulatory sandboxes for innovation. The role of regulatory sandboxes is to incubate innovation and allow innovators to test new technologies and enable regulators to understand their implications. Currently, there are examples of regulatory sandboxes in Austria, Canada, Denmark, Netherlands, Switzerland, UK etc. The case study from Singapore and UK is outlined below.

The case of the Monetary Authority of Singapore

The Monetary Authority of Singapore (MAS) established FinTech and Innovation Group (FTIG), which includes the FinTech Innovation Lab, in August 2015. The aim of the initiative was to leverage emerging private sector technological competences in order to better address risks and legal aspects of financial innovations, which would both further facilitate the promotion of the financial sector (developmental policy goals) and feedback into policymaking (regulatory and supervisory policy goals). The FinTech and Innovation Group included three sub-units:

- The Payments and Technology Solutions Office formulates regulatory policies and develops strategies for simple, swift and secure payments and other technology solutions for financial services;
- The Technology Infrastructure Office is responsible for regulatory policies and strategies for developing safe and efficient technology-enabled infrastructures for the financial sector, in areas such as cloud computing, big data, and distributed ledgers;
- The Technology Innovation Lab scans the horizon for cutting-edge technologies with potential application to the financial industry and works with the industry and relevant parties to test-bed new innovative solutions.

This is done through the MAS FinTech Regulatory Sandbox, which allows FinTech solutions to be tested after sufficient laboratory tests within a limited customer base, following a limited timeframe and given lighter legal and regulatory requirements valid during the specified timeframe – all subject to a formal agreement with MAS. The approach is based on co-creation and co-experimentation to limit uncertainty surrounding new financial innovations. Yet, it also allows MAS to actively learn from cutting-edge emerging developments in the field, to which it previously did not have real-time access.

The UK's Financial Conduct Authority (FCA) regulatory sandbox

Since 2016, FCA has allowed businesses test innovative propositions in the market, with real consumers within a regulatory sandbox. The sandbox is open to authorised firms, unauthorised firms that require authorisation and technology businesses that are looking to deliver innovation in the UK financial services market. The sandbox provides companies with regulatory expertise and a set of tools to facilitate testing, but also:

- the ability to test products and services in a controlled environment
- reduced time-to-market at potentially lower cost
- support in identifying appropriate consumer protection safeguards to build into new products and services
- better access to finance

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Source: Mikheeva and Tõnurist, 2019. Attrey, Lesher and Lomax, 2020; https://dfsobservatory.com/content/regulatory-sandboxes; https://www.fca.org.uk/firms/innovation/regulatory-sandbox

Experimentation, however, does not have to only serve the purpose of contextually testing the fit of a particular solution to the context or scale. Experimenting can also serve the purpose of understanding the underlying behaviour of systems. This is important to understand and contextualise strong and weak signals that may challenge or provide opportunities to the systems. This type of experimentation in distributed systems has been the basis behind chaos engineering in the private sector, which is the practice of deliberately stress-testing and experimenting in order to build confidence in its capability to withstand turbulent conditions in production (Box 3.5). The premise is that traditional risk management systems rely on risk identification and quantification based on past data (Jacobzone et al., 2020), yet, they have difficulty incorporating low probability, high impact disruptions (Ramezani and Camarinha-Matos, 2019). There is simply too little or no data for that. These situations occur and governments need new mechanisms to prepare them for highly stressful conditions. Thus, as part of antcipation, governments may not only run doomsday scenarios, but they could also break their organisations and systems randomly to see how they react to unexpected disruptions. This could be a source of anticipatory learning and, in the end, innovation.

Box 3.7. Chaos engineering

Technology giants including Amazon, Google, Microsoft and Facebook are known to test the resilience of their systems by actively engineering chaos. One of the most well known of these practices has been Netflix's "Chaos Monkey." As an internal service, the Chaos Monkey randomly selects virtual machine instances that host production services and deletes them in an effort to encourage Netflix engineers to design software that can withstand failure of individual instances (Basiri et al. 2016). This in general is known as **chaos engineering** i.e. "experimenting in a distributed system in order to build confidence in its capability to withstand turbulent conditions in production" (ibid.). As such, chaos engineering is an approach for learning about how systems behave by empirical exploration and experimentation. The aim is to generate new information and not test a specific fault condition.

Source: Basiri et al. 2016; Rosenthal et al. 2017.

Sense-making

Working with the uncertainty inherent in anticipatory innovation requires a different relationship with knowledge and learning compared with standard work processes and other types of innovation. Governments, like most organisations, tend to study the past and create predictive models on which they base decisions and tend to treat many issues as bounded problems, solvable given enough time, resources, and expert advice. While this is a salient strategy for many issues, an over-reliance on expert knowledge and prescriptive decision-making may lead to "expert bias," which can create vulnerable blind spots. Further, for complex cross-sectoral societal issues like climate change and ageing, experts from many disciplines and policy fields must be involved, each with their own unique set of knowledge, terminology, abstractions, assumptions, and cultures. While this diverse set of expertise is valuable for disrupting entrained thinking, organisations must not only create opportunities for formal knowledge exchange around tightly defined problems, but must also provide mechanisms for informal knowledge exchange to occur and in forms that also include contextual knowledge.

Through study of recent eras of knowledge management (Snowden, 2002), the field of organisational knowledge management has moved toward recognising and embracing different approaches and structures to allow knowledge to be managed differently, especially in complex human systems. Still, barriers remain. The cost of experts' and stakeholders' time may seem difficult for public officials to justify for loosely-defined problems, when the potential application of knowledge to a decision is uncertain. However, this cost should be compared with the cost of missed opportunities or failure to recognise when and how the world is shifting. Practices promoting informal contextual knowledge flow to uncover underlying assumptions, contextual factors, and values can be a jumping off point for anticipatory innovation. Through the mechanism of sense-making, organisations can identify emerging patterns while they are still forming and shape them before they stabilise. In some cases, governments might learn from real-world experiments, whether accidental or intentional, in order to learn from the feedback they create and understand the patterns and alternatives that emerge. An anticipatory government will seed changes based on this knowledge in order to point to more desirable futures.

Pattern recognition and disruptive change

To explore alternatives in an effective way it is not enough to think of different scenarios, it is necessary to actively test potential developments. Once action learning is underway, governments cannot still assume that they will be able to explore all options. To consider a variety of alternatives, governments learn how to read signals and recognise patterns. Here trajectory analysis[9] or trend projections[10] are often used (Fuerth and Faber, 2012). This is not only about what trends are embedded in the (extended) present, but also what signals are there of developments that had never been considered before. Genuine surprises are possible in a VUCA world, with black swans and wild cards and weak signals must be detected (covered in more detail in the data and measurement section below).

One of the most common models here is the S-curve pattern of change (Molitor, 1977), which identifies key leading events and key tracking points of change (Box 3.7). This model has been has been widely applied in the field of socio-technical systems (Geels, 2005) and technological revolutions and techno-economic paradigms (Perez, 2003; 2010) and in disruptive innovation theory (Christensen et al., 2018). S-curve based pattern analysis has been useful for charting the impacts of a single event or technology development impact, but is far from a real-time radar for seeing what is in motion. It has been used in some cases to predict ex-ante outcomes in different industries, testing the theory's predictive accuracy (e.g., for disruptive innovation: Christensen et al. 2004; Burt and Ronchi, 2007; Raynor 2011a; 2011b), but this is an exception rather than the norm. Yet, it is useful in characterising patterns of change and potential trajectories of change. In reality, there can be a variety of responses to disruptive change. Radical innovations can disrupt and destroy existing structures. However, hybrid solutions are possible, where potentially very-disruptive change sustains the current system and incumbent power (e.g., Furr and Snow, 2015).

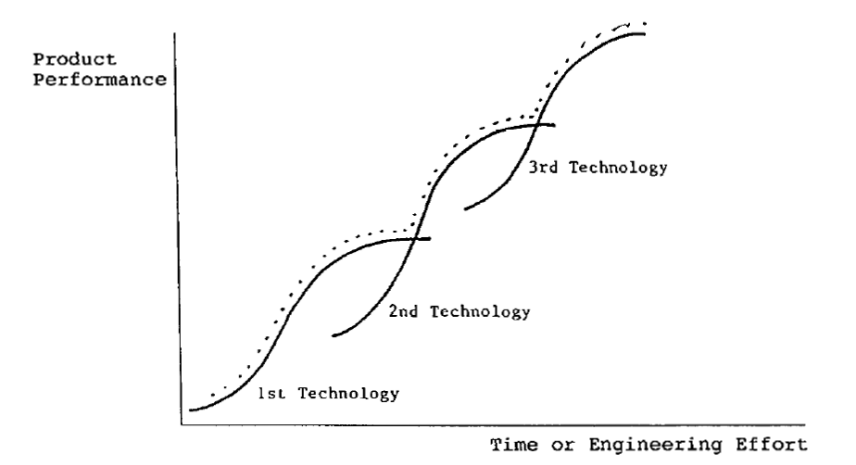
[9] Trajectory analysis is a method of assessing the course of upcoming trends and events in order to create manageable pathways that can assist policymakers in identifying opportunities for future commitments (e.g., for investments) (Fuerth and Faber, 2012).

[10] Trend projection is the extrapolation of current trend lines in the future based on historical data, rates of change and other indicators and variables (Fuerth and Faber, 2012).

Box 3.8. S-curve innovation patterns

The s-curve is an assumption that disruptive innovations follow a general pattern (Foster 1986; Utterback, 1994) and that has been deployed on a variety of scales and units of analysis to show the progression of disruptive innovations. Usually disruptive innovation, especially technological evolves through periods of incremental change punctuated by technological breakthroughs that can both increase or destroy the activities of incumbents in the system (Tushman and Anderson, 1986). S-curves link development of different industries or technologies to different forms of innovation, investment, management and organisational forms (innovation architecture).

Figure 3.2. Prescriptive S-curve



Source: Christensen, 1992: 340.

Essentially, the S-curve implies that at the introduction of a new technology or radical innovation, changes move slowly – it may take years of gestation or dormancy before acceptance. Usually the innovation/technology has to prove itself in niche markets where its functionality can increase. In the growth phase, the developments start to reach mass deployment and become an attractive target for investment. In the mature phase, the phase of development typically slows due to approaching limits of performance and saturation in markets, which shifts the focus to exploitation rather than exploration. As industries become more efficient they also become more rigid and struggle with accommodating radical innovation. At the same time, new searches and developments are in the pipeline.

As innovations usually do not follow a single S-curve, they are difficult to follow and thus, development may seem essentially random. They are also not as linear as older technologies and can later also re-cross newer options (e.g., optical versus magnetic storage in desktop memory) (Tellis, 2006).

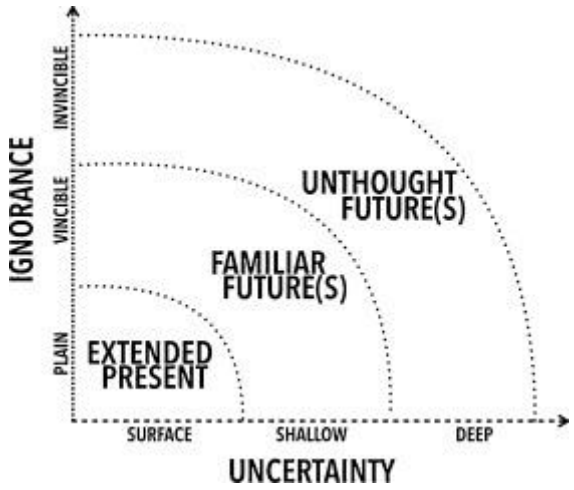
Source: Tushman and Anderson, 1986; Foster 1986; Utterback, 1994; Tellis, 2006; Perez et al., 2010; Priestley, Sluckin and Tiropanis, 2020.

Temporality and uncertainty are also core features in pattern detection (in selecting relevant time periods and causality relationships between variables). However, in many cases they do not seem to be truly integrated into disruptive change theories and innovation pattern detection that are usually deployed ex post rather than ex ante. One needs to recognise different levels of ignorance and uncertainty that are connected to this, which make it very difficult for organisations to make decisions about which leads to

follow or not (i.e., think of the numerous springs and winters of Artificial Intelligence development) (Berryhill et al., 2019)). Ignorance meaning the (perceived or not) lack of knowledge that affects decisions, as people tend to avoid ambiguity in accordance with the Ellsberg paradox.[11] Uncertainty, of course means that there are not calculable probabilities associated with a particular choice or an event. Alternatives can be of course tested and experimented, thus, decreasing uncertainty, but in some cases, uncertainty derives heavily from unpredictability and the variety of the system itself and becomes "invincible" to a degree. Looking at these two concepts – ignorance and uncertainty – together, Sardar and Sweeney (2016) identify three levels (Figure 3.3): extended present, familiar futures and 'unthought' futures:

- In the Extended Present, surface uncertainty (based on certain and deeply embedded) must be reduced by processing the available information to produce hypotheses that could shed some light on signals and patterns that are emerging. If available information is not enough, one needs to decide if gathering more data will help or not.
- In conditions of increased uncertainty, in Familiar Futures there is a need to determine what lines of inquiry could possibly produce appropriate knowledge and the time horizons involved in acquiring that knowledge.
- Finally, if the situation has reached a chaotic stage, then governments are dealing with deep uncertainty and Unthought Futures. Here it is possible that the paradigm itself is failing, which may mean that the most appropriate action now is to work toward an alternative, better paradigm.

Figure 3.3. Ignorance and uncertainty matrix



Source: Sardar and Sweeney, 2016

The former narratives are very important to activate change: constructed patterns become stories and narratives that open or close different potential future paths (Hollinger, 2006). For example, pandemics and their ends become narratives that influence future research and paths.[12] Emerging opportunities and alternatives for change arise from dynamic and complex socio-ecological processes (Baron, 2006). Here narratives and discourse can be very important: they not only explain what is(reality), but also guide people's future action (where we are going and why we need to act in particular ways) (Ramos, 2017).

[11] The Ellsberg Paradox maintains that people prefer to bet on known rather than unknown probabilities (Ellsberg, 1961). This means that people tend to prefer options in which they feel more knowledgeable or confident.

[12] Green, J.A. and Vargha, D (2020) How Epidemics End. http://bostonreview.net/science-nature/jeremy-greene-dora-vargha-how-epidemics-end?fbclid=IwAR0Qi6puWJlc0NDTSNJlKKR2wxKwjiGgf0fVDwsExRdClmOK_EDvcrtNGL0

Alternative and innovation search processes in a new learning environment tend to be interconnected to how managers define the new problem space and develop strategies for it (Tripsas and Gavetti, 2000).

Tools and methods

There is no one tool or method or best practice to work with anticipatory innovation. Reliance on traditional policy tools is difficult in situations where the future direction of technological innovation cannot be determined. This means that government must better operationalise foresight, futures thinking and upstream engagement with technology developers and lead users. Part of having agency is to have the necessary tools and methods to explore options and take them into action learning and experimentation. Here, different tools focus on imagination and creativity to envisage what future may be, permission and legitimacy to follow up on ideas, operationalise these ideas to experiments and pilots that can make radical changes tangible and epistemological tools that validate and generalise knowledge learnt. Before delving into the former, it is beneficial to address the host of tools and methods that are associated with anticipation. A number of proven foresight methods and scenario planning instruments are widely used (Table 3.1; see also Annex 1).

Table 3.1. Selection of traditional foresight methods

	Description	Uses
Horizon scanning	Systematic monitoring and examination of a broad range of data sources about the phenomenon about which one aims to gain foresight, in order to identify perspectives and trends, premature signs of potential upcoming developments, as well as how they may affect the future.	Analytical
Environmental scanning	Systematic monitoring of an environment (in the abstract sense) in order to recognise in advance opportunities and threats and thus being able to intervene promptly.	Analytical
The Delphi method	A method where an expert panel fills out questionnaires with their forecasts on a topic in two or more rounds that are then anonymously summarised to experts together with the reasons for their judgments, and the experts are encouraged to revise their earlier answers in light of these replies.	Strategic
Expert panels	Methods to elicit knowledge from experts. Expert panels are typically groups of 12-20 individuals who are given 3-18 months to deliberate upon the future of a given topic.	Consultative
Expert consultation	Engagement of experts by means of interviews, a short workshop or a small survey connected to a particular technology or projected impact. The consultation aims to determine expert expectations regarding possible, plausible or likely future developments connected to the phenomenon.	Consultative
Participatory foresight	Is a method usually used in normative foresight analysis, in which citizens state their visions and preferences for particular futures and provide comments on scenarios and solutions presented by experts.	Creativity, consultative
Causal layered analysis	Method to deconstruct conventional thinking to produce a shared view of possible future outcomes that can break existing paradigms of thinking and operating, which is achieved by group discussions, sharing of diverse perspective, and contrasting worldviews and underpinning myths.	Creativity
Scenarios	Scenarios are 'stories' illustrating visions of possible futures or aspects of possible future. Scenarios are constructed by starting with the present and past and projecting into the future and usually presented in a range of possible futures.	Strategic
Backcasting	Backcasting is a normative scenario method that analyses how events could develop from the present into an imagined future.	Prescriptive
Wild Cards and Weak Signals (Wi-We)	Carried out in small (usually expert) groups, the method allows alternative interpretations of an issue's evolution to be considered in order to gauge its potential impact. Wild Cards are situations/events with perceived low probability of occurrence but potentially high impact if they were to occur. Weak Signals are unclear observables warning us about the probability of future events (including Wild Cards).	Creativity
Narratives	Narratives are stories or "storied ways of knowing" about how the future may evolve.	Creativity, prescriptive
Visioning	Visioning is the creation of a preferred future that imaginatively captures values and ideals.	Prescriptive
Science fictioning	Is a method that creates stories, fictional narratives, that assume that possible events, which have not yet materialised, have taken place, usually at some point in the future, and elaborates on the consequences of this.	Creativity, prescriptive

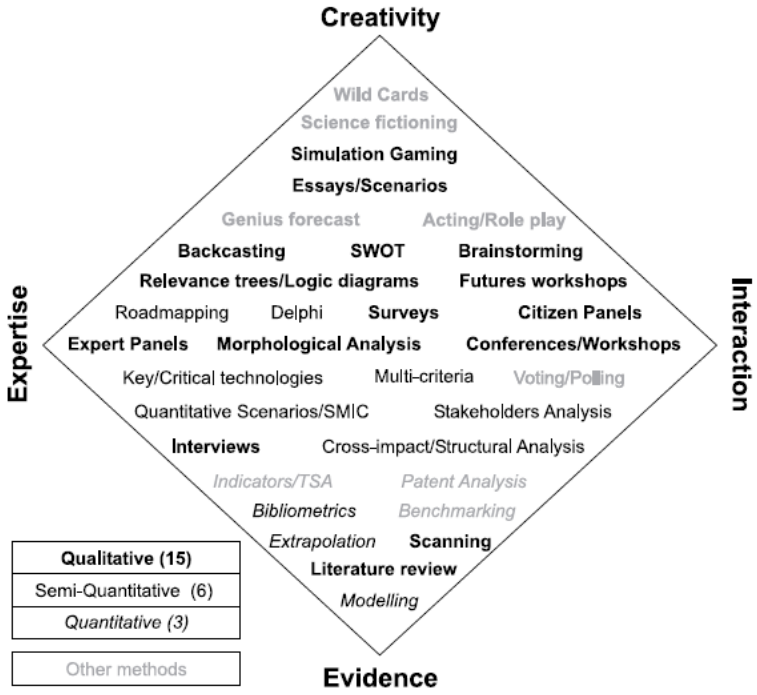
Trend analysis, extrapolations/Megatrends	Identification of general tendencies or directions evident from past events, and increasing or decreasing in strength of frequency of observation.	Analytical, simulation
Relevance tree/Logic charts	The relevance tree or logic chart is a method where the topic is approached in a hierarchical way. The relevance tree is an analytic technique in which a broad topic is subdivided into increasingly smaller subtopics, thereby showing an increasing number of paths to the objective.	Prescriptive
Vulnerability mapping	Mapping the vulnerabilities as probabilities that a social, ecological, or physical reference unit will suffer harm in the case of a certain event.	Analytical, diagnostic
(Technology) Road mapping	Is a planning technique that defines a sequence of objectives, future developments and future alternatives for decision making. Usually set in a collaborative foresight process in which a broad set of strategies and plans is developed to reach a common goal.	Strategic
Course of action analysis	Method developed in order to assess the costs, impacts and risks associated with alternative action plans. Each plan is assigned with values and metrics that measure all the possible developments. These are then compared and contrasted in order to obtain assessments based on the set of priority-reflecting decision-making rules.	Strategic, prescriptive
Cross impact/structural analysis	Method for predicting the probability for an event to occur based on its potential interactions with other events. To each hypothetical, which pertains to a set, is then assigned an initial probability; these conditional probabilities are determined using a matrix to consider their potential interactions.	Analytical, strategic
Futures Wheel	Is a structured brainstorming technique, which uses a wheel-and-spoke like graphical arrangement to analyse and take into account primary and secondary impacts surrounding a central or hypothetical trend. The futures wheel seeks to develop the consequences of today's issue on the longer-term future.	Creativity
Gaming	In foresight practices, this refers to a structured exercise for stress-testing decisions in a complex environment, which is simulated on the basis of a scenario.	Creativity
Historical Analogy	Method that uses the dynamics of past events to comprehend the underlying dynamics of present and future events.	Creativity
Implications Wheels	Structured brainstorming technique that gathers second, third and fourth order events around a central trend or hypothetical event, and uses probabilities to assess their potential repercussions.	Creativity
Issues-analysis	Process that systematically “unpacks” questions, dilemmas and cross-cutting implications that arise from tendencies, hypothetical future events and alternative political choices.	Diagnostic, strategic
Morphological Analysis	Method used to structure and investigate groups of relationships contained in multidimensional and non-quantifiable problem spaces.	Analytical, prescriptive
Robust decision-making	Method for connecting short-term policy interventions to different types of long-term futures. In cases of deep uncertainty, the method uses models not as predictors but as generators of cases exploring assumptions and outcomes.	Strategic
Adaption pathways	Adaptation pathways are a sequencing set of possible actions based on alternative external, uncertain developments over time using the concept of ‘tipping points’. Adaption pathway proposes a sequence of potential action following a particular tipping point.	Strategic
Simulation/Modelling	Quantitative method designed to understand a system's interactions using prototypes, computer programmes or other more or less simplistic representations of real systems. Simulations are used to analyse the behaviour of a system when asking ‘what-if’ questions about the real system and aid in the design of real systems.	Modelling, simulations
State of the Future Index	An index measures a 10-year outlook for the future. It is based on key variables and forecasts that collectively suggest which kind of trajectory the future may pursue.	Diagnostic, radar
STEEP Implication Analysis	Methodology for systematically assessing the social (S), technological (T), economic (E), environmental (E) and political (P) aspects and issues (in relation to problem analysis) of a trend, event, decision or policy	Diagnostic, analytical
SWOT analysis	Method for examining and assigning weight to internal factors - forces (S) and weaknesses (W) and external factors - opportunities (O) and threats (T) - in order to strategically coordinate resources and capacities with the environment.	Diagnostic

Note: Creativity implies relying on participants’ inventiveness and ingenuity; while evidence-based analytical methods often rely heavily on codified information, data, indicators.
Source: Inayatullah, 2004; 2008ab; Popper, 2008; 2019; Ramos, 2013; Heesen et al., 2014; Ramos, 2014; Brey 2017; Foresight Platfom, 2020.

These tools and methods are qualitative, quantitative or semi-quantitative (Popper, 2008b). Qualitative methods (e.g., futures workshop, citizen panels, environmental scanning, scenarios, etc.) tend to draw upon subjectivity and creativity of participants, but as such they are also more biased towards opinions, beliefs and attitudes of participants. Quantitative methods such as bibliometrics, modelling/simulation, and

trend extrapolation/megatrends apply statistical analysis to mapping trends. These methods may fall prey to the "fallacy of misplaced concreteness" (Whitehead 1925, 1967) as they assume that the extrapolations are based on reliable and valid data (an assumption that may not hold in the longer term or be correct in in complex environments). To be effective they should integrate more complexity into their core assumptions (Kriman et al., 2020). Semi-quantitative methods such as cross-impact/structural analysis, Delphi, multi-criteria analysis etc. try to quantify judgements and viewpoints and control for subjectivity. Another way to classify foresight methods is through the capabilities of the methods - evidence, expertise, interaction or creativity – as exemplified in the classic foresight diamond (Figure 3.4). There are also other criteria that can be used to classify methods (Table 3.2; also Annex A, Table A.1). Also, some of these methods are time consuming to use and depend highly on the selection of participants.

Figure 3.4. The foresight diamond



Note: Creativity denotes the mixture of original and imaginative thinking; expertise refers to skills/knowledge in a particular area; interconnection recognises that expertise gains from being challenged by other type of expertise of views from non-experts; and evidence asserts the importance to support foresight methods with reliable documentation and means for analysis.
Source: Popper, 2008.

Table 3.2. Types of methods

Criterion	Types of methods
Thinking about the future	explorative (foreseeing) – based on uncertainty (managing) – normative (creating)
Type of data	quantitative – indirect – qualitative
Method of data acquisition	heuristic – analytic
Kind of co-operation	bottom-up – top-down
Working environment	based on virtual environment – based on real environment

Reference to time	shaping future – analysing present state – based on the past
Source of data	using original data – using secondary data
Reference to technology	describing factors which influence technology development – determining influence of technology development for other aspects of life
Orientation	orientation focused on product – focused on process
Meaning	formal – alternatively
Stage of research	preliminary – recruitment – generation – action – final – renewal
Character of results	textual – graphical – verbal
Essence of research	based on creativity – interaction – evidence – expertise
Way of thinking	evolutionary – revolutionary
Layer	mathematical – social – engineering – system
Ways of inference	inductive – deductive

Source: Magruk, 2011:705.

Different methods can have a more passive or active stance on future developments: they may aim to explain what has happened and will happen or outline more active ways to shape the future. While often used synonymously, broad concepts such as foresight and futures thinking may be different in this regard. While foresight tools look more into the unpacking of what the future may be (with the notable difference of strategic foresight (covered in Chapter 1)), future studies is more action oriented and geared towards shaping the future (for example, how to influence integrational justice in sustainability and environmental change). Future studies are "*the scientific study of possible, desirable, and probable future developments and scope for design, as well as the conditions for these in the past and in the present. Modern futures studies assume that the future is not entirely determinable and that different future developments (futures) are possible and there is scope for design*" (Kreibich, Oertel and Wölk, 2011: 8). While the field of future studies emphasises the importance of mixing approaches, they are seldom applied in a diverse or plural way, thus putting emphasis on the dynamic or emerging nature of possibilities (Sardar and Sweeney, 2016). Usually the practice is sequential or layered forms where the use of one tool or method is followed by another (Curry and Schultz, 2009; Wienroth, 2018). In the context of anticipatory innovation governance, futures tools need to also bridge with innovation tools and methods, so that different possibilities can be worked on in practice. Examples of these are futures toolkits that have emerged in the public sector (Box 3.8). Anticipatory innovation, however, needs a stronger linkage than some of these tools have: a more direct route from anticipation to experimentation and innovation. Anticipatory innovation, thus needs different types of tools: ones that enhance creativity and imagination (e.g., visioning, historical analogy, gaming); promissory tools and methods conveying permission to proceed and that weigh values and give licence to explore options (scenarios, course of action analysis); operational tools that allow testing in practice (e.g., adaption pathways); and epistemic tools that make it possible to generalise knowledge and validate it (e.g., developmental evaluation).

Box 3.9. The Futures Toolkits

Futures toolkits have been in existence in the private sector for some time (see e.g., Nodklapp's Actionable Futures Toolkit), but they have started to enter the public sector as well.

UK Futures Toolkit

The Government Office for Science (GO-Science) in the UK government launched its first Futures Toolkit in 2017. It provides a set of tools to help embed long-term strategic thinking within the policy process, and explains how to ensure they have real impact. The toolkit summarises what futures thinking is, how it can be used in policymaking and describes a series of tools that can be used by policymakers to manage amid uncertainty and identify future actions. The tools vary in the expertise needed to use them, with tools for beginners through to tools for experts. Experts from government and industry have contributed to its development and have provided case studies to illustrate the tools. It is intended for policy officials and analysts across government.

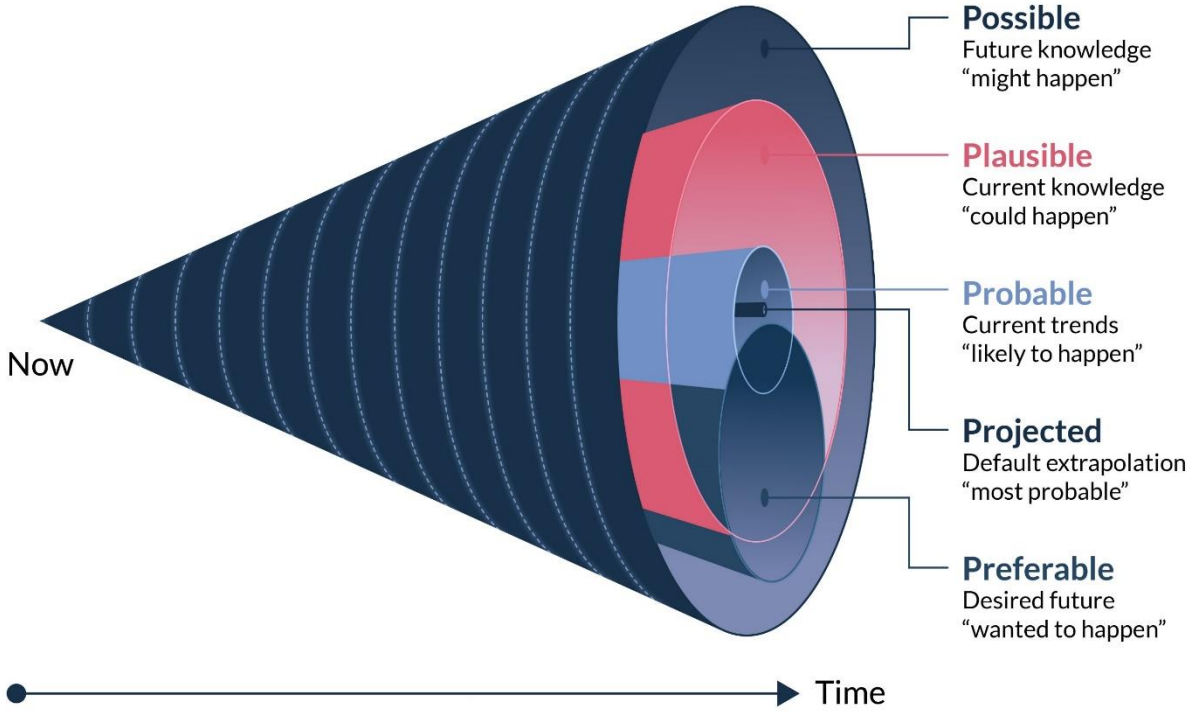
Source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/674209/futures-toolkit-edition-1.pdf; https://www.oecd-opsi.org/toolkits/actionable-futures-toolkit/

Approaches to creativity and imagination

> "The idea is not to show how things will be but to open up a space for discussion" (Dunne and Raby, 2013: 51)

In line with the traditional foresight methods covered above, there are lot of approaches to shape creativity and imagination around which types of different futures there may be (see the futures cone in Figure 3.5). Framing different futures may be more or less normative. The futures cone outlines these (e.g. preferable versus plausible or possible futures), but is also highly criticised for applying a rather static and linear time perspective on the future. Anticipation is an act in the present – our next steps shape the future potentialities and change them. Yet, exploring different types of possible and plausible futures in the present, may give an inkling about what may happen and allow for better anticipation (Brey, 2017). The method selection here will also depend on which types of futures people want to work with: for example normative (relating to existing values) or non-normative, preferable or possible.

Figure 3.5. Futures cone



Source: OECD based on Dosser et al., 2018.

One of the most common methods in foresight approaches is of course scenario analysis (Box 3.9). When facilitated well, scenario methods can help break through communication barriers between participants, bring forth a variety of perspectives and development paths that can affect the future in addition to opening new horizons and strengthening leadership. Yet, they are often critiqued for their lack of action orientation (Iden, Methlie and Christensen, 2017): there is usually a limited capacity to identify practical strategies towards futures. Besides foresight methods, there are also other creativity techniques that could be utilised for anticipatory innovation for example, de Bono's (1985; 2017) Six Thinking Hats methodology,[13] dialectical approaches or morphological analysis (Zwicky, 1969).[14] Another method that has gained prominence is the causal layered analysis (CLA), which aims to deconstruct existing, static narratives and develop new, empowering narratives by 'deepening' the future (Inayatullah, 2004; 2008). CLA has four dimensions:

1. The day-to-day future, the commonly accepted headlines of the way things are or should be. Solutions to problems are at this level usually short term.
2. Deeper future focused on the social, economic, political causes of the issue.
3. Culture or worldview. This is the big picture; the paradigm that informs what we think is real.

[13] The Six Thinking Hats methodology is a structured parallel thinking method for thinking about particular issues. The method identifies six modes of thinking which are directed at a problem at the same time.

[14] Morphological analysis involves arranging promising aspects and situations, and combining them just as systematically in order to identify new and suitable combinations. Thus, it explores futures in a multidimensional context, solution, and context-solution combination. The object is to break down the problem or system at hand into its core dimensions and to place them in a multi-dimensional matrix. Then to find new ideas by searching the matrix for creative and useful combinations. See e.g., Ritchey, 2011; Buzuku and Kraslawski, 2019.

4. The myth or the metaphor – this is the deep unconscious story (ibid).

Box 3.10. Scenario analysis

Scenario analysis is one of the most widely used approaches in foresight and futures studies that originated from business consulting. Scenario analysis is "a description of a future situation and the course of events which allows one to move forward from the original situation to the future situation" (Godet and Roubelat, 1996). Like foresight techniques in general, scenario analysis can be exploratory or normative (see back Box 2.3).

Scenario analysis usually entails a process of identifying and analysing key drivers, or factors in a particular domain and then using the drivers to construct and examine potential plausible future scenarios (York et al., 2019). They either examine what will happen (trend extrapolations, business as usual scenarios, probable scenarios), what could happen (forecasting, foresighting, strategic scenarios) and what should happen (normative scenarios such as those used in backcasting) (Candy 2010). Scenarios have the following characteristics (Low and Schäfer, 2019; Vervoort and Gupta 2018):

- They reject probabilistic forecasting and prefer a small set of futures that are usually easily comparable, but highly differentiated (alternative to each other) and rich in socio-economic and political detail.
- They should be developed in a deliberative way, incorporating diverse viewpoints.
- They should propose experimental reactions: provoking reflections on future threats and opportunities and strategies that allow for change or adaption.

Practitioners in general are divided in how actionable scenario analysis should be in its strategic framing and policy guidance. For some, the aspect of community learning may be more important in framing assumptions and creating expectations of future action (Talberg et al., 2018).

Source: Godet and Roubelat, 1996; Candy 2010; Vervoort and Gupta 2018; Talberg et al., 2018; Low and Schäfer, 2019; York et al., 2019; Dammers et al., 2019.

Like CLA, many tools connected to creativity and imagination encourage speculation. These are usually blended approaches between design, fiction and social dreaming (Dunne and Raby, 2013) to bring forth a new ‘discursive space’. This is sometimes referred to as ‘anticipatory ethnography (Lindley, Sharma, and Potts, 2014). These derive from a new generation of design thinking (see Box 3.9) that is trans-disciplinary, commons-oriented, collaborative and participatory in nature, and engaged across art, science and technology (Ramos 2017). These may include both promissory and operational elements of anticipatory innovation. Some of these novel approaches include experiential foresight and design futures, where practitioners provide people with living narrative contexts (with stagecraft, actors and scripts) that spark questions about different types of futures (Ramos, 2017). Forward Theatre is an approach in this line from Head (2011): exploring alternative futures through drama or the Sarkar Game developed by Voros and

Hayward utilising social roles in thinking about the future (Inayatullah, 2013).[15] In the Futures Studies Reintegration into Society Project at Santa Martha Acatitla Women's Prison in Mexico in 2015, forward theatre was used with adult women in prison to present possible future scenarios when coming out from prison under the UNESCO Participation Programme and the World Futures Studies Federation (Ramos et al., 2019). These methods mean to encourage debate and dialogue on hypothetical possibilities embodied through well-crafted narratives and performances.

Box 3.11. Design, Speculative Design and Design fiction

Traditional design

Traditional design or affirmative or mainstream design is usually a tool for getting from existing to preferred situations through incremental steps and invariably involves a singular 'preferable' outcome (Lindley, Sharma, and Potts, 2014). It usually tends to affirm the status quo.

Speculative Design

Speculative design is different as its aims is to open up a discursive space of the plurality of the future and is thus connected to a variety of approaches from critical design, design fiction, design as inquiry, anti-design, radical design, design futures, and other forms of design practice that critically interrogate society through the tools and materials of design (Fox, 2019).

Design Fiction

Design fiction is a blend of design thinking, science fiction, and science that aims to visually depict, via text, video, objects and graphic, 2D or 3D visual media and narrative, a slice of life in a plausible future (Bleecker 2009). Artefacts, diegetic prototypes are developed to serve as conversation starters, i.e. a way to provoke critical reflection about how future technologies or other developments will impact society and human relationships (York et al., 2019). This is supposed to help to suspend disbelief about future changes through the deliberate use of diegetic prototypes (Lindley and Coulton, 2015). These types of diegetic prototypes can be found in the works of Jules Verne or E.M Forster's The Machine Stop, right through to comic books like Stan Lee's X-men and television series, e.g. Star Trek or movies such as Her (Lindley, Sharma, and Potts, 2014).

Source: Bleecker 2009; Lindley, Sharma, and Potts, 2014; Lindley and Coulton, 2015; York et al., 2019; Fox, 2019.

Promissory tools and methods

An important question for policymakers is not just about what futures are plausible, but which futures are acceptable to citizens. Promissory practices are designed to gauge and ready people for potential future states. Promissory practices are connected to managing expectations about the future (Koay and Sharp, 2014) and creating promissory narratives around anticipatory innovation. This is connected to the legitimacy of the innovative process: should or should not these types of options be explored? Anticipatory tools and methods should encourage people to ask whether and how innovations and moral principles interact and iteratively shape one other over time (Stahl and Coeckelbergh, 2016). Nevertheless, it is difficult to get people to envision novel, morally-challenging situations, where they can still remain reflexive about what is or is not acceptable in the present versus what should or should not happen in the future (Lehoux, Miller, and Williams-Jones, 2020). Existing moral values influence which innovations are more likely to become embedded in society; while some innovations may challenge these values in terms of

[15] See further: https://library.teachthefuture.org/wp-content/uploads/2017/01/Sarkar-Game.pdf

what "public good" is or what "ethically acceptable" mean (Boenink, 2016). Morality and ethics can be included in the anticipatory innovation toolbox through different approaches, merging foresight, technology and impact assessment (Brey, 2017). Some of these approaches include ethical impact assessment (e.g., Wright, 2011), ethical technology assessment (Palm and Hansson, 2006; Kiran, Oudshoorn, and Verbeek, 2015), anticipatory technology ethics (Brey, 2012), the techno-ethical scenarios approach (Swierstra, Stemerding, and Boenink, 2009) and the moral plausibility frameworks (Lucivero, 2016).[16]

However, experiential knowledge is needed to connect stories about future innovations to people's own experiences. Here moral imagination and "works of imagination" (e.g., vignettes, short stories, etc.), can improve our ability to address these challenges (Lehoux, Miller and Williams-Jones, 2020). Stories about the future may, thus, help to make foresight and anticipatory knowledge more concrete and therefore easier to understand but they don't provide experiential knowledge since the future by definition does not exist yet.

There are also more formative frameworks that set the boundaries for a promissory narrative up front, such as for example the responsible research and innovation framework (Box 3.11). While it may seem obvious that innovation processes should be responsible vis-à-vis fundamental values in society, the implementation of ICT technologies has already demonstrated, in various cases, the negligence of the right to privacy and data protection (Von Schomberg, 2012). Being successful at anticipatory innovation in a responsible research and innovation sense would be to understand all the dynamics influencing the development process of innovations and not going beyond acceptable risks and avoiding potentially harmful consequences (Stilgoe, Owen and Macnaghten, 2013). The framework thus helps to draw these out and frame the conversation in this normative future sense.

[16] In effect, the list should also include more common approaches connected to ethical risk analysis and ethical risk-benefit analysis of emerging technologies are anticipatory approaches, because the calculation of risks and potential benefits requires anticipation and estimation of probabilities of future consequences of the emerging technology or development (Brey, 2017). They provide quantitative, ethically grounded assessments of risks and benefits, but they always remain projections of the future and the narrow focus on risks, may limit other types of impacts from being considered, even though they deserve moral consideration (ibid).

Box 3.12. Responsible research and innovation framework

Responsible Research and Innovation (RRI) aims to be a transparent, interactive process. RRI should enable societal actors and innovators to become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability (see also the precautionary principle in Box 3.2 above) of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in society) (Von Schomberg, 2012: 9). The concept is grounded in some normative anchors (Stilgoe, Owen and Macnaghten, 2013; Burget, Bardone, and Pedaste, 2017):

- (Ethical) acceptability: compliance with the fundamental values (e.g., EU charter on fundamental rights, right to privacy and the safety) and the safety of products in terms of acceptable risks.
- Sustainability: meeting the needs of the present without compromising the ability of future generations to meet their own needs.
- Anticipation: understood (here) as the ability to envision the future of research and innovation and understanding how current dynamics help design the future.
- Inclusion: engaging different stakeholders in the early stages of research and innovation.
- Reflexivity: reflecting on the values and beliefs during research and development.
- Responsiveness: responsive action in line with ethics, risks, transparency and accessibility.

RRI originates from the expected positive impacts of technology and examines what can be done to ensure those impacts come to fruition. This counteracts the 'wait and see' approach of public policy. RRI has been connected to the narratives around grand challenges (European Commission 2012; 2013; Stahl, 2013; Von Schomberg, 2013). While the frame is connected to the debates around the idea of responsible development, which was originally aimed mostly at addressing risks and avoiding negative outcomes, RRI tackles broader innovation policy. Due to its forward-looking approaches it has been linked to adaptive and anticipatory governance (Owen and Goldberg 2010: 1706; Forsberg et al., 2015). Given this, RRI expects governments to (Sutcliffe, 2011: 3):

1. Have a deliberate focus of research and use the products of innovation to achieve a social or environmental benefit.
2. Ensure a consistent, ongoing involvement of society, from beginning to end of the innovation process, including the public and non-governmental groups, who are themselves mindful of the public good.
3. Assess and effectively prioritise social, ethical and environmental impacts, risks and opportunities, both now and in the future, alongside the technical and commercial aspects.
4. Create oversight mechanisms that are better able to anticipate and manage problems and opportunities and which are also able to adapt and respond quickly to changing knowledge and circumstances.
5. Value openness and transparency as an integral component of the research and innovation process.

Due to its normative nature, there is always a trade-off between 'opening up' the debate to more plural processes versus veiled political and normative commitments (Low and Schäfer, 2019). Furthermore, options may look plausible at a particular stage of development. Hence, to be effective a "negotiating plausibility" approach is suggested for RRI (ibid).

As a practical example, the OECD has adopted a Recommendation on Responsible Innovation in Neurotechnology that embodies nine principles focussing on (1) promoting responsible innovation; (2) prioritising safety assessment; (3) promoting inclusivity; (4) fostering scientific collaboration; (5) enabling societal deliberation; (6) enabling capacity of oversight and advisory bodies; (7) safeguarding personal brain data and other information; (8) promoting cultures of stewardship and trust across the public and private sector; and (9) anticipating and monitoring potential unintended use and/or misuse.

Source: Owen and Goldberg 2010; European Commission 2012; 2013; Von Schomberg, 2012; Stahl, 2013; Von Schomberg, 2013; Stilgoe, Owen and Macnaghten, 2013; Burget, Bardone, and Pedaste, 2017; Low and Schäfer, 2019.

Some well-known anticipatory innovation policy tools – such as normative codes of conduct and regulatory sandboxes (adopted for example in Australia, Malaysia, Singapore, the United Arab Emirates and the United Kingdom, etc.) – would fall in to the promissory category (e.g., Mikheeva and Tõnurist, 2019; Zetzsche et al. 2017). The same would apply for ethics frameworks. Indeed, numerous frameworks have been developed recently that address AI in the public sector. They do not operationalise what needs to happen, but set boundaries in which to explore options; thus, providing a 'safe' promissory environment for innovation. Some of these options may have clear conflicts and there are methods that could be used to mitigate these issues. An example of this is the transcend method that originates from conflict theory (Box 3.12).

Box 3.13. Transcend method

Johan Galtung's (2000) transcend method draws on the central thesis that to prevent violence and develop the creative potential of a conflict, there has to be transformation (Galtung 2011). This is achieved through dialogue based on empathy, non-violence and joint creativity. The method draws upon the following steps: mapping the conflict, legitimizing, and bridging incompatibilities. It draws heavily on dialogue and brainstorming. The methods aims to 'dis-embed' the conflict from where it is located, and 'embed' it elsewhere, which may include a dream (future, positive), reality (present - past, negative), nostalgia (past, positive), nightmare (future, negative); This is repeated again and again until richly reflected conflict solutions emerge (Galtung, Fischer and Fischer, 2013). The method is of course biased in favour of transcendence, i.e., trying to go beyond current paradigms.

Source: Galtung 2000; 2011; Galtung, Fischer and Fischer, 2013.

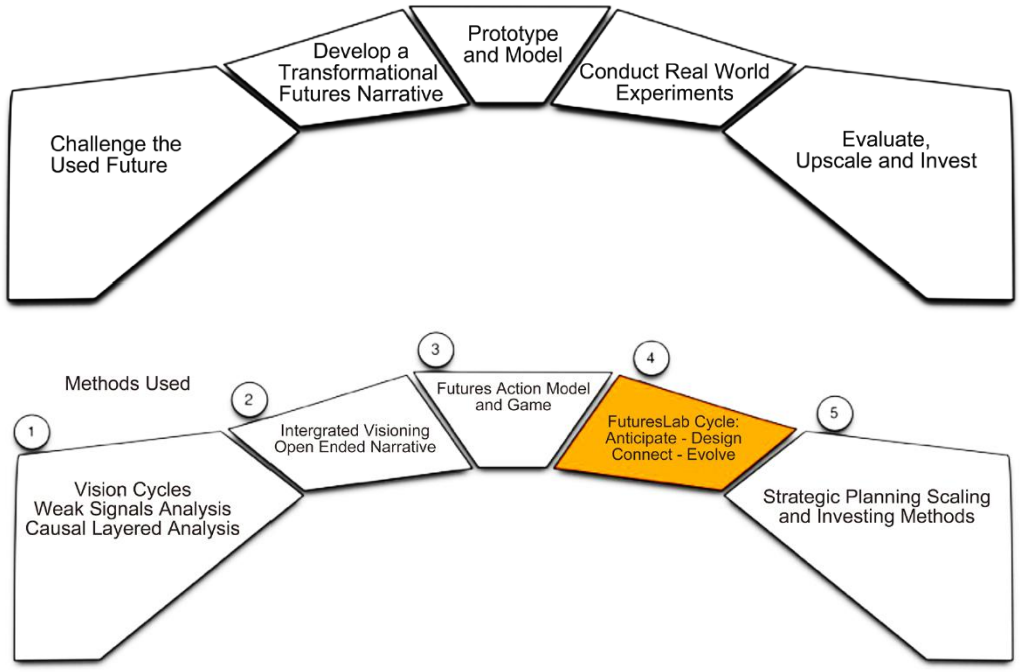
Operational tools

> "The world is a complex adaptive system – once we map the future – it changes. Thus, while we need a vision, we do not need a blueprint." (Inayatullah, 2008)

Anticipatory innovation only makes sense if action is actually taken. While there are tools and methods to create new narratives to follow up on new initiatives, obtain permission to explore, tools are needed to also

operationalise and take these futures into effect. This takes us towards operationalisation of anticipatory innovation. It is part of conscious evolution (Sahtouris, 2002). Anticipatory innovations create adopted practices, products and services that can be part of existing technology or business models or separate from them. For this to work, anticipatory innovation requires a lot of testing, which in some cases must regulated, thus allowing innovators to go beyond the promissory stage. There are demonstration projects, prototypes and other types of proof-of-case approaches that could be measured and analysed in terms of their effects (see e.g., innovation lifecycle studies from the OECD[17]). There are some models that connect these stages in coherent steps (Figure 3.6) and actively start to drive experimentation.

Figure 3.6. Anticipatory experimentation model and the associated techniques and methods



Source: Ramos 2017b: 107-8.

To go beyond simple experimentation and innovation methodologies, here is a closer look at action-oriented models and anticipatory innovation that draw on using input from futures thinking and learning models and taking the insights into the experimentation phase. These include different approaches such as the Anticipatory Action Learning, which merges participatory approaches and futures studies, and opens "a transformational space of inquiry, the long-term and planetary future, with the everyday and embodied world of relating and acting" (Ramos, 2017: 830). This includes Inayatullah's (2008) Six Pillars approach (example in Table 3.3) from the José Ramos' "Futures Action Model" (FAM) described in Box 3.13.

[17] The Observatory of Public Sector Innovation conducted a series of innovation lifecycle studies covering topics such as ideation, prototyping, evaluation etc. These studies are accessible here: https://oecd-opsi.org/projects/innovation-lifecycle/

Table 3.3. Six Pillars method and associated workshop activity

This is an example of the methodology applied to the context of Artificial intelligence

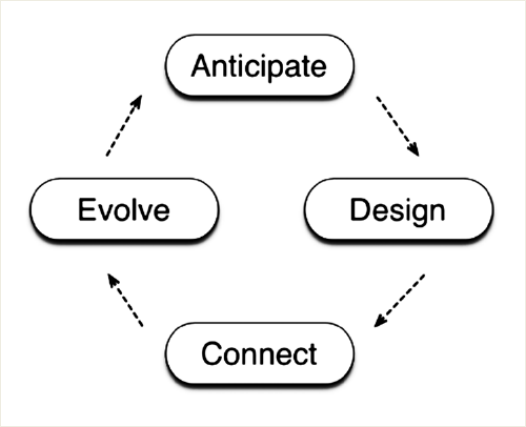
	Aim of stage	Workshop approach to AI
Mapping	Mapping the past, present and futures to determine where we've been, where we are and where we are going.	Introductory overview of the authors' previous research that outlined the genealogy of AI and the concept of augmentation through technology. Participant definition of AI (exploratory question with responses provided via Delphi withheld preferences technique). An anticipatory process of applying the futures triangle, using rapid listing, group inquiry and Delphi prioritisation
Anticipate	Identifying emerging changes or drivers of change on the horizon; issues, problems or opportunities that will, or must interfere with the mapping	Modified emerging issues analysis (based on specified timing) seeking to identify implications of AI futures on organisational adaptation approaches.
Time	Identifying the overarching patterns of history and challenging our consciousness of change models and possible futures.	Departing from the cyclical and seasonal nature of AI, including the concept of AI evolution connected to the concept of advantage. Connecting the timing of the future scenario for workshops to researched themes around workforce disruption.
Deepen	Engaging with the inner dimensions, be that the meanings we ascribe to the world (inner-individual), our behaviour (outer-individual), official/ organisational strategies (outer-collective), or the interior maps of organisations (inner-collective).	Causal Layered Analysis to examine AI and the team of the future. 40 minutes facilitated discussion covering Litany, System, World View and Myth/Metaphor. Summary CLA across two chosen organisational scenarios finalised post workshop.
Create Alternatives	Using scenarios and questioning to create alternatives or identify different mechanisms to deliver the same state or outcome	Scenario analysis combined with the Futures Triangle – rapid list Pull discussion, four plausible scenarios selected – best case, worst case, outlier, most likely plausible scenario selected by participants by Delphi and force ranking processes. Role Play based on a prioritised scenario from CLA of AI and Team of the Future to deepen the insight.
Transform	Focussing the futures on those paths which lead to preferred images	Futures triangle articulated the preferred scenario for the pull of the future used to examine the implications of AI on organisation adaptation approaches and in particular 'what do leaders of organisations need to think about when considering transforming their organisations towards a specific AI future?'

Source: Adapted example from Farrow, 2020; Inayatullah, 2008, p. 7-8.

Box 3.14. Future Action Model

Futures Action Model (FAM) is problem-solution sequencing methodology based on the sociological method of Action Research (Ramos, 2013). While it draws on a waterfall problem-solving approach, the process of the model is actually dynamic and non-linear. It combines the participatory approach with futures research methodology. Starting from larger challenges and global issues it moves to "a solution space where participants can explore the purpose, resource strategy, and governance system of an initiative that can effectively address the issue or problem" (Ramos, 2017a: 837).

Figure 3.7. Futures Action Lab cycle



Source: Ramos, 2017b: 109.

The Futures Action Model involves the following steps (Ramos, 2017b):

1. Creating a safe space within which we can experiment, without expectations to what gets created (ideas, designs, prototypes) must succeed. The focus is on learning that may lead to another experiment rather than traditional success.
2. Creating a space for network problem solving with a commitment for open source, to contribute to the global knowledge and design commons. Ideas or designs or experiments are put out into the world as if they belonged to no one and everyone, letting go of the burden of ownership, and releasing ideas into the public.
3. Learning from collective intelligence: people's feedback, attempt to let go of biases, and discover blind spots.
4. Cultivating a community of co-creators.
5. Documenting each project and the various stages of the project on the website so that projects and ideas remain accessible to people, and that the various iterations of a project or idea are documented.

   The Future Action Labs have been used in a variety of contexts including development of the Commons Game, the Future Melbourne 2026 process, etc.

Source: Ramos, 2013; 2017ab.

Epistemic tools

Epistemic tools aim to validate and generalise the knowledge from anticipatory innovation. In a prior publication, the OECD (2018) tackled the difficult concept of evaluation and learning for innovation in the public sector.[18] As anticipatory innovation is an ever-evolving process addressing uncertainty, tools and methods are required that allow to learn on an ongoing basis. Thus, anticipatory innovation requires a learning system with a 'built-in capacity for reflection on experience and to recognize change or learning when it occurs' (Ison and Russell, 2000: 208). This evaluation should not be only ex-post, but should be carried out throughout the anticipatory innovation process.

This also requires constant examination of one's own assumptions about the potential future and asking questions (Burrows, and Gnad, 2018):

- Why are people confident that this assumption is correct?
- Under which circumstances might this assumption be untrue?
- Could the assumption have been true in the past but no longer today or in the future?
- Is there any inconsistent data, which might falsify the assumption?
- How much confidence do I have that this assumption is valid now and will continue to be valid in the future?
- If the assumption turns out to be invalid, how much impact would this have on the analysis?

To make the basis of these questions visible, dialogue mapping (facilitation technique used to visualise group-based critical thinking (Conklin, 2005)) among other methods could be used to make each participant's judgements more transparent, explicit and easier to communicate to others.

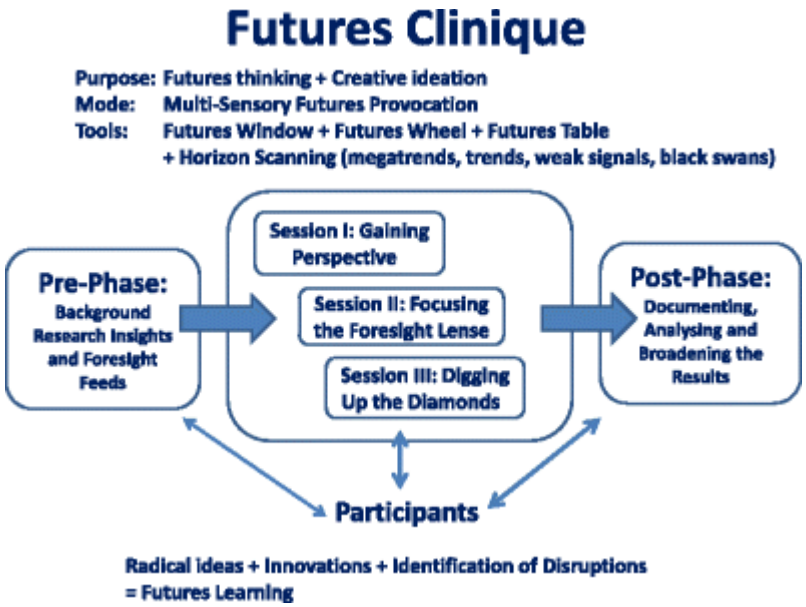
Many foresight methods integrate tracking and measurement frameworks into their processes (e.g., Dahrendorf Foresight Process; see also Figure 3.8);[19] but the outcomes and assumptions cannot be fully examined as ideas and options are not tried out in practice. As such, anticipatory action learning (Stevenson, 2002; Inayatullah, 2006), developmental evaluation (Gamble, 2008), theory of change approaches, etc. when critically and continuously re-examined seem to be the most valuable epistemic tools for anticipatory innovation, because they incorporate real-life testing into their approaches. This also applies to generating knowledge from experimental approaches. Here, the uncertainties regarding the potential consequences for society can be explored in practice, as often these uncertainties often cannot be properly expressed as quantifiable risks and cannot be known or conjectured through foresight approaches because the consequences are unpredictable and emergent outcomes emerge from the coevolution of technology and society and other factors (Brey, 2017).

Figure 3.8. Futures Clinique: the participatory foresight process

A method for promoting futures learning and provoking radical futures

[18] OECD (2018) Observatory of Public Sector Innovation. Evaluating Public Sector Innovation Support or hindrance to innovation? Available at: https://oecd-opsi.org/wp-content/uploads/2019/05/Evaluating-Public-Sector-Innovation-Part-5a-of-Lifecycle-Report.pdf

[19] The Dahrendorf Foresight Process generated narratives about alternative futures in a four-step process: starting with questioning common wisdom (Key Assumption Check), collectively identifying key drivers of change (Structured Brainstorming); generating a multiple plausible narrative of the future (Multiple Scenario Generation) and developing an early warning system to track future developments (Indicators) (Burrows, and Gnad, 2018).



Source: Heinonen and Ruotsalainen, 2013.

Another cluster of tools that may be of use for evaluation purposes are connected to systems thinking and organisational learning (Senge and Sterman 1992; OECD 2017; 2020). It can be applied to foresight (Saritas, 2013) systems thinking, which has been concerned with first and second order change and has been developing principles to allow change beyond the current paradigm and the lobbying of incumbents (Ison and Straw, 2020). Schmidt-Abbey, Reynolds and Ison (2020) tackle the area of systemic evaluation and its use for capturing systemic sensibilities – the bigger picture – of complex turbulent situations of change. These approaches rely on critical reflexivity (see chapter 1 for more) and have some underlying elements – interrelationships between systems components, multiple perspectives and boundary judgements (critical engagement with 'in' the system-of-interest, and what is 'out') (ibid) – that make the approaches particularly interesting for anticipatory innovation. Indeed, unintended and cascading effects are always a possibility. Systems thinking is, however, not often practised inside governments and needs new types of capabilities and capacities to be used meaningfully (Tõnurist et al., 2020).

As argued throughout the section for tools and methods for anticipatory innovation governance, in practice diversity and transdisciplinary approaches are key. Anticipatory innovation lives in the context of high uncertainty and complexity and different evaluation tools and methods may bias our understanding. Stated simply, the plurality of future possibilities increase or diminish the complexity at hand. Hence, different tools and methods need to be combined to generalise findings (from systems thinking, hermeneutics, macro-history, sociology, ecology, literature, ethics to philosophy, etc.).

Data and measurement

Anticipatory innovation needs data to underpin potential future developments with distinct indicators that could help policymakers track events, spot trends and separate relevant information from noise (Burrows, and Gnad, 2018). Usually indicators have to be observable, reliable, stable over time, valid and unique to the specific phenomena. Data requirements to track uncertain futures are difficult to define; especially, as one does not know what one should look for. By definition, events or developments that may shape the futures have not happened yet and, as covered in Chapter 1, governments tend to be in a double blind situation due to the Collingridge's Dilemma (while things are possible to influence, there is little evidence to support specific types of action). Previously we covered different futures and foresight techniques that

either rely on participants' expert or experiential inventiveness and ingenuity or draw upon and extrapolate from information, data, and indicators. OECD is currently working on these challenges in the context of improved rule-making and is looking into different types of digital technologies that could be used by governments and opportunities and challenges public agencies face when applying these new tools. But here we ask specifically, what sort of information is used in the former and how should this be obtained? How can this be codified and used effectively in organisations?

Reading signals

First and foremost, anticipation relies on strategic intelligence and signal detection and classification (Lesca and Lesca, 2013). In response, a variety of tools and approaches (e.g., environmental scanning analyses and Ansoff's filters – Kaivo-oja, 2012; Ilmola and Kuusi, 2006) have been developed involving corporate sourcing and sense making around both strong and weak signals (Box 3.14). Scanning systems usually have three steps of filters: (1) a surveillance filter, including methods used in information acquisition; (2) a mentality filter, representing the selection, and (3) a power filter, regarding the influence of decision makers who note or neglect information (Kim and Lee, 2017). Signals may be retrieved from experts and futurist, scientists and consultants, etc., but also increasingly text-based or online data (e.g., through text mining) (e.g., Eckhoff et al. 2014; Antons et al., 2020); in technology fields, patent data remain the most widely applied data sources to signal detection (Kim and Lee, 2017). They can be compiled in radars and indices (Schoemaker, Day and Snyder, 2013; Kim et al., 2013).

Box 3.15. Weak signals

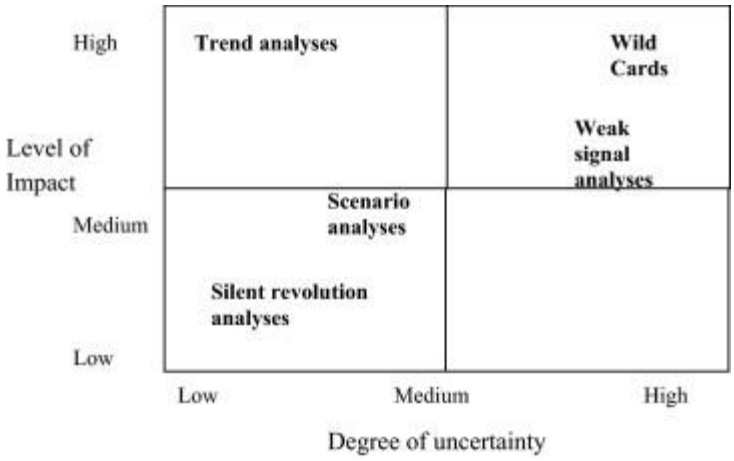
Weak signals are early signs anticipating or pointing to possibly emerging new issues, but which are yet confirmed (Heinonen and Hiltunen, 2012). They can include events, new technologies and novel practices or alike – pointing towards a new phenomenon, which can either strengthen or wither away as time passes. For example, in 2012 Uber launched a small initiative called the UberX — the "low cost Uber" that received very little attention at the time, yet, it was a signal that the industry may considerably change. Between 2012 and 2018, Uber's net revenue per quarter rose from USD 1.4 million to USD 2.97 billion with 80% of the transportation services generated by UberX. Weak signals are, thus, the first symptoms of important discontinuities, warning signs, or new possibilities. Some typical examples of weak signals can be connected to developments in technologies, societal innovations, conflicts, origins of conflicts, demographic shifts, new rivals, new regulations, etc. (Saritas and Smith, 2011; Kim and Lee, 2017).

Source: Saritas and Smith, 2011; Heinonen and Hiltunen, 2012; Kim and Lee, 2017; https://www.cbinsights.com/research/report/how-uber-makes-money/

Signal detection may involve both active and passive scanning for signals (either sending out probes/questions and listening for answers; or periodically observing what is happening in general or what people are talking about), but overall it aims to predict in some way of format future change, in order to exploit new opportunities and avoid future threats (Rossel, 2009). Different approaches are useful, when dealing with high uncertainty and weak signals, versus lower uncertainty and strong signals (Figure 3.9). Some of these were addressed already in the alternatives exploration and experimentation and tools and methods sections. What is noteworthy is that effective signal detection is highly dependent on complexity, sense-making and strategic decision making which all effect which types of signals are captured or what significance is attributed to the signal. For example, the Cynefin framework is often use to contextualise

signals (Kurtz and Snowden, 2003) among five different domains: (1) reliable causes and effects; (2) knowable causes and effects, (3) unknowable cause and effect (except in hindsight), (4) no cause and effect and (5) transition domain (ibid). Interpreting signals in chaotic or complex situations is considerably different when causal relationships can be described or determined with expert interpretation.

Figure 3.9. The impact–uncertainty matrix and futures research methods



Source: Kaivo-oja, 2012.

Real-time data monitoring and predictive analytics

In rapidly developing environments, signal detection can be difficult by traditional means (e.g., digesting reports of evolving problems, traditional statistics or patent data when dealing with technology) and thus, require real-time monitoring: part of anticipatory innovation governance is creating those real-time monitoring systems so governments can act and innovate based on received signals. The case of real-time monitoring systems has been known in the field of disease outbreaks for some time (Ramalingam, 2016) and is of course on the rise with the Covid-19 crisis where 'track and trace' technologies utilising big data, mobile positioning data, social media data, etc. are on the rise worldwide (Amaral, Vranic and Lal Das, 2020). These types of approaches have also been used to track biodiversity and wildlife conservation (Pettorelli et al., 2019; Wall et al., 2014), water systems and agriculture (Lafont et al., 2019), education (Williamson, 2016) and beyond. This has led to also the rise of predictive analytics and machine learning that utilise big data. Big data can and has of course been used more widely, but the recent push for the adoption of approaches has been unprecedented.

Box 3.16. End of world hunger through real-time monitoring: Artemis

The World Bank is working with the biggest technology giants – Amazon, Google and Microsoft – to develop a system called Artemis that would trawl through data from satellites, food prices, weather records and social media and analyse it for signs of famine. Based on this data, the systems would construct models using advanced artificial intelligence algorithms to estimate and forecast the near- to mid-term risk of famine at a local (district/province) level. The aim is to link the AI system to a funding mechanism which automatically releases relief money once certain thresholds are met, rather than waiting for a famine to be officially declared.

Source: World Bank (2018) https://www.worldbank.org/en/news/press-release/2018/09/23/united-nations-world-bank-humanitarian-organizations-launch-innovative-partnership-to-end-famine

Big data allows individual data-points to be considered collectively and compared with each other, either geographically, demographically or behaviourally (Tate et al., 2018). Predictive analytics rely on the analysis of large and varied data sets to uncover hidden patterns, unknown correlations, user preferences, etc. to help make informed decisions (Engin and Treleaven, 2018). This can provide new insight into the events, life experiences, and patterns and trends in society as digital signals (Kowalkiewicz, Safrudin and Schulze, 2017). In essence, predictive analytics 'forecast' what might happen in the future with an acceptable level of reliability, and includes what-if scenarios and risk assessments (Tate et al., 2018). For instance, China (Centre for Strategic and Management Studies), Brazil (Centre for Strategic and Management Studies), Canada, the European Commission with the Joint Research Centre, Germany (e.g., BMBF Foresight project), Japan (National Institute of Science and Technology Policy), and the UK (National Foresight Programme with the Technology Strategy Board) have all put in place offices with mandates to anticipate futures through different predictive and prescriptive policy initiatives (Wilsdon, 2014).

This has involved a variety of activities including crowdsourcing maps for natural disasters, forecasting battlefield casualties, anticipating terrorism, and predicting gang-related crimes, or 'predictive policing' (Webb, Sellar and Gulson, 2019). Education has also become the domain of data-based anticipation. For example, learning analytics platforms capture data from children's educational activities to track and algorithmically optimise their educational experience thus helping to predict the future performance of the system and the student (Williamson 2016). The U.S. Army has developed its Automated Continuous Evaluation System which uses big data analytics and 'context-aware security' to investigate government, commercial, and social media data to uncover patterns of applicants (Höchtl, Parycek, and Schöllhammer,. 2016). In the Netherlands, predictive data dashboards are used to make crime patterns visible (Box 3.15). In other context, data and funding is made available to analyse big data in new ways. For instance, in Korea these schemes are used to give experimental freedom to develop models based on big data that focus on a particular problem, and which can then be scaled, free from the constraints of the government's own policy and delivery agenda (OECD, 2019)). All of the above, of course need to address the accuracy and fairness of data driven models, bias detection and correction, and set up ethical frameworks.

Box 3.17. The Netherlands: predictive data dashboards for subversive crime

In 2016, CBS (Statistics Netherlands) started to develop Urban Data Centres (UDC) by matching national data and data expertise with smart, data-driven city needs (OECD, 2019). This has developed into different partnerships and initiatives. The particular development, the City Deal "Zicht op Ondermijning" is a predictive data dashboard that makes criminal patterns visible and helps to gain insights that contribute to tackling subversive crime.

The City Deal is a national partnership between the municipalities of Amsterdam, Breda, The Hague, Eindhoven, Helmond, 's-Hertogenbosch, Rotterdam, Tilburg and Utrecht, the ministries of the Interior and Kingdom Relations, Finance and Justice and Security, Tax authorities, the Public Prosecution Service, the National Police and the Central Bureau of Statistics. In 2019, the municipalities of Almere, Groningen and Maastricht also joined the City Deal. The municipalities of Arnhem and Zwolle joined in 2020.

The tool links microdata (personal, company and address-based data) in a secure environment within CBS. The aim is not to detect crime (the tool does not give data on individuals or companies), but to shed light on the different patterns between different factors influencing criminal activity.

The aim of this City Deal is to contribute to the preventive approach to subversive crime with the aim to:

- Gain insights into local and regional patterns within organised subversive crime;
- Recognise possibilities and vulnerable sectors and areas;
- Recognise the (lack of) social resilience.

These patterns make it possible to formulate an effective strategy that focuses on enforcement and prevention of crime.

Source: OECD (2019), Public Value in Public Service Transformation: Working with Change, OECD Publishing, Paris, https://doi.org/10.1787/47c17892-en; Factsheet City Deals, 2020; https://www.zichtopondermijning.nl/

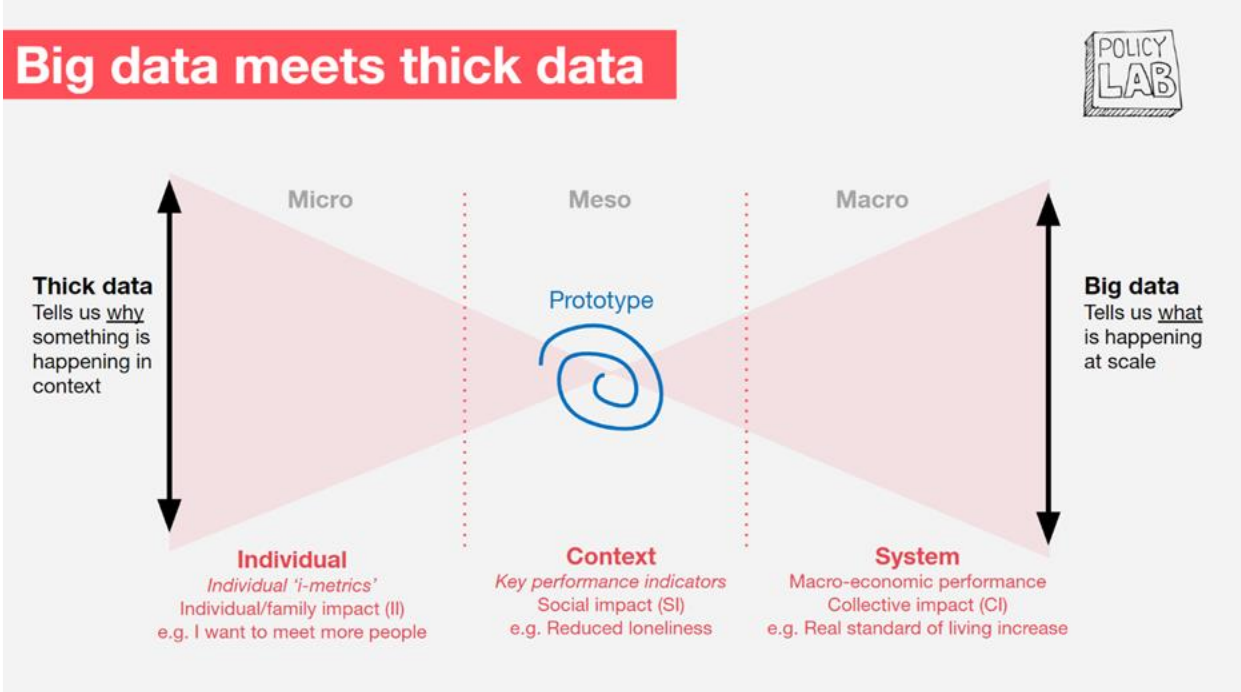
Thick data

> "Culture is not a power, something to which social events, behaviours, institutions, or processes can be causally attributed; it is a context, something within which they can be intelligibly – that is, thickly – described." (Geertz, 1973: 9).

Monitoring and actively listening to signals from the human and non-human world (Dobson, 2014) does not have to be placed in only quantitative data. Furthermore, it limits the information received to things that can be easily quantified. For anticipatory innovation, also deep, thick, contextual data is needed. Anthropologist Clifford Geertz (1973; 2008) argued some years ago that some highly-complex situations are only made meaningful through 'thick description'. 'Thick data' is synonymous with ethnographically collected and analysed observational data (Bornakke and Due, 2018). It enables a reflection on contextual complexity: why people do what they do or why certain things happen in certain contexts. It is especially effective when combined with other data sources like big data in a blended fashion for analysis (e.g., Lu et

al. 2018). Some public sector innovation labs have already noted the importance: e.g., the UK Policy Lab's model already includes both big and thick data in an action-oriented way (Figure 3.10).

Figure 3.10. Policy Lab's model for combining big data and thick data (2020)



Source: https://openpolicy.blog.gov.uk/2020/01/17/lab-long-read-human-centred-policy-blending-big-data-and-thick-data-in-national-policy/

Thick data and other interpretations of data can be collected in a variety of ways. Crowdsourcing data and using user-generated content has become increasingly popular from both expert (Box 3.17) and non-expert environments (Box 3.18). Especially, the Cognitive Edge SenseMaker® (Box 3.18) enables users to collect large quantities of narrative data, make sense of complex environments and identify patterns in information (Van der Merwe et al., 2019). It has been applied in concrete and tangible situations such as worksite safety culture at a factory and other that are large and complex, including peace-building and reconciliation at a national scale.

Box 3.18. Crowdsourcing data

Magic box

UNICEF is investing in the development of Magic Box, a collaborative platform that is made possible through the contributions of private sector partners that share their data and expertise for public good. By harnessing real-time data generated by the private sector, UNICEF can gain critical insights into the needs of vulnerable populations, and make more informed decisions about how to invest its resources to respond to disaster, epidemics and other challenges. As a platform for engagement and a product that can change the way UNICEF works in emergencies like Zika or Ebola, Magic Box stands to shake up the industry 79onsiderably.

Futurescaper

Futurescaper is a cloud-based, futures thinking crowdsourcing platform. It enables to crowdsource ideas about the future and the connections between those ideas, and turn them into dynamic systems maps ideas and increase collective understanding (Ramos, 2017). They help to increase participation in futures exercises in terms of both amount and diversity, increased volume and speed of data collected and analysed, increased transparency around driver selection and analysis, and decreased overall cost of project administration (Raford, 2015). There are other similar platforms, for example Popplet and Parmenides Eidos.

Hunchworks

UN Global Pulse is the UN Secretary-General's initiative that has developed a tool called HunchWorks which enables researchers to test their ideas with the goal of moving (as quickly as possible) from a hunch, to proof, to action. Researchers who notice an anomaly in data that she suspects is related to impending crises would input into the tool a hunch outlining her concerns. After attaching relevant evidence, she would have shared it informally through the system, where it would be visible only to a trusted network of expert colleagues in relevant communities of practice. Her colleagues might, in turn, have brought in additional evidence supporting or refuting her conclusion, provided feedback about her observations, and suggested other experts to invite into the conversation.

Futurium

The Futurium is a German foresight platform for evidence-based and participatory policymaking (Accordino, 2013). The platform hosts an online foresight toolkit to facilitate the joint creation of ideas to help design future policies and utilise social networks, open data, semantic and knowledge mining technologies as well as participatory brainstorming techniques to engage stakeholders and harness their views and creativity to better inform policies that matter to them (ibid)

Source: Raford, 2015; Ramos, 2017.

Box 3.19. Using narratives to realise Kansas' vision for the early childhood system

The Kansas vision for the early childhood system is: all children will have their basic needs met and have equitable access to quality early childhood care and education opportunities, so they are prepared to succeed in kindergarten and beyond. In 2019, the State of Kansas received a large federal grant to conduct a needs assessment and craft a strategic plan for the early childhood system where all children can thrive. The leadership of a new Governor and the support of the Kansas Children's Cabinet and Trust Fund, Kansas Department of Health and Environment, Department for Children and Families and Department of Education created an opportunity to harness innovation to make Kansas the best place to raise a child.

To inform these efforts, Our Tomorrows project implemented a Community Sensemaking Approach to better understand what it takes for families to thrive or survive in Kansas. Our Tomorrows utilised a complexity-informed narrative research approach called SenseMaker® from Cognitive edge to achieve three goals:

1. Gather stories about thriving and surviving from families across Kansas.
2. Make sense of patterns that emerged from the stories through Community SenseMaking Workshops with stakeholders at various levels of the system.
3. Take action and enable bottom-up change through Community Action Labs. From a complexity perspective, these goals meant developing a 'human sensor network', embedding citizen feedback loops and sensemaking processes into governances, and complexity-informed decision-making through safe-to-fail portfolios.

Since the launch in 2018, this ambitious effort collected 2,666 stories through the Our Tomorrows SenseMaker framework online, on paper, or through interviews. Stories were collected from all 105 Kansas counties, representing frontier, rural, and urban voices. These anonymous stories were then returned to communities at fourteen Community Sensemaking Workshops. Community members reviewed story packs for themes selected from analysis of patterns in the quantitative metadata of the stories. Participants generated ideas to change the patterns they saw and create the conditions for families to thrive. Participants could then apply for up to USD 2 000 dollars in funding for these ideas. This money is known as "Actionables" from Community Action Labs that were set up by Our Tomorrows to support local portfolios of Actionables that were quick, local, and inexpensive.

The innovation was scaled up state-wide in 2019, and future plans are to institutionalise the community sensemaking approach into governance mechanisms for the early childhood system. First the story collection effort will be deepened with the launch of Our Tomorrows 2.0 in 2020. New stories that are collected will be accessible through a state-wide Story Bank hosted at the Kansas Children's Cabinet and Trust fund. The Sensemaking Analysis and Visualization (SAVVY) Dashboard will provide early childhood stakeholders with real-time access to patterns that are emerging from Our Tomorrows SenseMaker narratives to support decision-making. Local capacity for SenseMaker data analysis and community-lead sensemaking workshops will be developed by the Our Tomorrows team. The Community Action Lab structure could stimulate complexity-informed intervention on an ongoing basis to provide support for the State's early childhood innovation portfolio by sourcing safe-to-fail experiments from community members. This bottom-up innovation identifies localised approaches that can be replicated or scaled up by centralised government to similar areas.

The Community Sensemaking Approach carried out by the Our Tomorrows is an innovative application of complexity-informed approaches to citizen engagement in four ways. First, it is the first instance of an ongoing SenseMaker feedback loop between citizens and decision-makers with public data at scale in the early childhood system. Second, it enables 'fractal engagement,' or action at multiple levels in

the system when people ask themselves “What can I do tomorrow to create more stories like the ones I want to see and fewer like the ones I don’t?” Every person is empowered to act at their own level of authority and within their set of skills. Third, Community Sensemaking workshops brought SenseMaker data back to communities for analysis and action planning in a way that was comprehensible for anyone who attended. Fourth, the Community Action Labs grant-making process crowdsourced a portfolio of safe-to-fail experiments to develop a complexity-informed intervention strategy.

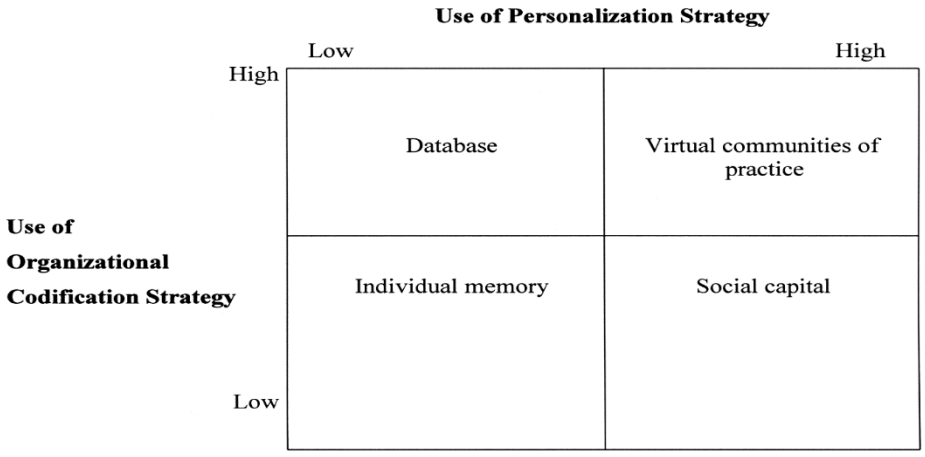
Source: OPSI case study platform, 2020.

Knowledge management and reflexive use of data

Not only the types of data that are connected for anticipatory innovation are important, but the way in which they get used is influential to outcomes. For example, when monitoring for weak signals it is essential that the organisation addresses its own interaction with its social-ecological context as well, not just looking for signals externally (Pickering, 2018). Furthermore, the issue of criteria by which the relative value of (uncertain) normative claims or signals should be evaluated, is usually left unanswered. Data processing is reflexive when assessment processes involve competing methods and perspectives, potentially dialogue and deliberation (Dryzek and Pickering, 2017). In many cases data and evidence should not be the boundary for innovation, as discussed. In uncertain and complex areas there may not be enough evidence to go by. It is important to discuss collectively what is and what could be (Kimbell, 2019).

Furthermore, it is important to also set up knowledge management systems to know how data is treated and stored. For example, the Knowledge Retrieval Matrix (Figure 3.11) developed by Gammelgaard and Ritter (2005) outlines the different modes of data and knowledge bases in relation personalisation and organisational codification. This may involve (virtual) communities of practice that share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger, 1999).

Figure 3.11. Knowledge retrieval matrix



Source: Gammelgaard and Ritter, 2005.

Organisational capacity

Anticipatory innovation governance should enable experimental processes and capacities, which sometimes are difficult to do in traditional organisational structures, where day-to-day needs overshadow the need to experiment and search for radical and transformative innovations (Vervoort and Gupta, 2018). To search for alternatives, it is important to use the right tools and methods and data for anticipatory innovation. The structure of activities that may challenge the status quo or business as usual (or simply, how to do exploration and exploitation in the same organisation) is a long debated area in the disruptive innovation literature and is related to the innovator's dilemma (Box 3.19). As the old adage goes: many cooks can spoil the broth. This has inspired volumes of research on ambidexterity (Andriopoulos and Lewis, 2009; O'Reilly and Tushman, 2013; Koryak et al., 2018) and organisations' dynamic capabilities (Winter, 2003; Teece, 2012; 2018) as well as the potential capabilities organisations need to possess to manage uncertain futures. These dynamic capabilities are an organisation's "ability to integrate, build external competences to address rapidly changing environments" (Teece et al., 1997). This, in the public sector context, has been analysed in a similar vein by Dunlop (2015) as 'dynamic learning relationship' and especially 'reflexive learning.' Reflexivity is the capacity of an agent, structure or process to change in the light of reflection on its performance (e.g., Pickering, 2018). Researchers frequently distinguish between 'first-order' reflexivity (whereby institutions generate effects that feedback on themselves) and 'second-order' reflexivity (whereby institutions build a capacity to critically scrutinise their own practices) (Voß and Kemp, 2006: 6–7).

Ambidexterity is commonly defined as a working balance between exploration and exploitation, where organisations can do both effectively at the same time. While ambidexterity is desired, studies to date have not fully explained the mechanisms by which it can be achieved (Turner et al., 2018). Ambidexterity can be temporal (running exploitation and exploration sequentially), structural (separating the two into each as separate, parallel, entities) and contextual (situation-dependent flexibility) (Jensen et al., 2008; Meglio, King, and Risberg, 2015). In addition to these examples, organisations have tried to use mixed models such as 'tiger-teams' (groups of expert, ad hoc staff) sent in to support evolving incidents, and the empowerment of key individuals to go beyond 'normal' procedures when emerging problems are identified (Turner et al., 2018). Yet, it is not so easy. Private sector experience shows that manager cognition, organisational capabilities, and organisational incentives are all separately important in shaping strategic change and in the best case scenario they tend to be aligned (Kaplan 2008). Work practices and cultures can shape values, which can shape (technical) choices. Moreover, some values become design choices and concrete options (Shilton, 2015).

Box 3.20. Innovator's dilemma

> *The asymmetries of motivation chronicled in this chapter are natural economic forces that act on all business people, all the time. Historically, these forces almost always have toppled the industry leaders … because disruptive strategies are predicated on competitors doing what is in their best and most urgent interest: satisfying their most important customers and investing where profits are most attractive. (Christensen and Raynor, 2003: 55)*

Clayton M. Christensen's book "The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail", which has come to form the backbone of the theory of disruptive technologies, has been one of the most influential in the field of innovation. In essence, the theory argues that investing in disruptive technologies is not a rational financial decision in established organisations for senior managers as for the most part, disruptive technologies are initially of interest to the least profitable user base in the market.

> *"The reason [for why great companies failed] is that good management itself was the root cause. Managers played the game the way it's supposed to be played. The very decision-making and resource allocation processes that are key to the success of established companies are the very processes that reject disruptive technologies: listening to customers; tracking competitors actions carefully; and investing resources to design and build higher-performance, higher-quality products that will yield greater profit. These are the reasons why great firms stumbled or failed when confronted with disruptive technology change." (Christensen, 1997)*

Successful organisations concentrate on what their customer base needs, on developments that are technologically feasible, not nurturing disruptive technologies. As such, there are essential organisational dynamics that devalue disruption and potential anticipatory innovation activity, including:

- *Resistance to change.* There can be a lot of resistance to radically new innovations inside organisations if they fly in the face of established practices. Usually innovations that create totally new areas of engagement are more easily adopted.
- *Strategic intent.* Current activities invariably have bigger financial portfolios; thus, in organisational terms they outweigh new, smaller radical projects.
- *User focus*. Feedback from current users and customers can steer organisations away from radically new products and services as they usually (at least initially) underperform established products and services.

Consequently, there are many examples of market leaders who have lost their leading positions in the market due to abovementioned dynamics from Kodak to Nokia (Lucas and Goh, 2009; Bouwman et al., 2014).

Source: Christensen 1997; Christensen and Raynor, 2003; Lucas and Goh, 2009; Bouwman et al., 2014.

Autonomy

Organisations (at least in the private sector) tend to be more consistently successful when facing disruptive innovations when they build autonomous strategic processes next to their day-to-day business (Burgelman, 1991). More financially and operationally autonomous units are able to circumvent traditional stage-gate processes in organisations whose metrics screen out disruptive innovations that do not meet rigid hurdles for new product ideas (O'Reilly and Tushman, 2008). This does not mean that there will not be conflicts between units pursuing different types of innovations simultaneously (O'Reilly and Tushman,

2016). In the private sector, there are many attempts to create structural ambidexterity from a 'skunkworks' to spin-offs or—if all else fails—acquisition of start-ups or licencing technology (Sandström, Magnusson, and Jornmark, 2009; Christensen, Alton, Rising, Waldeck, 2011; Sandström, Magnusson, and Jornmark, 2009; Marx, Gans, and Hsu, 2014). This is also the reason why labs and dedicated innovation units have been created in the public sector.

As such, innovation and living labs have become widespread in the public sector (OECD, 2017; Tõnurist, Kattel, and Lember, 2017; Schuurman and Tõnurist, 2016; McGann, Blomkamp, and Lewis, 2018; Criado et al., 2020). Some (but not all) of these laboratories have also have had and have clear anticipatory purposes (see Table 3.4) – e.g., the Interactive Creativity Landscape, which is part of the Fraunhofer Office Innovation Centre; Learning Garden in the Scandinavian Financial Institute, Future Centre "The Shipyard" by the Dutch Tax Office, UK Department of Trade and industry Future Focus laboratory, Royal Mail Innovation Laboratory and others (Haner, 2005 et al., 2007; Heinonen, and Hiltunen, 2012; Salako, Gardnerand Callaghan, 2017). The cases of SITRA in Finland, Fraunhofer in Germany, the Defense Advanced Research Projects Agency (DARPA) in the US and the Brazilian National Development Bank (BNDES), which are solely committed to futures and exploration, are exemplary here, although, their goals and anticipatory focuses have varied with time (Mazzucato and Penna, 2015; Vataja, Dufva, and Parkkonen, 2019; Bonvillian, 2020). It is not surprising that operational autonomy has been an important factor for these organisations to follow anticipatory innovation practices. This is especially crucial in the public sector where change and innovations are especially rare (Howlett 2014) and so are adaptive policy designs (Nair and Howlett 2014).

Table 3.4. Organisations for innovation: A typology and selected examples

Objective?	Core activity					What type of organisation?	Methods used	Examples
Promote innovation across government	**Support and co-ordination**	Support in specific area or function	Experimentation	Investment and funding	Capacity building and networking	- central government innovation units	-tools and guidance -monitoring and co-ordination -training and coaching -events	-Innovation and Policy Coordination, Australia -Central Innovation Hub, Canada -Better Public Services Results Programme, New Zealand
Promote service improvement in functional areas	Support and co-ordination	**Support in specific area or function**	Experimentation	Investment and funding	Capacity building and networking	- dedicated teams and units for functional policy areas (e.g. digital or open government)	- project implementation support - dedicated squads /change teams	-Open Government Team, Germany -Open Mexico, Mexico -Laboratorio de Gobierno, Chile
Develop and test innovative solutions	Support and co-ordination	Support in specific area or function	**Experimentation**	Investment and funding	Capacity building and networking	-innovation labs -behavioural insights units -innovation units -delivery teams	- prototyping - human-centred design - randomised controlled trials - project-based working - data analysis	-Futurs Public, France -Mindlab, Denmakr -Laboratorio de Gobierno, Chile -Behavioural Insights Unit, United Kingdom

Fund innovation	Support and co-ordination	Support in specific area or function	Experimentation	**Investment and funding**	Capacity building and networking	-funds	- piloting - grant funding - competitions and awards	-Vinnova, Sweden -NYC Innovation Zone (iZone), United States
Develop capacity for innovation and networking	Support and co-ordination	Support in specific area or function	Experimentation	Investment and funding	**Capacity building and networking**	-central government -innovation units -innovation labs -formal and informal networks across government	- project shadowing - training and coaching - tools and guidance - events - regular meetings - network communications	-Mindlab, Denmark -Laboratorio de Gobierno, Chile -Slimmer Network (Smarter Network), Netherlands -Change Agents / Change Makers, Finland

Source: OECD, 2017; 160.

Futures commissions or committees are other examples of government's structural response to ambidexterity (e.g., OECD High Level Risk Forum, 2017). These are semi-independent research and communication institutes or agencies established to provide research about the future for both government and the public (Ramos, 2014). While government funded, their semi-independent nature allows them more liberty in providing critical commentary within both policy development processes and public discourse (ibid). This can also turn into a weakness, as with all semi-autonomous units, as change in leadership and power may mean that there is less of a shield from changes. Sometimes they are also integral parts of government itself (Box 3.20), but usually with specific statuses outlining their independence.

Box 3.21. Committee for Technological Innovation and Ethics (Komet)

In mid-2018, the Swedish government established the Committee for Technological Innovation and Ethics (Komet). Komet stands apart from traditional department structures, is independent from them, and has a wide mandate to make recommendations to the government. The committee's mission is to help the government to identify policy challenges, contribute to reducing uncertainty surrounding existing regulations, and accelerate policy development linked to fourth industrial revolution technologies. The committee's initial focus is on precision medicine, connected industry, and autonomous vehicles, vessels and systems. The committee will continuously deliver policy proposals to the government and, where applicable, also assess whether regulatory frameworks need to be adapted. A reference group, including representatives from government agencies, business and organisations experienced in policy development, will assist the committee.

Source: https://www.kometinfo.se/in-english/about-us/

Resourcing

"If just a tiny fraction of the sums spent on scientific and technological research and innovation were devoted to labs for designing and testing new organizational and institutional structures, we might have

a much broader range of options to head off the looming implosion." (Toffler and Toffler, 2006)

Appropriate resourcing (both financial and human) is a crucial component of the governance of anticipatory innovation. While other types of innovation have strong, immediate drivers in public sector organisations (e.g., austerity see De Vries, Bekkers, and Tummers, 2016) anticipatory innovation lacks these immediate incentives which trigger government action. As discussed above with autonomy, special arrangements for resourcing of anticipatory innovation initiatives have to be made. Without adequate resourcing, the incentives for anticipatory innovation are not totally absent but are not as visible or immediately detectable as the ones that trigger an immediate reaction (e.g. a crisis). The introduction of a new law or certain financial incentives to organisations might provide momentum to dedicate more resources to emerging areas of research and its applicability in the public sector. When it comes to anticipatory resourcing, this does not have to be inside the organisation, but can lie also in the broader networks of communities of practice with in-kind, pro-bono, volunteer or crowdsourced input. See for example the Emerging Futures Fund in the UK (Box 3.21). Yet, this needs to be considered, so that resources can be allocated in a timely manner to emerging issues.

Box 3.22. The Emerging Futures Fund of the United Kingdom's National Lottery Fund

The UK National Lottery Fund established the Emerging Futures Fund in 2020 to help communities (via voluntary and community organisations, registered charities, social enterprises, and Community Interest Companies) move towards recovery and renewal after the impact of COVID-19. They are funding organisations to look at how things are changing, what is needed in this transition, and what is possible in the future.

This unique exploratory funding mechanism of GBP 1 million with a term of 3 to 6 months involves GBP 20 000 - 50 000 awards for projects in 3 areas:

1. Exploring new narratives, perspectives and community storytelling
2. Community foresight and public imagination
3. Investing in strong signals of transformation

The National Lottery Fund wants communities to explore what they want to keep doing because it's been working well, what they want to leave behind as they start thinking about moving into recovery and renewal, any new ideas that will help when it comes to rebuilding and renewal.

The UK National Lottery Fund also intends to use the results of the Emerging Futures Fund to understand and shape additional long-term investment. This open call for projects provides resources for community-sourced emergent responses to an evolving crisis for which exact solutions cannot yet be formulated.

Source: UK National Lottery Fund.

Christensen (1997) maintained that successful innovation implementation requires four types of resources: material resources (physical and financial means), personnel resources (manpower), conceptual resources (knowledge and skills), and time resources (for transition and experimentation). The city of Helsingborg's anticipatory innovation funding scheme was based on provision of conceptual and personnel resources before time and material resources could be invested. Having the tools, space and the common language to talk across political and administrative leadership about anticipatory innovation allowed the city to make the decision to invest its finances into an uncertain area where the outcomes and the projects

themselves are not clear from the outset. The ability to work across silos may also support anticipatory innovation mechanisms. This may require the budget to be geared to inter-departmental, long-term future objectives rather than to departmental concerns (which would in turn require permanent co-ordination and harmonisation of departmental policies) (Burrows, and Gnad, 2018).

Box 3.23. Anticipatory innovation funding in the city of Helsingborg

The City of Helsingborg, Sweden, created a SEK 250 million innovation funding scheme for anticipatory innovation in 2019 with the aim to find new, smarter and more efficient ways to plan and build cities where both the people and planet can thrive. For this, the city has built an open innovation platform around city expo, H22 – A Smarter City, that puts the best innovations on display and invites participants to explore and take part in new urban designs – all the things that come together to compose life in the city. The investment is financed through dividends paid by the Port of Helsingborg, a wholly-owned subsidiary of the City of Helsingborg. From the funding SEK 118 million (approximately 11 million euros) will go to H22. The remaining money will go to the city's committees where they will be used for testing and developing better and more efficient welfare solutions over the course of the subsequent three years.

For the past decade, Helsingborg has been known as one of the most innovative cities in Sweden. In recent years, the City of Helsingborg has received a number of awards: Sweden's IT municipality, Quality Municipality of the Year, Growth municipality of the year and three years in a row 'Sustainability Municipality of the Year' (Gronholm, 2019). The achievements and bold investment in anticipatory innovation did not appear out of thin air. The city began, years ago, by training its senior leaders in innovation and futures thinking; the leadership programmes are not only for administrative managers, but also the city's political leadership. This has helped to build up conceptual resources for transformative innovation in the city. Furthermore, the city created Sweden's first municipality accelerator, Hbg Works, which is a space for the city to start exploring internally AI and more radical innovation ideas. The city has made it possible for civil servants to work in the accelerator for innovation ideas.

Source: OECD; Gronholm, 2019; http://h22.se

Institutional structures

The degree of institutionalisation of anticipatory innovation in governments is an area that still needs to be explored in research and practice, although institutional factors are important to policymaking amid uncertainty. Yet, the institutions literature has traditionally focused on exploring how institutions shape behaviour (a 'first-order problem') and is only now starting to shift towards exploring how institutions themselves change under certain conditions (a 'second-order problem') (Hall, 2010). Nevertheless, this discussion is now coming to the fore in designing for resilience and robustness (Howlett, Capano, and Ramesh, 2018), but little has been learned yet from innovation and complexity literatures in the public sector.

Only a few contemporary challenges can still be confined to one policy area or one national jurisdiction (see Box 1.5. Institutional and transboundary challenges), and governments have realised that a single-issue focus is, in many instances, insufficient- Consequently, foresight and future thinking in some

countries cuts across the traditional boundaries of policy areas and government departments (Habegger, 2010: 50). Some governments have integrated elements of the anticipatory innovation governance model (e.g. use of foresight and futures) into their core activities and businesses (e.g., Singapore, Netherlands and Finland (Box 3.22)). However, a widespread analysis of how a government system works from an anticipatory innovation lens (and the corresponding working structures) is yet to emerge for the public sector.

Box 3.24. Finnish Government Foresight System

The Finnish Government Foresight Group was previously hired in-house by all 12 ministries to facilitate the integration of foresight in decision making processes. A comprehensive scenario-based strategy process was conducted in nearly all the ministries, with the government officials of the ministries being the content creators and owners. The strategies of multiple ministries were built based on this work.

The process in addition created a common understanding of the factors affecting the future of Finland. This formed the basis for the ministerial Future Review, and was the foundation for a joint operating environment analysis, leading to a joint publication of the factors affecting the future of Finland. The process also helped create foresight teams in ministries, increased practical experience among civil servants, and established a common framework and language of foresight within the government. It enabled a multi-level strategic futures dialogue within the government. Furthermore, the process was reported to the meeting of the permanent state secretaries and to the Government Foresight Group, both chaired by the State Secretary. The continuous and joint ministerial foresight work now continues with the experimentation of digital tools across the government for continuous horizon scanning, and a tool for visual reasoning and software-based approach to complex decision-making, strategic reasoning and problem-solving.

Source: OECD (2018) Observatory of Public Sector Innovation. Evaluating Public Sector Innovation Support or hindrance to innovation? Available at: https://oecd-opsi.org/wp-content/uploads/2019/05/Evaluating-Public-Sector-Innovation-Part-5a-of-Lifecycle-Report.pdf

Research indicates that flexible institutional design and variety of institutional configurations – polycentrism – coupled with participatory practices can facilitate diversity of ideas and avoid lock-in (Schoon et al., 2011). As such, Pahl-Wostl (2009) finds that more complex and diverse governance regimes have a higher adaptive capacity. Allowing for ‘slack’ in available resources can help address shocks and crises (Capano and Woo, 2017). The maxim is: designing complexity to govern complexity (Ostrom, 1998).

Different institutional landscapes may influence governments’ capacity for unifying diverging viewpoints and resolving conflicts between stakeholders that are at the core of creating a common vision for the future. More corporatist, co-ordinated (decentralized) politico-economic systems provide better channels for negotiating policies with key stakeholders and, thus, a better platform for consensus-based policy decisions (Schmidt, 2002: 232-245; Schmidt 2009).

Meanwhile, non-corporatist (centralised) systems tend to be better suited for pushing through policy decisions solely by the government (regardless of stakeholder involvement) (ibid). As the knowledge on possible solutions tends to be dispersed between stakeholders, the public sector, as it searches for solutions, needs to move from top-down policy approaches towards more dispersed collective problem-solving approaches (Head and Alford, 2013; Roberts, 2000). This means that if understanding and managing complexity is a goal, governments should move towards an increasingly decentralised and autonomous organisational configuration.”

An institutional infrastructure is needed to accommodate this, especially in very legalistic and slow-changing systems. One of the opportunities to create room for anticipatory innovation is to change the way rules and regulations are made (see Box 3.23 on the emerging field of 'rules as code'), but also changes in human resource, fiscal and budgetary planning and other core government functions are needed.

Box 3.25. Infrastructure for anticipation: Rules as Code

Rules as Code (RaC) rethinks one of the core functions of governments: rulemaking. It proposes that governments create an authoritative version of rules in software code that allows rules to be understood and actioned by computer systems in a consistent way. Not only a technological concept, however, it also proposes to change the underlying processes of government rulemaking and public service delivery. RaC responds to several of the challenges driving the move towards anticipatory innovation governance. At a macro-level, for example, RaC recognises the increasingly wicked, complex and fast-moving nature of issues, which demand responsive and effective public sector intervention. This requires an ability to work rapidly across traditional silos to design responses that are cognisant of related impacts across multiple policy domains. It also challenges existing rulemaking and service delivery structures, which are typically linear, in favour of more agile, iterative and multidisciplinary approaches. RaC proposes to treat government rules as a digital product and service from the outset of their creation. In so doing, it seeks to make government rules and rulemaking more effective for a digital age and represents a deliberate, strategic and systemic response to the transformation of a core government function.

Source: Mohun and Roberts 2020 (forthcoming), Cracking the Code: Rulemaking for humans and machines, OECD, Paris.

Authorising environment

In public management, authorising environments are institution(s) granting the public organisation its powers to conduct its functions and provide/authorise the necessary budget (Andersen and Lawrie, 2002). Authorising environments can be internal or external (governmental-based or community-based) (Ostrom, 1996) and involve politics that are both internal and external to the organisation. In addition to resources, they influence accountability and trust in public organisations.

In the context of the public value literature (Moore, 1995), an authorising environment indicates the legitimate limits on the public manager's autonomy set by the individual and collective values of the multiple stakeholders (Benington, and Moore, 2010). Together with agency, an authorising environment determines which types of anticipatory innovations get explored but also how the overall governance system of anticipatory innovation works.

An authorising environment is needed to fulfil the innovation potential and transformation buy-in of anticipatory government innovation. This involves engaging in both internal and external politics (debates that have been covered on Moore's theses on public value and politics with a big "P" and small "p" (Alford, 2008)). Authorising environments are thus institution(s) granting the public organisation its powers to conduct anticipatory innovation functions and provide/authorise the necessary budget (Andersen and Lawrie, 2002). In addition to resources, they influence accountability and trust in public organisations.

This means defining an authorised perimeter for exploring alternatives or preparing for threats and opportunities that may seem unlikely in current circumstances. The need for authorisation is especially pronounced during priority setting as decisions tend to carry considerable emotive and political weight (Williams 2015), or during funding allocation where strong justifications are needed to shield them for

potential questioning given strong competition with alternative funding allocation. After initial funding decisions have been made, anticipatory innovation tends to be slightly shielded from broader communities inside and outside the organisation in practice (e.g., thus the continued efforts to create structural ambidexterity in organisations). However, to fulfil the innovation potential and transformation buy-in from the broader authorising environment is needed.

Establishing a broad authorising environment for change requires establishing the ideas/narratives behind anticipatory innovation practice as publicly powerful (Adams and Hess, 2010): for example, the need to counter climate change and its effects on people's lives. This is needed as a counterbalance to support experimentation while admitting (at least tacitly) that solutions are unclear. Thus, the critical stakeholders within the authorising environment connected to anticipatory innovation have to remain open to ideas, and not looking towards reaching a pre-determined institutional endpoint (Rao, 2014). Providing relevant and timely knowledge can help, but usually narratives beyond traditional metrics are needed as the evidence base for anticipatory innovation is a priori lacking. In many cases the trust in radical innovation projects comes from the quality of decision-making processes rather than evidence connected to the decisions (e.g., Zimmer-Merkle and Fleischer, 2017).

The following section will discuss some of the key mechanisms which may considerably influence authorising environments in the space of anticipatory innovation. These include: accounting for vested interest, public interest and participation, networks and partnerships, legitimacy, the notion of evidence and the existence of learning loops.

Vested interest and cognitive biases

> "… the future is colonised. No matter how sophisticated the technique… forecasting simply ends up by projecting (the selected) past and the (often-privileged) present on to a linear future." (Sardar, 1999: 9)

An authorising environment for anticipatory innovation may be affected by path dependencies (known in both innovation management and policymaking (Coombs and Hull, 1998; Peters, Pierre and King, 2005)), vested interest (Balalaeva, 2015) and general political myopia (Bonfiglioli and Gancia, 2013).

This is connected to the role and interest of incumbents and business-as-usual that often discourage transformative innovations due to their own interest and incentives gained from legacy systems. This is understandable as many transformative ideas can be directly challenging to the status quo or even potentially destructive when dealing with discontinuous innovation (Schumpeter, 1942/1994). Having a high sunk cost, it is difficult for many to see the broader public good of transformative innovation in the longer term or envision an effective creative accumulation path (Berkek et al., 2013). To be fair, disruptive innovations can be both competence enhancing and competence destroying, which either build on the existing capabilities or make existing knowledge obsolete (Tushman, and Anderson, 1986). In addition, it is often difficult to know for certain how innovation is going to affect existing capabilities (Berkek et al., 2013). Yet, those having explorative strategies towards new domains seem to cope better with radical change and crises in general (Archibugi, Filippetti, and Frenz, 2013).

It is important to make vested interests open and transparent in anticipatory innovation processes as outside of personal motivations, they can start to influence which types of alternatives get explored and which do not, limiting the organisation's innovative scope and behaviour (see for example Trillas, 2020 in the context of regulators). Thus, it is worthwhile to ask 'who is privileged and who is marginalized in a

discourse on the future,' or 'who wins and who loses in that future' (Inayatullah, 1998 through Ramos, 2017), so, the process of 'decolonising' the future can be started.

Existing knowledge base, entrenched in the status quo among seasoned experts, can also start constraining actions and make it difficult to respond effectively (e.g., Macher and Richman, 2004). Thus, authorising environments can also be influenced by expert bias and the 'not invented here' syndrome (tendency to avoid information not created inside organisations or by known partners) (Antons and Piller, 2015). Expert bias does not mean that only the domain-specific knowledge is analysed or taken into account. Experts can also be overly optimistic about the possibilities of their field (Eder, 2003) and thus, either discount criticism or overinvest in specific innovation paths. Furthermore, cognitive biases and group think hinder the human brain to think systematically about the future (Burrows, and Gnad, 2018). Some cognitive biases that are extremely important to expert bias are the following:

- Availability bias: decisions makers and also experts tend to spend more time and resources in those issues that come to mind more easily, due to media, political cycles, accidents or scandals (Cooper and Kovacic 2012).
- Confirmation bias: experts tend to organise evidence to confirm their prior beliefs (so called defence motivation), or direct their attention to facts that confirm those hypotheses on which they have staked their reputation (ibid). This is in line with other ego-based biases like overconfidence, over optimism and wishful thinking (Heger and Papageorge, 2018).

One overarching bias beyond individual cognitive biases about the future (projection bias, hyperbolic discounting, and others) is people's limited ability to envision the future and relate on a tangible, experiential level with future scenarios, although some methods and practices are showing promise (see box 3.26).

Box 3.26. Breaking cognitive biases by experiencing the future

The future, with all its possibility and uncertainties, is difficult to imagine, which creates a bias against action to shape the future. Several practices have emerged over the last 20 years that can reduce the abstraction and increase the actionably of futures knowledge.

Design fiction

Design fiction is a combination of design, science fact, and science fiction, an amalgamation of practices and a way of materialising ideas and speculations without the pragmatic curtailing that often happens when dead weights are fastened to the imagination.

The practice of design fiction seeks to manifest possible worlds tangibly, although not always set in the future − most often through physical objects and installations, or media artefacts such as short films to prototype elements of a possible world; past, present or future.

An example is a card-based game called Thing from the Future that challenges players to describe, collaboratively and competitively, objects from a range of alternative futures. The object of the game is to come up with the most entertaining and thought-provoking descriptions of hypothetical objects from different near-, medium-, and long-term futures.

Experiential futures and scenarios

Experiential futures and scenarios is a practice and method for bridging the “experiential gulf” between inherently abstract notions of possible futures, and life as it is apprehended, felt, embedded and embodied in the present and on the ground. It involves exploring and shaping change by using “the continuum of human experience”, instead of confining activity to legacy methods and media, such as white papers, or workshops relying entirely on verbal exchange. The need for experiential futures is rooted in a challenge inherent to futures work: by definition, it deals with abstractions. In order to activate adequate consideration and responses, “the future” needs to be embodied.

An experiential scenario is the manifestation of one or more fragments of an ostensible future world in any medium or combination of media including image, artefact, and performance. It involves designing and staging interventions meant to be experienced, exploiting the full array of sensory and semiotic vectors, in order to enable a different and deeper engagement in thought and discussion about one or more futures. This is a complement to the traditional textual and statistical means of representing scenarios and one that can be experienced socially, further reducing abstraction and facilitating the development of consensus around resulting options for taking action.

It includes not only futures-inflected editions of conventional design outputs (print material, concept images, prototypes, physical artefacts, etc.), but also takes in all manner of other things that one might create in order to manifest, evoke and make available thoughts, feelings and insights about the whole gamut of possible futures. This wide palette includes installation, mail art, advertisements, immersive theatre, guerrilla intervention, digital simulation (VR/MR/AR), and games. Tangible, immersive, interactive, live, and playable modes are all in scope.

An example is the development of a scenario in which people experience ‘air from the future’ to demonstrate the consequences of continuing to burn fossil fuels or developing a future “spa” offering behavioural modifications for convicted criminals on behalf of the government, including proprietary ‘narrative therapies’ using AI implants, ingestible tech, and the smart city grid. Such experiential scenarios are intended to interrogate values, imagine possible futures, and explore actions to address complex problems.

Note: Experiential futures scenario by Leah Zaidi

Source: Candy and Dunagan, 2017. https://doi.org/10.1016/j.futures.2016.05.006

Other biases that influence decision making include herd behaviour (see Banerjee 1992), action bias (see Patt and Zeckhauser 2000), or tunnel vision (Kahneman 2011). Table 3.4 gives an overview of flaws in cognitive processing and their influence in innovative problem solving. Especially in the anticipatory innovation space these can lead to what is called the "Minimal Squawk Behaviour" (Leaver, 2009) – trying to avoid problems and keep a low profile if there is no significant environmental pressure. This means that civils servants tend to act only when risks have already emerged.

Table 3.5. Flaws in Cognitive Processing and Their Consequences for Innovative Problem Solving

Cognitive Bias	Description	Innovation Consequences
Projection bias	Projection of past into future	Failure to generate novel ideas
Egocentric empathy gap	Projection of own preferences onto others	Failure to generate value-creating ideas
Focusing illusion	Overemphasis on particular elements	Failure to generate a broad range of ideas
Hot/cold gap	Current state colours assessment of future state	Undervaluing or overvaluing ideas
Say/do gap	Inability to accurately describe own preferences	Inability to accurately articulate and assess future wants and needs
Planning fallacy	Over optimism	Over commitment to inferior ideas
Hypothesis confirmation bias	Look for confirmation of hypothesis	Disconfirming data missed
Endowment effect	Attachment to first solutions	Reduction in options considered
Availability bias	Preference for what can be easily imagined	Undervaluing of more novel ideas

Source: Liedka, 2015: 930.

Interdisciplinary approaches, internal reviews, and formalised critical dissent practices are very important to counteract biases introduced by a small group of experts. Experts are often "subject to implicit, ambiguous assumptions about the shape of future developments, and to the biases that accompany the expertise of their proponents" (Low, 2017). Furthermore, the active inclusion of minority voices and disadvantaged groups is essential to pool new types of knowledge from differently situated actors and counter vested interest (Pratt et al., 2016). This is important not only in thinking about the future, but also its application in technology so that existing and new biases are not introduced to technological designs (see Box 3.24). Tools and methods need to account for complexity, perception, values and worldviews that may create vested and pre-determined interest. This can be done using Causal Layered Analysis, Integral Theory, etc., which are covered under the tools and methods section.

Box 3.27. Avoiding bias in AI

Biases are not only introduced by people into the system – they also emerge based on how technology is designed and its underlying logic (e.g., which data it can or cannot process). This is most evident in the cases of AI, where existing biases in data based on race, ideology, gender etc. could be introduced to the AI and thus government decision-making processes. This could lead to unfair or unlawful practices or the perpetuation and deepening of existing discrimination (OECD, 2018). Governments must ensure they have access to sufficient, quality, unbiased data before they can fully and ethically take advantage of AI techniques (Berryhill et al., 2019).

The OECD established a multi-stakeholder group on artificial intelligence at the OECD (AIGO) in 2018 to design principles that would maintain trust in this technology (OECD, 2019). Based on this work, the OECD developed a document entitled Recommendation on artificial intelligence in 2019, which declares that "AI actors should respect the rule of law, human rights and democratic values, throughout the AI system lifecycle. These include freedom, dignity and autonomy, privacy and data protection, non-discrimination and equality, diversity, fairness, social justice, and internationally recognised labour rights".

Source: Berryhill et al., 2019; OECD (2018), "AI: Intelligent machines, smart policies: Conference summary", OECD Digital Economy Papers, No. 270, OECD Publishing, Paris, https://dx.doi.org/10.1787/f1a650d9-en.; OECD (2019), Scoping principles to foster trust in the adoption of AI, Proposal by the Expert Group on Artificial Intelligence (AIGO), http://oe.cd/ai.; OECD (2019), Recommendation of the Council on Artificial Intelligence, OECD Publishing, Paris, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449.

Occasionally, consensus can be reached; sometimes, it may be necessary to actively and directly supress opposition to innovation (read more about induced institutional innovation in Ruttan and Hayami, 1984). This means delving into group dynamics not only on individual vested interests and biases. In very broad strokes, diversity, again, may be of help here: the more diverse the groups the better their 'seismic sensitivity', i.e. their ability to detect 'weak signals', to distinguish them from 'noise' and to incorporate new drivers of change into their thinking (Silver, 2012).

Nevertheless, path dependencies, vested interest and short-termism cannot be counteracted by standalone measures, but have to be supported by institutional mechanisms that will take decision-makers out of the short term. Anticipatory innovation governance mechanisms should act as 'commitment devices' that, through the systemic use of analytical tools and policy frameworks, embed the future in the present (Boston et al., 2019).

Public interest and participation

Members of the public, who warrant the development of innovations as citizens and taxpayers and who may be exposed to their benefits and risks as users, are an important constituency in responsible research and innovation (Arentshorst et al., 2016; Stilgoe et al., 2014). As anticipatory innovation by definition can be disruptive, large-scale citizen engagement in diagnosing change and influencing society could be needed. This falls under the umbrella term "Anticipatory Democracy" (Toffler 1970; Bezold, 1978; 2019) coined by the influential futurist, Alvin Toffler. Yet, there is always the "fear of the public's fear" that in many cases holds back innovation and even discussions around them (Marris 2015; Ribeiro and Shapira, 2019).

Many countries struggle to keep pace with innovations, require rigorous public engagement methods to inform anticipatory innovation governance in terms of the connected values and potential impacts of change (e.g., Grunwald, 2014). Public interest and participation are important parts of the authorising environment for anticipatory innovation not only in terms of validating which innovations or futures to pursue, but also providing input into the development process itself. Already, participatory foresight

activities seek to include civil society in the negotiation of a “more fruitful” social contract around techno-scientific advances (Kaivo-oja, 2017). From an innovation perspective itself, it is important to involve upstream stakeholders as early as possible, because innovations tend to become more entrenched and thus harder to change later on. Yet, there is little or no research into how, in practice, prospective public deliberative processes should be organised to inform anticipatory innovation governance (Lehoux, Miller, and Williams-Jones, 2020). Input could be needed to aid in policy formulation and decisions, priority setting, cooperation, networking and crowdsourcing, generating visions and images of future, triggering action and public debate and consensus around potential options. However, in general, broad foresight processes and scenarios tend to ignore the human perspective with living with a particular innovation or technology (Stahl et al., 2014). Thus, it is important to introduce deliberative mechanisms that support mutual learning processes between experts and non-experts by exploring what these individuals know about a given innovation and what they value (Lehoux et al., 2009; Lehoux, Miller, and Williams-Jones, 2020). One of the large-scale examples of the former was facilitated by the Danish Design Centre in Denmark as part of the Futures Welfare project (Box 3.29).

Box 3.28. Participatory Futures: Future Welfare

Future Welfare is a participatory futures platform developed by the Danish Design Centre (DDC), which uses participatory futures and design tools and methods to address the complex challenges the Danish welfare system is experiencing now and prepare for how they may evolve in the future. The platform comprises various projects in the healthcare field. Boxing Future Health, for example, is a laboratory where more than 3 000 stakeholders engage in immersive scenarios of possible futures in a controlled environment. As part of this project, the 'Chemotherapy at Home' initiative aims to enhance hospital efficiency and patient comfort by administering chemotherapy treatment at home monitored by digital pumps.

The design-centred approach allows uncertainty to be dealt with in a dynamic way, as the construction of alternative future scenarios in controlled 'labs' where participants can experience potential futures recognises that the future state of the Danish society and welfare needs is not fixed but constantly evolving and responsive to new emerging developments. This is evident in the use of backcasting to track the possible future state of healthcare in 2050 and then work backwards to define a path that traces developments from that future horizon to the present, thus examining what has to be addressed now and in the near future (2020 and 2030).

Scenarios enable participants to depart from the current factual world to explore radical ideas, without any predetermined rules that restrict their imaginary capacity. The ideas generated by participants across sections tend to be heterogeneous, due to the diversity in their background and expertise. This diverse knowledge can further inspire participants to respond with alternatives when their own beliefs and understandings of the world are challenged. This enables critical revision of presumed assumptions and spurs further conformity-breaking tendencies among participants. From a policy perspective, this platform provides an opportunity to explore future scenarios in a participatory way, thereby revealing values around potential options, which in this case has implications for the future welfare system in Denmark.

Source: Authors based on Danish Design Center and case developed by the LSE Capstone Report on Anticipatory Innovation Governance, 2020.

There are asymmetries in knowledge, language, and power connected to futures as wells as thinking and talking about anticipatory innovation (Brey, 2017). Non-experts should be encouraged to use their experiential knowledge to reflect prospectively, their "imagination of the future may need enhancement" (Boenink et al., 2018). As outlined in the tools and methods-section, there are online approaches that make it possible to creatively engage with thousands of people at the same time. For instance, the Institute for the Future's Massively Multi-player Online Games or the Open Foresight projects relies on off-the shelf social media platforms to conduct social foresight inquiry (Ramos, 2014). Yet, some of these approaches can remain transactional. Engaging in moral or practical imagination requires a synthesis of the personal with the collective which requires "the capacity to imagine something rooted in the challenges of the real world yet capable of giving birth to that which does not yet exist" (Lederach, 2005). These discussions should be facilitated in ways that move the debate beyond prevailing interests, and negates prevailing power relations that may distort the discussion (Brey, 2017).

Participatory and deliberative ethical approaches to anticipatory innovation enable the inclusion of the opinions, viewpoints, and moral intuitions and judgments of different people in a way that could enrich the

assessments of innovations and assure better outcomes (Brey, 2017). This allows for ‘democratic anchorage’ (Sørensen and Torfing, 2005) of anticipatory innovations. Some examples of these have emerged in the field of AI (see Box 3.23). Yet, envisioning novel (sociotechnical futures) is not straightforward – most scenario-based methods raise challenges and dilemmas from existing contexts and technologies. There are two challenges with public engagement for anticipatory innovation: first, it is difficult to make the effects of innovations tangible that are still in blue sky thinking (Davies and Selin, 2012). Second, there is very little in terms of methodology that helps to creatively envision how these innovations are governed from a serious moral standpoint (what should – or should not – happen in the future) and how to anticipate future ethical issues (e.g., how to obtain equality within and between generations; conflicting perspectives of lead users and users of today) (Lehoux, Miller, and Williams-Jones, 2020). The more machine learning, real-time and predictive data analytics techniques increase in the field, the more difficult it becomes to navigate for stakeholders (Aykut, Demortain, and Benboudiz, 2019). Hence, other tools need to be brought to the table in tandem with technological developments to analyse values. This can be done through various forms of anticipatory ethics including formal analysis of built features (Brey, 2012), real-time technology assessment (Guston, 2011), or specific ethics interventions (Shilton, 2015). The reality is, however, that future societies that have already integrated novel approaches or technologies into their lives, judge them differently from the context of their use, rather than values that are contextual to the world we know now (Nordmann 2014). So, for example, cars and airplanes today are viewed very differently than a hundred years ago. It is difficult to imagine that generations past would have been able to decide upon the needs of urban mobility today.

Box 3.29. Engaging stakeholders for AI

Citizens' juries about ethical AI

Decisions within public services are increasingly being made with the help of AI and predictive analytics. While there is considerable potential in these initiatives, there are also known risks and costs associated with the use of AI. Striking the right balance between benefits and costs requires debate and conversation with all stakeholders, also citizens, who have been excluded so far from the discussion.

The RSA (Royal Society for the encouragement of Arts, Manufactures and Commerce) has tried to remedy this through the creation of the RSA's Forum for Ethical AI. In the first phase of this work, the RSA and Deepmind ran a citizens' jury to explore the use of AI in decision-making. Drawing on the model of the RSA's Citizens' Economic Council, we convened participants to grapple with the ethical issues raised by this application of AI under different circumstances and enter into a deliberative dialogue about how companies, organisations, and public institutions should respond.

UNICEF's Generation AI

UNICEF's Generation AI is a multi-year initiative that aims to set and lead the global agenda on AI and children: outlining the opportunities and challenges, as well as engaging stakeholders to build AI powered solutions that help realise and uphold child rights.

The team behind the initiative will consult experts across relevant fields to fill in the gaps in evidence where it is most needed to further child rights in the context of the extremely far-reaching, fast-paced, and in some cases unpredictable development of AI technologies. Nevertheless, the formal research with collected insights from children relaying their hopes, worries, and visions for how technology may impact their lives. Taken together, this work will inform sets of actionable, specific recommendations for governments, companies, and caregivers that we will stress test before striving to implement through strategic partnerships.

Source: https://www.thersa.org/action-and-research/rsa-projects/economy-enterprise-manufacturing-folder/forum-for-ethical-AI; https://www.unicef.org/innovation/GenerationAI

There is a need to combine prospective analysis (awareness of long-term future prospects, and of the need to pay due regard to agency, uncertainty, and the associated scope for alternative futures) with participatory processes (paying due regard to the dispersion of knowledge and agency across multiple stakeholders, whose insights and engagement need to be mobilised) (Miles, 2012: 71). In addition, as argued before, this should also have a practical relevance (being closely related to actual decision making and strategy formation actions (ibid)) in terms of anticipatory innovation governance, so, stakeholders also see their input into actual innovations explored. This can be done through anticipatory action learning (Inayatullah, 2006) and processes called 'rehearsing for reality' which empowers stakeholders with agency participating in anticipatory processes (Kesby, 2005: 2039). An example of this can be found in the Netherlands in the field of environment and climate change.

Box 3.30. Rehearsing the future in the Netherlands

The Netherlands has a long tradition of using scenarios to explore the future but has struggled to apply them. This has been overcome by organising a regular practice and rehearsal in which policymakers and stakeholders in a joint and guided undertaking practice the use of scenarios, for instance, to prepare vision building, strategy development or decision-making.

Both in the public and the private sector scenario studies have been conducted and published, regularly, for many years (see for example the PBL Netherlands Environmental Assessment Agency and CPB Netherlands Bureau for Economic Policy Analysis). In addition to them, various other public organisations as well as large companies such as Shell, Philips and Rabobank have been using scenario planning for years.

Various surveys in the Netherlands show that most policymakers working on a national level are familiar with scenario studies and that these studies are widely used. But they also indicate that policymakers and stakeholders do not always use scenario studies in accordance with the intended use of these studies. For instance, only scenarios indicating high economic growth are taken into consideration, increasing the risk of over investments in infrastructure or offices. Policymakers often find it difficult to take into account all the different possible futures presented by scenarios, and struggle with the question of how to develop policy on that basis. Sometimes they also find it frustrating, since scenario studies not only include 'desirable' scenarios, (e.g. economic prosperity), but also 'undesirable' scenarios (e.g. economic stagnation).

The actual use of scenarios is stimulated by the process of rehearsing the future. This is done by organising regularly and over an extended period of time a series of informal dialogues in which policymakers and stakeholders in a joint and guided undertaking practice the use of scenarios. Application include, for instance, preparing vision building, strategy development or decision-making. In the subsequent dialogues the participants may use the scenarios to identify the relevant aspects of a policy issue, to identify the possible future challenges regarding the issue, to make their different ambitions related to the issue explicit and to explore how these ambitions may be realised. During each dialogue, the participants work in small parallel groups, in which they not only discuss these matters but they also visualise them and reflect on them. They do this in several rounds. In each round, input is provided by another scenario. In this way, they are stimulated, for instance, to identify the minimum as well as the maximum challenge regarding the issue (indicated by contextual scenarios) or to combine elements of different ambitions regarding solving the issue (exemplified by policy scenarios). The results are reported on flips and maps and integrated in a report on the dialogues that provides stepping stones for vision building, strategy development or decision-making.

The informal dialogues may be organised prior to or in parallel with the formal procedures of vision building, strategy development or decision-making. Although no formal decisions are taken within the informal dialogues, the dialogues can help to prepare such decisions. Dialogue participants who hold strategic positions within their organisations can act as ambassadors between the informal dialogues and the formal procedures. For participants the dialogues are a time investment, but their effort will pay off as the formal procedures regarding vision building, strategy development or decision-making will be smoother and less time-consuming: 'by taking time you save time'.

Source: OECD based on Dammer, 2019.

Networks and partnerships

> "The very idea behind transition management is to create a societal movement through new coalitions, partnerships and networks around arenas that allow for building up continuous pressure on the political and market arena to safeguard the long-term orientation and goals of the transition process." (Loorbach, 2010: 239)

The range of alternatives under exploration is usually dependent on organisations, agencies and companies working on a particular challenge – in essence the networks and partnerships connected to transformative change (Ramos 2010). These in broad terms are classified as global knowledge networks (Stone, 2002) that encompass policy networks, scientific networks, alliances and networks of experts, and public and private arrangements all important to anticipatory innovation processes (Croxatto, Hogendoorn, and Petersen, 2020). The ability to effectively partake in the former is known as 'collaborative network capability' and is associated with competitive advantage of organisations (Arkadani, Hashemi, and Razazzi, 2019). This capacity should be analysed across individual, organisational and network levels.

Thus, networked or collaborative governance models are relevant to anticipatory innovation, especially those involving engagement with those with access to weak signals and early insights about forthcoming transformative changes. Over the last decade, following the introduction of technology enablement-oriented Government as a Platform (see O'Reilly 2011) and more broad collaborative governance (see Emerson 2012), governments have been encouraged to borrow from technology platform principles to incorporate co-creation methods into their processes and to develop shared decision-making and collective development of policies and projects—beyond traditional public participation, institutionalised expertise, and public-private partnership models.

Some networks transcend scale. Networked regions and transnational city-networks—such as C40 Cities and Global Compact of Mayors—have become increasingly involved in pooling resources, setting agendas, and sharing policies and experimental knowledge, especially around broad social missions and goals like carbon reduction (Gordon and Johnson, 2018). These networks may also be leveraged to share weak signals and early insights for anticipatory innovation both in cities and regions as well as at national and international levels.

Both formal and formal networks and mechanisms of governance can build capacity for anticipation. Formal mechanisms of governance are organisational and legal features such as corporate ownership, structural design, and legally binding contracts (e.g., strategic alliances and joint ventures) while relational mechanisms are forms of governance that rely upon the social ties created by actions and trust from prior experiences between partners, constituting de facto governance practices (Somavilla et al. 2020). The latter is of particular importance for anticipatory innovation. These informal alliances over time allow actors to target strategic directions designed to maintain and sustain frequent interactions, generating governance effects on the way in which expert knowledge is built and gains authority. This trusted relationship, while still subject to the same normative biases of any group, can open up situations for exploring uncertainty.

Thus, to be effective, governments have to engage with these networked ecosystems to spur on anticipatory innovations and have collaborative network capabilities to be successful. One of the most impressive and effective networked governance model can be found in Mondragon Valley in the Spanish region of Gipuzkoa (Box 3.25)

Box 3.31. D2030 Social Innovation Platform in the Mondragon Valley, Gipuzkoa

D2030 is a Social Innovation Platform comprised of a network of actors in the region of Gipuzkoa, a sub-national entity north of Spain. The region, home of the Mondragon Cooperative Valley in the Basque area, the world's largest industrial co-operative ecosystem, draws from its Basque culture and heritage traditions in embarking on a "Just Transformation" towards a low-carbon future economy. Just Transformation draws from the Just Transition framework developed by the trade union movement to encompass a range of social interventions to secure workers' rights and livelihoods when economies are shifting to sustainable production, primarily combating climate change and protecting biodiversity.

The D2030 Platform aims at generating the largest Deep Demonstration on how industrial ecosystems can design, implement and evaluate Just Transitions while applying the radical democracy and inequality-fighting principles embedded in the local Basque culture for generations. For this purpose, public authorities, private sector, civil society, international organisations, and academia are working together to generate a new systemic response to the existing and emerging challenges of the area: digitalisation, decarbonisation, ageing, etc. with a priority focus on developing new inclusive competitiveness models.

The Regional Government of Gipuzkoa, a partner in this network, is leveraging the network as a platform for experimentation for their future innovation strategy, "Building the Future" (Etorkizuna Eraikiz). In 2020 and 2021, all D2030 network members will work collaboratively to develop, test, and learn from experiments and explore alternatives and will develop governance mechanisms that enable an anticipatory approach. The networks and partnerships mechanism D2030 allows for inclusion of insights from a broad network of lead users and ecosystem shapers in the region as well as a way to mirror the public values and participatory cultural traditions of the region.

Source: OECD based on input from Regional Government of Gipuzkoa.

Networks and partnerships are, thus, an important part of the authorising environment for anticipatory innovations, discussing and framing value boundaries connected to developments (see, e.g., Croxatto, Hogendoorn, and Petersen, 2020). They are essential in understanding and participating in disruptive innovation processes and the connected innovation path creation (Garud, Kumaraswamy, and Karnøe, 2010). (See the difference between path dependence and path creation in Table 3.5). These networks use formal or relational mechanisms to build capacity. Substantial work has been completed in recent years in the areas of open innovation, collaborative innovation and innovation ecosystems to understand network effects to innovation in recent years (e.g., Dedehayir, Ortt, and Seppänen, 2017; Verhoest et al., 2019).

Table 3.6. Path dependence versus path creation

Dimensions	*Path dependence* [a]	*Path creation*
'Initial conditions'	Given	Constructed
'Contingencies'	Exogenous and manifest as unpredictable, non-purposive, and somewhat random events	Emergent and serving as embedded contexts for ongoing action
'Self-reinforcing mechanisms'	Given	Also strategically manipulated by actors
'Lock-in'	Stickiness to a path or outcome absent exogenous shocks to the system	Provisional stabilisations within a broader structuring process

Source: Garud, Kumaraswamy, and Karnøe, 2010.

In the field of anticipatory innovation governance is de facto an emergent system where boundaries are still in flux. In collaborative forums and arenas ideas are tested in polycentric environments. Networks and participants in the broader knowledge system are the ones that usually normalise ideas within a specific field (Gupta, and Möller, 2019). This points to the importance to analyse the role of self-governance and 'de facto governance' (Rip, 2010) as element in anticipatory innovation governance, especially in the early stages of development of different fields (Wienroth, 2018).

Legitimacy

Policy environments can be also ill prepared for innovation due to political or economic constraints, which are somewhat different from those in the private sector (Mol 2009). When it comes to commitment to change, the political system cannot be overlooked. To be able to commit to change and carry it through effectively, anticipatory innovation processes need to be legitimate. This is not only dependent on the analytical capabilities of civil servants, but also organisational skills and capacities of ministers and political staff that lend legitimacy to processes and decision-making (Tiernan 2015).

Box 3.32. Legitimacy for long-termism in Spain

In January 2020, the Government of Spain created a foresight unit within the Prime Minister's Office quickly after the formation of the coalition government. The National Office for Prospective and Long-Term Country Strategy (*La Oficina Nacional de Prospectiva y Estrategia de País a Largo Plazo*) was inspired by the foresight units in Canada, USA, France, Finland, and the United Kingdom. The Office was formed to address structural issues in Spain over the next 30 years, including climate change and the rural exodus and to counter the short-termism of democratic governance: urgency overshadowing importance, legislative obsolescence, a focus on quick wins, and an increased rate of change in daily life. The office will explore possible demographic, economic, geopolitical, social and educational challenges and opportunities in the medium and long term and help the country prepare for them.

This move, made in the context of a newly formed government that has been moving to consolidate its own overall political legitimacy, represents a clear and strong commitment to the institutional role of anticipation and foresight at the centre of national-level decision-making.

Additionally, the Spanish foresight capability represents not only its own legitimisation of foresight as a strategic approach for Spain, but it also legitimises the prior foresight units in the countries that inspired the Spanish Office.

Source: https://www.boe.es/eli/es/rd/2020/01/27/136/con and https://www.lamoncloa.gob.es/serviciosdeprensa/notasprensa/presidencia/Paginas/2020/140120-redondo.aspx

On the individual level, legitimacy can be seen as part of the 'political acumen' that is needed to change processes, innovate (Pal and Clark 2015), but in an uncertain, complex context it is more than that. Woo et al. (2015) argue that not only capacity at the organisational and individual level are important, but also policy capacity at this 'master' steering level (legitimation capacity) is needed to establish trust as a system-level resource and build political support (Ramesh et al. 2016). For example, Finland addresses these issues around legitimacy of anticipatory action through future reviews that are up for public debate (Box 3.25). In essence, there is a need for strong visionary leadership as old concepts of order erode faster than new recipes for stability can be created (Burrows and Gnad, 2018) and these visions should be open for debate.

Box 3.33. Future reviews in Finland

The futures reviews of the ministries describe Finland's key questions in the years ahead. Their purpose is to assess situations and developments in society and examine issues for political decision making connected to the future. The aim is to generate public debate and provide information for the forthcoming elections and government formation talks.

There have been five iterations of futures reviews in Finland: the earlier ones were published in 2003, 2006, 2010 and 2014 and the last in 2018. The ministries' foresight working group coordinates the drafting process and has members from each ministry.

Source: Hallinnonalojen tulevaisuuskatsaukset. Available at: https://vnk.fi/tulevaisuuskatsaukset; https://valtioneuvosto.fi/en/artikkeli/-/asset_publisher/10616/tulevaisuuskatsaukset-suomisopeutuu-omin-vahvuuksin-globaaliin-muutokseen

While senior leaders in organisations often tend to defend the status quo and mainstream thinking, the involvement of decision-makers enhances buy-in especially if it involves 'outsiders'. (Burrows and Gnad, 2018). This is a paradoxical, but important balance to gain the space and legitimacy required to implement anticipatory innovation. It is generalised as the Disruptor's Dilemma or the need to gain the support of the very incumbents they disrupt (Ansari, Garud, and Kumaraswamy, 2016).

In fact, sometimes disruptions and crises can create legitimacy for anticipatory innovation, especially if everyone believes in the importance and urgency of the crisis, such as governments' responses to covid-19. While the innovative responses themselves tend to be responsive and adaptive to the new reality created by the crisis, a new legitimacy is created for governance mechanisms that anticipate such crises in the future.

Box 3.34. Building legitimacy for a digital sandbox at the UK Financial Control Authority

The innovation division at the Financial Conduct Authority of the United Kingdom (FCA explored the creation of a permanent digital sandbox to provide enhanced regulatory support to innovative firms so they can test and develop 'proofs of concept' in a digital testing environment.

Based on their experience of running the Regulatory Sandbox, TechSprints, and other innovation services, the FCA recognised that data had become increasingly vital to the way firms operate and engage with each other and the consumers they serve. They also recognised the long-standing challenges like data access, industry collaboration, and data standardisation as barriers for market participants and innovators. Their proposed digital sandbox included:

- Access to high-quality data assets including synthetic or anonymised data sets to enable testing and validation of technology solutions.
- Regulatory call-to-action – to identify areas of regulatory interest where FCA would like to see innovation play a greater role, or issue specific challenges.
- A collaboration platform – to facilitate diversity of thinking, share learnings and foster an ecosystem around solving complex industry-wide challenges.
- An observation deck – to enable regulators and other interested parties to observe in-flight testing at a technical level, to inform policy thinking in a safeguarded environment.
- Application programming interface (API) or vendor marketplace – where vendors can list their solutions and APIs, to encourage greater interoperability and foster a thriving ecosystem.
- Access to regulatory support – such as development of testing plans, signposting to relevant regulations, informal steers or support to understand the wider regulatory environment or the authorisation process.

This sandbox would build anticipatory governance mechanisms for alternatives exploration, feedback loops with lead users in the ecosystem, as well as networks and partnerships. The covid-19 crisis created and exacerbated many challenges within financial services, including issues such as fraud prevention, and supporting vulnerable consumers of financial services. There was an opportunity to accelerate the development of the digital sandbox by launching a pilot version, specifically aimed at tackling some of the challenges caused by the coronavirus. The launch of the pilot would enable support of digital innovation at a more rapid pace during Covid-19, while allowing the FCA and others to evaluate the features of the Digital Sandbox.

In effect, the crisis not only provided the legitimacy for innovative responses, but also for permanent structures, i.e. anticipatory innovation governance mechanisms, to be developed. If successful, the pilot will put the FCA in a better position to respond to future crises that demand digital solutions. In addition, this new structure will likely position the FCA as a shaper of future financial technology and regulations as well. One potential future policy role for the Digital Sandbox, could be to make available dummy data sets for proposed Open Finance initiatives. This would allow innovators to test and ideate with dummy data, to demonstrate what could be achievable if financial institutions were required to open access to various data sets. This process could act as a trial to inform the policymaking process.

Source: Innovate FCA: Digital sandbox – coronavirus (Covid-19) pilot. Available at: https://www.fca.org.uk/firms/innovation/digital-sandbox

Evidence and evaluation

> "The future is uncertain, in many policy areas there is deep or radical uncertainty. Yet evaluators (parliamentary or otherwise) of the quality of anticipatory governance are time bound. They cannot jump decades or centuries forward in time and then look back to assess how well the governments of the early 21st century prepared for, or navigated, the future. Historians many generations hence will enjoy the benefit of such hindsight, but current observers do not. Accordingly, any assessment today of the quality of anticipatory governance is bound to be imperfect and incomplete." (Boston et al., 2019)

Anticipatory innovation governance invariably involves the exercise of judgement. But can one make a case for something that is inherently uncertain? Some of the issues connected to evidence for anticipatory innovation was covered in the Chapter 1, in connection with dealing with uncertainty. So, it should not come as a surprise that at the very centre of anticipatory innovation governance there is a serious epistemological problem. "Proposed anticipatory actions intended to influence the shape of the future are based on 'uncertain normative claims' which are inherently uncertain (because they describe what the future will be) and prescriptive (because they describe a good or desirable future)" (Mittelstadt, Stahl, and Fairweather, 2015).

Box 3.35. Evaluation mechanisms for France's Fund for Public Transformation (Le Fonds pour la transformation de l'action publique) (FTAP)

In 2017, French Prime Minister announced the creation of a 5-year, EUR 700 million fund for carrying out public transformation, as part of the Action Publique 2022 programme. The goal of the Public Action Transformation Fund (Le Fonds pour la transformation de l'action publique, FTAP) is to support the implementation of long-term structural reforms in the French public sector, including large- and small-scale reforms to improve the public service and reduce public spending while fostering experiments and bold initiatives that have a very high potential for improving public services, such as:

- digital transformation and digital service creation;
- resource and expenditure pooling, and shared service centres;
- public service improvement experiments; and,
- re-organisation, merger and overhaul projects to reduce duplication.

The Interdepartmental Direction of Public Transformation (DITP) was charged with coordinating calls for projects with public actors, collecting responses, monitoring projects, and examining proposed projects upstream of a steering committee.

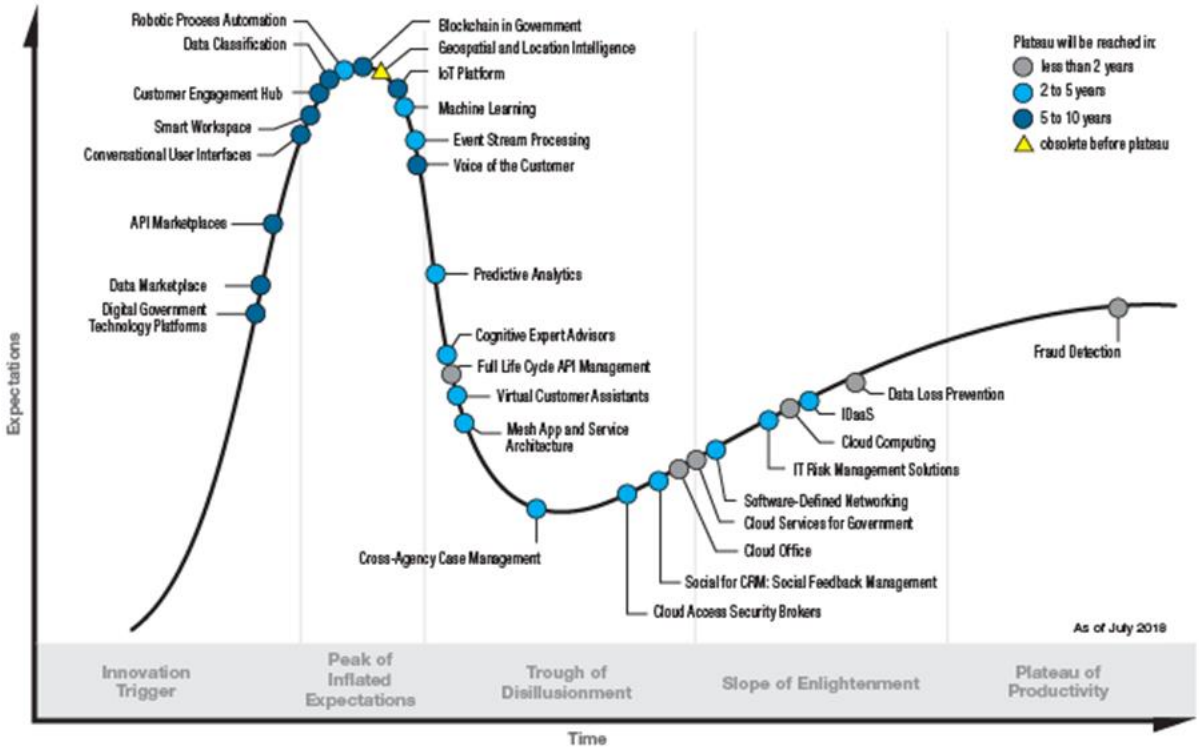
Despite the ambitions and resources dedicated to the fund project, which provided legitimacy for the role of innovation and transformation in shaping the future of the public sector in France, the mechanism of evaluation and evidence limited the types of projects eligible for the funding. Following initial calls for projects, the DITP discovered challenges in not only soliciting many projects at all but also in advancing ambitious projects with uncertain outcomes. This could be due, in part, to the requirement that for each 1 euro invested, project submitters were required to show at least a 1 euro return. Further, the minimum project budget was set at EUR 1 million and only senior civil servants were permitted to respond to the call for projects. As many project evaluation requirements were constrained by law, the DITP was limited in its ability to advance truly radical and bold transformation projects, although DITP has been exploring other ways to provide flexibility despite the rigid constraints.

The case of the Public Action Transformation Fund is not unique in terms of its evaluation and evidence mechanism. Most public entities are accountable for spending public funds. However, future evidence and evaluation is constrained as it is based on a limited and normative definition of public value (i.e. financial savings) and will tend to limit the amount of anticipatory innovation and future-oriented transformation that can occur.

Source: Input from Direction Interministérielle de la Transformation Publique (DITP), France ; and, ACTION PUBLIQUE 2022. Available at: https://www.modernisation.gouv.fr/action-publique-2022/fonds-pour-la-transformation-de-laction-publique/700-millions-deuros-pour-transformer-laction-publique

Clearly uncertain normative claims in an evidence-driven policymaking systems does not carry a lot of justificatory power. They are seen as a mixture of fact, analogy, surmise, speculation, and outright fantasy. Indeed, many future possibilities may just be that – possibilities – or hypes that never materialise. Gartner Hype Cycle for Digital Government Technology is a good example here (Figure 3.12) – most technologies may never go through disillusionment. How can anticipatory innovation governance live up to good standards of evidence (Box 3.26)?

Figure 3.12. Gartner Hype Cycle for Digital Government Technology, 2018



Source: www.gartner.com/smarterwithgartner/top-trends-from-gartner-hype-cycle-for-digital-government-technology-2018.

Box 3.36. Ensuring the good governance of evidence - what standards of evidence are needed for policy design, implementation and evaluation?

The OECD Expert Meeting on Standards of Evidence has developed six standards for evidence. They are:

- **Appropriateness**: Evidence should be selected to address multiple political considerations, useful to achieve policy goals, and consider the local context.
- **Integrity (honest brokerage)**: Individuals and organisations providing evidence for policymaking need processes to ensure the integrity for such advice, including managing conflicts of interest, ethical conduct and the influence of lobbying.
- **Accountability**: those setting the rules and shape of official evidence advisory systems used to inform policymaking should have a formal public mandate, and the final decision authority for policies informed by evidence should lie with publicly accountable officials.
- **Contestability**: Evidence must be open to critical questioning and appeal, can include enabling challenges over decisions about which evidence to use.
- **Transparency**: Information should be clearly visible and open to public scrutiny. The public should be able to see how the evidence bases informing a decision are identified and utilised. Transparency is also part of the OECD principles for regulatory quality and governance, as well as Open Government.
- **Deliberation**: There should be space for engagement that enables members of the public to bring their multiple competing values and concerns to be considered in the evidence utilisation process. This is also about co-design and co-creation of policies and participation from an Open Government perspective that contributes to evidence.

Source: OECD, (Forthcoming ([123]), Standards of Evaluation, a review of international perspectives.

Generally speaking, there are currently two main, broad approaches in policy practice in terms of knowledge use. One is the evidence-based policymaking (trying to make probabilities more calculable) and the other can be described by Schön's (1987; 1991) reflective practices, which has entered into many theoretical streams under 'complexity sciences' and is mostly used by systems thinkers. One can classify these as 'passive' or 'active' strategies (Walter, 1992): either waiting for the best available (scientific knowledge) or continuously experimenting to identify strategies as new conditions emerge. In either case there are two dimensions on making decisions uncertainty: 1) having the grasp of the diversity of possible directions, diverging futures 2) and obtaining a plurality of perspectives in appraising these directions (Stirling 2014, 51). As the future is invariably influenced by current actions and policies, it is difficult to study the latter based on an evidence-based policy (Minkkinen, 2019). This is due to the paradox of predictions: once one is made, there is always a choice to work towards an alternative future (Ramos 2017). The reality is that most problems in the public sector are complex and thus, decision-making in the public sector should not rely on evidence, which accounts for only a simplistic, linear version of reality (OECD, 2017). Furthermore, there is some debate on the fact of how selective and politicised the use of evidence in policymaking can be (e.g., Jennings and Hall 2011). To be fair, anticipatory processes and future projections are also coloured by cognitive schemes and embedded assumptions of participating agents (Dufva and Ahlqvist, 2015). Thus, it is important to also take a reflexive, 'second-order' approach to anticipation (Miller, 2007; Minkkinen, 2019).

In practice, one has to accept that not all uncertainty about the future can be eliminated. This does not mean ignoring uncertainty, which can lead to policymakers limiting their ability to take corrective action in

the future and end up on a course that could have been avoided, missing potential opportunities (Walker et al. 2013). Rather this implies that in a dynamic, uncertain policy setting, policies should be constantly monitored and evaluated to make sure that they serve their envisioned goals (Ramjerdi and Fearnley 2013). Amid uncertainty, it is even more important to monitor on a continuous basis. This requires governments to also be flexible: for example avoiding huge sunk costs, or choices that will lock in a policy course for generations. Prior knowledge of what approach will work will always be limited, and that anticipatory innovation governance should help governments understand the range of possibilities within which they can take action. There is no way to actually determine the ideal response to a problem without actually bringing this action to fruition, observing the results of doing so, and then using the feedback gathered from taking this action to set policy.

Learning loops

Given the challenges of applying traditional evaluation and evidence practices in the context of wicked and uncertain problems and emerging issues, governments need new approaches and structures for reflexive learning that allow quick course corrections, before new patterns become locked in. In building learning loops, governments should embrace a diversity of stakeholders, scientific uncertainty and continuous renegotiation (Head 2014). What is crucial here is that long-term costs and benefits, as well as significant risks and opportunities (also outlined in the tools and methods section under promissory tools) be given adequate governmental attention (Boston et al. 2019). This may also require a critical look at time itself and how it is treated in the evidence base and evaluations as part of politics of temporality (Adams, Murphy, and Clarke, 2009: 247).[20] This is connected to 'futures consciousness' (Ahvenharju, Minkkinen, and Lalot, 2018), which can be summarised as the ability to rigorously study different options and build feedback loops from exploring imagined futures based on learning (Poli, 2017; Box 3.27).

For example, in connection to anticipatory governance Fuerth end Faber (2012) suggest three types of feedback in the policy process: (1) feedback for monitoring and adjustment of policy; (2) feedback for accountability, control, and self-synchronisation and (3) feedback for learning.

[20] The so-called 'politics of temporality' produced by anticipatory governance revolves around two axes: (a) how time is 'used' or practised (by whom or what) in governance attempts (e.g., as a variable in different algorithms; as a social or cultural 'imaginary', etc.), and (b) how time is conceived (Webb, Sellarand and Gulson, 2019).

Box 3.37. Types of learning

Single loop learning happens when an organisation investigates its effectiveness, and adjusts its functioning if it finds a discrepancy. If the organisation looks deeper, they may find they need to change the programme's underlying norms, assumptions and policies, not just how it functions. This is described by Argyris and Schön (1978) as *doubleloop learning* (1978). The organisation can also reflect on what prevented them from seeing that the system needed changing in the first place. This third level is called *deutero learning* (Schön, 1975). All three types of learning are needed for anticipatory innovation to happen: some signals may lead to quick fixes and adaption, but more transformative, upcoming changes may force doubleloop and deutero learning and innovations that change the systems themselves.

Source: Argyris and Schön 1978; van Acker, 2017.

Anticipatory innovation governance systems may have significant feedback mechanisms that sustain and shape the landscape in new and often unpredictable ways. A tiny input or action can ripple across the entire system landscape in a way that can be both unpredictable and of a level of significance greater than might be expected given the size of the original input. In practice, this means that the traditional model of developing a policy-based solution and expecting the intended result to follow in a linear fashion is not only unlikely, but may in fact be counterproductive insofar as it can have negative effects that can sometimes extend beyond the original problem the solution was intended to address. Thus, governance structures are needed to structure that analysis and collate information in a long-ranged, strategic, holistic and connected way to stay ahead of events and our own influence on the system (Feurth and Faber, 2012). In this way, it is clear that anticipation and anticipatory innovation governance is linked to policy planning and the anticipatory feedback system that constantly measures consequences against expectations. As a way to learn from experience and refresh policy, this type of governance should be integrated with the former (Vervoort and Gupta, 2018). Policy design is invariably about the future and how to get there (Lasswell, 1951; Peters, 2018). Anticipatory innovation governance can, thus, enhance 'dynamic' policy effectiveness, i.e. ensuring that the policy addresses not only the problem in a given context, but how it adapts to changing conditions and circumstances over time (Bali, Capano and Ramesh, 2019).

4 Governing the ungovernable: Towards an AIG model

> "Change is the law of life. And those who look only to the past or the present are certain to miss the future." John F. Kennedy, Address in the Assembly Hall at the Paulskirche in Frankfurt June 25, 1963, Public Papers of the Presidents.

It is hard to get by in the world as we know it today. It is too complex and full of surprises. Accidents can happen. New technologies offer opportunities to improve economic efficiency and quality of life, but they also create many uncertainties, unintended consequences and risks. The benefits and risks of new technologies do not generally involve the same people. Dealing with forthcoming challenges requires acknowledging the complexity of policymaking, and the fact that the issues that policymaking tries to address have become too complex to successfully guide through linear policymaking processes (OECD 2017).

There is increased awareness that situational complexity is now the norm rather than the exception when it comes to the environment in which policymakers are expected to define and set policy. What is characteristic of these complex environments is the emergent nature of the system. An action that affects the operation or intensity of a problem that has emerged inside a complex system can emerge from any part of the system, rather than through a centrally located or co-ordinated actor or set of actors. This means that linear, traditional approach to policy formulation is inadequate when it comes to addressing these types of problems. Lacking a verifiable solution, or even in some cases an ability to agree on the nature or scope of the problem itself, traditional policymaking processes often break down. When policymakers do act within these systems using traditional policymaking tools, they often find that the results of these interventions are increasingly difficult to predict, and sometimes serve to make the situation worse. A new model is needed.

Consequently, this working paper has presented a theoretical model for anticipatory innovation governance linking the act of anticipation with innovative practice in a dynamic way bridging foresight and futures thinking with action-oriented innovation approaches. This model needs to be tested within the workings of the public sector. This approach sits firmly in the area of how policy is made, and, in particular, in a recognition that policymaking in a complex system cannot assume that a linear process of gathering information, assessing it, and then acting upon it through a deliberative policymaking process will be effective. Complex systems do not function in a linear fashion, and so a linear policy development process is not up to the task at hand. Hence, the model should also be validated in an action learning context.

Government capacity should not remain static; it needs to adapt to societal and technological changes. Governments have to anticipate, adapt to and mitigate these change processes as part of their innovation

portfolios. Anticipatory innovation governance should involve upstream governance measures such as co-creation with lead users, test-beds, experiments, adaptive regulation, standardisation and value based designs (e.g., regulatory sandboxes). These tools allow governments to start to actively engage with rapidly evolving technological change. Innovation governance practices that are needed today need to engage with technology at different phases throughout the innovation process and with broader public and private participation than traditionally considered. Anticipatory innovation governance mechanisms should also balance directionality and potential lock-in in innovation portfolios as ways to read and capture weak and strong signals of new technological paths and business models not captured in 'missions.' This is crucial as in a fast-changing context targets may change so rapidly that traditional instruments could lag behind and become irrelevant. As such, anticipatory innovation approaches can help explore, deliberate and steer the consequences of innovation at an early stage without unduly constraining innovators. They can incorporate public values and concerns, mitigating potential public backlash against technology or make the various value trade-offs visible.

This working paper has looked at these aims through the lens of anticipatory innovation mechanisms – through mechanisms that give agency to individuals and organisations – and the authorising environment that shapes the values connected to the governance system. Yet, while governments have to be anticipatory, they also have to be many other things: legal, honest, legitimate, democratic, effective, efficient, fair, accountable, sustainable and much else (Boston et al., 2019). This is because while "flexibility is important for governance systems to deal with uncertain, unpredictable, and non-linear forms of social and environmental change … governance systems [also] require stability to ensure that new policies persist over sufficient timeframes to bring about desired effects, and to stabilise expectations and enhance coordination over time" (Beunen et al., 2017). This underlines many paradoxes described in the discussion above around anticipatory innovation governance mechanisms. While the anticipatory innovation governance system emphasises the experimental, and provisional nature of policymaking and stresses situated and reflexive processes, it also sits within a system that has to instil certainty and stability.

Consequently, the work on anticipatory innovation governance is just in its beginnings. As no true anticipatory innovation governance systems exists, the validity of what has been proposed in the paper and the multiple dilemmas connected to anticipatory innovation governance need to be tested out in practice. This will involve investigating how governments are:

- Testing sense-making methods and approaches to pick up weak signals and creating reflexive knowledge management systems to do so.
- Engaging with weak signals before a new course of paradigm is locked in by exploring alternatives.
- Creating organisational capacity to incorporate innovation anticipatory practices into public sector innovation portfolios effectively.
- Active exploration and experimentation with emergent issues that might shape future priorities and commitments and linking the innovation practice more closely with the act of anticipation.
- Testing assumptions and biases in radically different future possibilities and developing ethical assessment tools for government to explore issues around vested interest and cognitive biases.
- Involving diverse sets of stakeholders into discussions around plausible, possible and preferable futures and developing effective tools to do so.
- Developing reflexive practices and continuous learning loops to quickly change course.
- Institutionalising anticipatory innovation governance within the broader government system and creating sources of legitimacy for the approaches.

Action research towards an anticipatory innovation governance model

Anticipatory innovation governance draws on a set of well-established tools and methods, with bodies of literature, knowledge, and practice that are sound – while continuously evolving. The work to mature anticipatory innovation governance from here on focuses on two complementary pillars: first, to understand how governments today facilitate anticipatory innovation and address complex issues. Second, what needs to change in current government functions to make working in an anticipatory form possible.

A governance model that allows anticipatory innovation governance to happen requires foresight and innovation to be built in to the administrative system. This means developing a governance system to continuously develop future scenarios, test and disseminate innovations especially with a particular aim of spurring on innovations connected to uncertain futures in the hopes of shaping the former trough the innovative practice. Anticipatory innovation governance needs to be ingrained into the everyday practices of government so that policy reforms and structural changes can benefit from this capacity.

The current set of action research projects (detailed in Box 4.1) represents a promising start against these research goals, allowing OPSI to advance a repeatable and robust source of value for members. This testing and chronicling of practices could be improved by additional work across a broad range of country contexts, and over time as practices show value outside a COVID-19 context. OPSI will continue testing and refining the overarching framework and system lens against a growing set of real-world needs and contexts to establish those system elements that are most influential, and those that are most generalizable (as opposed to system elements that are important, but only within specific contexts).

This work will generate a body of knowledge, experience, and case studies about systems-level interventions that facilitate and foster anticipatory governance, allowing for comparability, collaboration, and the establishment of good systems practices across OECD countries.

Box 4.1. OECD's anticipatory innovation governance research portfolio

The Observatory of Public Sector Innovation, OECD is collaborating with different countries and governments on multiple levels to understand and explore anticipatory innovation government mechanisms and to build a new governance model. The following projects are part of the OECD anticipatory innovation governance portfolio:

Finland, Ministry of Finance and Prime Mister's Office

In collaboration with the European Commission and the SRSP/TSI instrument, the project will build up a steering and governance system to address emerging, complex challenges with uncertain outcomes. The aim is to create an innovation stewardship model in the Government of Finland incorporating the anticipatory innovation function. The governance model should enable the Finnish government to adapt to transformative change in a systemic manner. The project will run from August 2020 to June 2022 and involve sectoral tests of the new anticipatory innovation governance model.

Slovenia, Ministry of Public Administration

Across the EU, the role of the public sector is changing. Effective and long-term workforce management strategies are key to respond effectively to current and future crises. The OECD is working together with the Ministry of Public Administration to address these challenges from the perspective of ageing and talent management in the public sector. What type of future skills and capacities are needed in the public sector? How might we plan human resources with an uncertain future in mind? Initiated in 2020,

the project will produce deliverables to the European Public Administration Network (EUPAN) and build future anticipatory scenarios for the future of the public sector in Slovenia.

Ireland, Department of Public Expenditure and Reform

The OECD is working together with the Our Public Service 2020 (OPS2020) team towards the vision of the Irish public service in 2030, reviewing the prior plan and building up recommendations to include anticipation and strategic foresight into the core capacities of the public service. The OPS2030 aims to reflect what the world will look like in 2030, the challenges and opportunities the country may face, and the capabilities that will be needed as a public service to effectively navigate this new world.

Latvia, Investment and Development Agency of Latvia (LIAA)

Over 2020-2022, the OECD will work together with LIAA to develop anticipatory innovation governance capacity in six core national priority areas. The aim is to test different governance mechanisms on the systemic, organisational and individual level and co-create shared future visions in different sectoral fields. This should help LIAA to build up public sector capacity to deal with transformative change together with the wider ecosystem of partners.

Sweden, Vinnova

Vinnova supported the creation of the anticipatory innovation governance work in OECD and provided insights into the working paper accompanying this paper. The work started with exploring innovation portfolios, including managing anticipatory innovation within these, and evolved through learning from existing transformative change management models in practice (from supporting innovation management in public organisations to futures committees already in place, e.g., the Committee for Technological Innovation and Ethics, or Komet).

Gipuzkoa regional government, Basque country, Spain

The OECD is working with the Gipuzkoa regional government and Climate KIC on mapping out Gipuzkoa's innovation portfolio and regional innovation network and testing different collaborative governance models to emphasise anticipatory innovation governance in the portfolio. The project runs from 2020-2021.

Sweden, City of Helsingborg

The City of Helsingborg has in recent years invested heavily into anticipatory innovation (Box 3.2) and introduced a variety of mechanism to support adaptive and employee-led change within its portfolio. The efforts are driven by the global smart city expo planned for 2022 (H22). In 2020-2021, the OECD is analysing what the governance mechanisms for anticipation in an organisation look like, how to make anticipatory innovation sustainable, and how to keep the momentum on transformative change.

Finland, Itla Children's Foundation

The OECD is working with Itla on testing different tools and methods for anticipation in two cities in Finland: Oulu and Vantaa. The project introduces different futures thinking methods to the public sector and designs different ways for the city governments to keep working in an anticipatory manner (see Box 3.1.).

Portugal, LabX

Governments need anticipatory skills and capacities to solve problems in new ways, change the culture, use new types of tools, and understand the changing context for public services. But where to get started? In partnership with the Observatory of Public Sector Innovation, LabX (Government of Portugal) has been developing a starter kit for anticipatory innovation. The starter kit allows teams and

organisations to get practical with anticipation by using a range of tools. LabX together with OPSI are developing an initial prototype of the Starter Kit.

Source: OECD.

Anticipation within core government structures

The initial results of the empirical work in Sweden, Finland and the Basque country show (Box 4.1) that core government functions strongly influence the prospects for anticipatory innovation possible in the public sector. These areas include, but are not limited to:

- *Human resource planning*. Allowing diverse sets of skills and capacities to enter the public sector. Building up teams with multi-disciplinary skillsets and supporting competencies in futures thinking and foresight to accompany innovation capacities. In smaller governments, this may involve more mobile movement of anticipatory innovation capacities between teams.
- *Strategic planning*. Countering the linear and closed idea of the future. Allowing a variety of futures and possible scenarios to co-exist in strategic plans and continuously stress-testing approved strategies with megatrends and wild cards. Accounting for long-term visions and intergenerational fairness, but allowing for flexible changes when conditions alter. Signal and trend detection should be integrated as core tasks of strategic planning and should be upheld continuously. Anticipatory innovation governance mechanisms should help balance directionality and potential lock-in in strategic planning, in order to read and capture weak and strong signals of new technological paths and business models. This is crucial because, in fast-changing environments, targets may change so rapidly that traditional instruments could lag behind and become irrelevant.
- *Structures of governmen*t. Creating competence centres for anticipatory innovation governance, but also allowing for decentralised alternatives exploration. Creating autonomy for anticipatory innovation with time, space, and resources to explore different ideas on the ground, so that business as usual and short-term goals do not overshadow anticipatory needs.
- *Budgeting*. Resource planning that allows for testing and experimentation beyond traditional fiscal structures, countering short-termism, but also allowing challenges to existing strategic aims.
- *Procurement*. The possibility to create partnerships, building networks within the ecosystem from common future narratives, and building test beds for new ideas. While the possibilities to support early innovations exist in international procurement regulations, they are far from commonly used.
- *Evaluation and auditing*. As anticipatory innovations are uncertain by nature, it makes sense to evaluate the practice of government from a portfolio perspective: allowing for failure, but also expecting successes. Anticipatory innovation may also require longer time frames than the current government evaluation and audit models allow. Audits should also take into account the cost of not following opportunities to encourage more experimentation and risk taking in the public sector.
- *Open government and participation*. Governments should include more futures thinking methodologies into their engagement practices. This can help incorporate public values and concerns, mitigating potential public backlash against new developments, or making the various value trade-offs visible. This can also help set better boundaries for technological development and discuss ethical and moral issues in a democratic manner.

How governments become proactive and anticipatory to prepare for unknowable futures is one of the most pressing governance issues, and certainly one of the most challenging to overcome. Governments are generally intended for steady stewardship rather than risk-taking; and politically for responding to publicly

recognised issues, not uncertain emerging possibilities. However, we also know that governments' grand challenges are complex and uncertain. Climate change futures depend on a system of human and natural complexity that extends from the lifecycles of micro-bacteria, to scientific advancement, to elections across the world. Economic and social security futures hinge on climate change, global trade flows, and how quickly and effectively the global community responds to COVID-19. Anticipatory innovation governance represents a holistic approach to not only the tools and methods that enable governments to explore and shape those futures, but also to question national and international systems for making use of those tools and their resulting insights.

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Annex A.

Table A A.1. Innovative classes of technology foresight methods

Innovative classes	Methods belonging to each class
Consultative	Voting, Polling, Survey, Interviews, Expert Panels, Essays, Conferences, Workshops, Citizen Panels, Brainstorming
Creative	Wild Cards, Weak Signals, Mindmapping, Lateral Thinking, Futures Wheel, Role Play, Business Wargaming, Synectics, Speculative Writing, Visualization, Metaphors, Assumption Reversal
Prescriptive	Relevance Trees, Morphological Analysis, Rich Pictures, Divergence Mapping, Coates and Jarratt, Future Mapping, Backcasting, SRI Matrix, Science Fiction Analysis, Incasting, Genius Forecasting, Futures Biographies, TRIZ, Future History, Alternative History
Multicriterial	Key Technologies, Source Data Analysis, Migration Anal., Shift-Share Anal., DEA, Factor Anal., Correspondence Anal., Cluster Anal., Sensitivity Anal., AHP, Input- Output Anal., Priorization, SMART, PRIME, MCDM
Radar	Scientometrics, Webometrics, Patent Analysis, Bibliometrics, Technological Substitution, S-Curve Anal Technology Mapping, Analogies
Simulation	Probability Trees, Trend Extrapolation, Long Wave Anal., Indicators, Stochastic Forecast, Classification Trees, Modelling and Simulation, System Dynamics, Agent Modelling
Diagnostic	Object Simulation, Force Field Anal., Word Diamond, SWOT, STEEPVL, Institutional Anal., DEGEST, Trial&Error, Requirement Anal., Theory of Constraint, Issue Management, ANKOT
Analytical	SOFI, Stakeholder Anal., Cross-Impact Anal., Trend Impact Anal., Structural Anal., Megatrend Anal., Critical Influence Anal., Tech. Barometer, Cost-Benefit Anal., Technology Scouting, Technology Watch, Sustainability Anal., Environmental Scanning, Content Analysis, FMEA, Risk Anal., Benchmarking
Survey	Web Research, Desk Research, Tech. Assessment, Social Network Anal., Literature Review, Retrospective Analysis, Macrohistory, Back-View Mirror Analysis
Strategic	Technology Roadmapping, Tech. Positioning, Delphi, Scenarios, Social Impact Assessment, RPM, Technological Scanning, Multiple Perspectives Assessment, Causal Layered Analysis, MANOA, Action Learning

Note: The classification method is based on 65 different variables including: 1. Explorativity; 2. Rely on Uncertainty; 3. Normativity; 4. Qualitative character; 5. Indirect nature; 6. Qualitative Character; 7. Heuristic Character; 8. Analyticity; 9. Bottom-up Character; 10. Top-down Character; 11. Rely on Working in a Virtual Environment; 12. Rely on Working in the Real Environment; 13. Shaping the Future; 14. Analysing Present State; 15. Appeals to the Past; 16. Describing Factors Which Influence Technology Development; 17. Determining Influence of Technology Development for Other Aspects of Life; 18. Focus on the Product; 19. Focus on Process; 20. Formal Nature; 21. Optional Nature; 22. Preliminary Character; 23. Recruitment Character; 24. Refresher Character; 25. Graphic Character; 26. Text Character; 27. Verbal Nature; 28. Unambiguity (exclusion the free choice of usage of different ways and principles); 29. Expensive Character; 30. Requiring the Participation of a Numerous of Human Resources; 31. Time-consuming; 32. Objectivity; 33. Regularity; 34. Penetrative Character; 35. Rely on Creativity; 36. Rely on the Interaction; 37. Rely on Evidence; 38. Rely on Expertise; 39. Susceptibility; 40. Resistance to External Factors; 41. Resistance to Internal Factors; 42. Scanning Character; 43. Forecasting Character; 44. Creating Vision; 45. Planning Character; 46. Action Character; 47. Evolutionary Character; 48. Revolutionary Character; 49. Understanding Character; 50. Concerning Synthesis and Modeling; 51. Concerning the Analysis and Selection; 52. Mathematical Perspective; 53 Social Perspective; 54. Engineering Approach; 55. Systemic Thinking; 56. Technological Perspective; 57. Cognitive Perspective; 58. Inductive Character; 59. Deductive Character; 60. Reliance on Statistical Inference; 61. Using the Raw Data; 62. Using Secondary Data; 63. Generating Codified Results; 64. Complex Attitude; 65. Shot Scenario.
Source: Magruk, 2011.