White Paper

Agile Governance
Reimagining Policy-making in the Fourth Industrial Revolution

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Contents

Introduction

The Fourth Industrial Revolution is characterized by the unprecedented advances in technology transforming the way individuals and groups across society live, work and interact. New principles, protocols, rules and policies are needed to accelerate the positive and inclusive impacts of these technologies, while minimizing or eliminating their negative consequences.

The institutions that have traditionally had the responsibility of shaping the societal impacts of these technologies – including governments, companies and civil society organizations – are struggling to keep up with the rapid change and exponential impact. At the same time, an implosion of confidence is occurring around the world as trust in mainstream institutions, from companies and governments to media and NGOs, is at its lowest point in five years.[1] There is an urgent need for a faster, more agile approach to governing emerging technologies and the business models and social interaction structures they enable.

As traditional policy development processes lag behind the rapid pace of technology innovation, citizens increasingly expect the private sector and other non-government entities to take on new responsibilities and develop new approaches to support the diversification and speed of governance.[2] The Fourth Industrial Revolution requires the transformation of traditional governance structures and policy-making models.

This white paper is part of the World Economic Forum's Center for the Fourth Industrial Revolution's project on agile governance. In this paper, we define agile governance as *adaptive, human-centred, inclusive and sustainable policy-making*, which acknowledges that policy development is no longer limited to governments but rather is an increasingly multistakeholder effort. It is the continual readiness to rapidly navigate change, proactively or reactively embrace change and learn from change, while contributing to actual or perceived end-user value.[3]

Why governance is shifting in the Fourth Industrial Revolution

The complex, transformative and distributed nature of the Fourth Industrial Revolution[4] demands a new type of governance to address the interlinked dynamics of the pace and synergistic nature of emerging technologies; the transnational impact of technologies and broader societal implications; and the political nature of technologies.[5]

The pace of technological development and the characteristics of technologies render previous policy-making cycles and processes inadequate. Emerging technologies scale much quicker than in previous industrial revolutions. They build on and diffuse over digital networks, which enable them to mature at a pace and on a scale previously unseen. These emerging technologies are rapidly developing around us, irrespective of whether we develop new governance systems to manage their use. Moreover, as these technologies mature, they converge and combine, creating ever stronger and impactful ecosystems, which can become self-governing by algorithms, coding rules and internal dynamics independently of human action and decision. Now is the time to make decisions and take action if we are to shape the configuration and impact of technologically driven systems for a shared, common objective.

The second dynamic is the global scope and broad societal impact that new technologies exert. As these technologies diffuse exponentially so does their impact on surrounding systems, including investments, organizational strategies, productivity, consumption and human behaviour. Emerging technologies challenge not only the governance of technologies themselves but also require new policies, approaches and social protection mechanisms to manage, for example, the disruptions to labour markets, the environment and human interactions. This includes rules and policies to ensure that human labour and creativity are augmented rather than replaced, and legislation that preserve democratic participation and citizen agency in the light of the influencing power of emerging technologies. New processes need to be developed within both national and international contexts that can provide opportunities to facilitate synchronization and learning between governments tackling similar issues.

The third dynamic stems from the political nature of emerging technologies – not in the sense that they derive in some way "*from the right*" or "*from the left*" but rather that technologies embody values, assumptions and principles that effect how and who they impact in society. The effect of the application of these technologies is, therefore, more than as neutral tools. The ideas going into them, the ideologies of the developers creating them, the norms and values in the context within which they are developed and deployed all have an impact on their applications and outcomes. For example, whether artificial intelligence (AI) has racial biases; gender assumptions such as service robots with female characteristics while industrial robots have more male characteristics; or ethical questions concerning genome editing on humans and animals. The political nature of advanced technologies requires our attention and governance because we are building economies, societies and world views through them and they, in turn, shape how we interpret the world and the possibilities we envision. Agile governance can proactively help shape and direct how technologies impact people and communities in a malleable way through an iterative process.

The pace, scope, scale and political nature of the Fourth Industrial Revolution – and our aspirations that its impact be human-centred – are all reasons why we need agile governance. First, acknowledging that changes and disruptions are much faster and more complex than before forces us to rethink and redesign our policy processes. Second, being explicit about the political nature of technologies can help us highlight a mandate for agile governance in the area of emerging technologies and their applications. This includes identifying where and how values are formed in the development and use of technologies and determining the optimal political frameworks for integrating values in both spheres. Third, positioning values that promote societal benefit and well-being as priorities for governance can direct the development and use of emerging technologies and who they benefit.

Defining agile governance

In its simplest form, *governance* refers to making decisions and exercising authority to guide the behaviour of individuals and organizations. Governance is commonly achieved by the creation and enforcement of explicit rules (backed by the power to reward or impose sanctions), less explicit social norms, guidelines, policies, or the creation of defined command structures.

Traditionally, governance in the public sense has been the remit of governments and it is most often experienced by the governed in the form of legislative or executive acts in line with their political contexts. However, governance is an activity that also occurs daily across privately held organizations, within formal and informal civil society organizations and in social contexts among family and friends.

As emerging technologies are shifting power away from governments towards companies and non-state actors, the traditional view of governance is also shifting and expanding as a concept. The dynamics of the Fourth Industrial Revolution, and the fact that the myriad of challenges facing humanity cannot be solved by any single sector alone, suggests that governance must become a multistakeholder endeavour. This shift in governance is also occurring because governments and policy-makers are finding themselves increasingly constrained to just being reactive to the speed of technological innovation. This creates a new role for the private sector and academia working alongside public officials to provide expertise on the technologies they are developing, their applications and potential consequences. The private sector is producing and disseminating powerful new technologies that are having a fundamental influence on social and economic structures, from AI to autonomous vehicles to the confluence of systems underlying the gig economy. These technologies and the systems they enable are rapidly shifting behaviours and creating new rules for human interaction by virtue of the incentives and boundaries built into their design. In spite of the lack of a political mandate, technology pioneers are increasingly developing private rules, certification schemes, standards, social norms or policies that end up, by default, governing the way societies live, work and interact and often without being restricted by national borders or limited to a single jurisdiction.

Agility implies an action or method of nimbleness, fluidity, flexibility or adaptiveness. In the software sector, the concept of agile or "agility" has been around since the 1990s. The Agile Manifesto[6] was written by 17 software developers in 2001 and refined for the policy-making sphere by the Forum's Global Agenda Council on the Future of Software Development and Society report.[7] The report's principles value outcomes over rules, responding to change over following a plan, encouraging wider participation over control and fostering self-organization over centralized government. These principles continue to be widely used in technology development.

The concept of *agile governance* aims to shift the manner in which policies are generated, deliberated, enacted and enforced in the Fourth Industrial Revolution. Pairing these terms sets the expectation that governance can be, and some would argue should be, more agile to keep pace with the rapid changes of society – driven significantly by the rapid development and deployment of emerging technologies. Policy-makers must become more proactive in shaping these developments. The difference between plan-based methods of policy-making and the concept of agile governance relates to the shift in the value placed on time sensitivity.

However, in many ways, the concept of agile governance also conjures up some contradictions. Government policy-making is intentionally "deliberate", "broadly encompassing", or even "inclusive" – attributes that are often at odds with the interpretations of agile, which anticipate increases in speed. While more timely experimentation and decision-making may be warranted in many cases, agile governance does not privilege speed over the duty of public and private governance processes to empower and protect those they serve.

An example of the trade-offs of scale, speed, and quality is provided by the high expectations and significant resources that many governments' education departments and ministries invested in massive open online courses (MOOCs) five years ago, with the hope that these could efficiently lower the cost of education while increasing the number of graduates.[8] However, the issues regarding certification and validation, lack of personalization and low engagement and commitment to MOOCs contributed to less than 5% of those enrolled completing the course and thus the loss of public investments and expectations.[9] Like the case of MOOCs, there are many situations where the appropriate policy response is to pause, deliberate and improve upon existing governance models. Furthermore, agile governance in its ideal form does not sacrifice rigour, effectiveness and representativeness for speed.

In fact, agility can also enable policy-making that is more inclusive and "human-centred" by involving more stakeholders in the process and allowing for rapid iteration to meet the needs of the governed. Agile governance can also ensure long-term sustainability by creating mechanisms to constantly monitor and "upgrade" policies governing emerging technologies, as well as by sharing the workload with private sector and civil society to maintain the relevant checks and balances.

Increased agility in policy-making also seeks to address "policy decay"[10] – the idea that policies inevitably lose their relevance over time. Legislators often benefit politically from policy decay by yielding more power in maintaining the status quo, so when the pressure to change policies is at its highest, they can leverage their influence to seek

the concessions they want along party lines. However, this does not mean politicians would be averse to applying agile governance principles. There are always circumstances where the greater good outweighs political incentives; where politicians have shared interests with business and civil society to intervene before the use of a technology or technological application becomes widespread; and where the strategic gains of maintaining the status quo are outweighed by the advantages of developing forward-leaning policies that can become the global standard.

Governments that lean forward on policy for emerging technology often become more competitive in their region, and globally, and develop to be leaders in different technology sectors. For example, in Estonia, the e-Estonia[11] initiative has empowered the government to become an incubator of pioneering ideas about digital citizenship, security, virtual business, and education – fostering economic growth for Estonia, where Tallinn is the easiest place in the European Union (EU) for foreign entrepreneurs to set up a business. For €100, anyone can become an "e-resident" of Estonia, allowing them to run an online company based in the single European market without ever setting foot in it. So far, 22,000 people have done this, spawning 3,536 firms.[12] Another example is Rwanda, where the medical drone delivery company Zipline's joint initiative with the Government of Rwanda was awarded the 2017 Index Award[13] – often referred to as the Nobel Prize for Design – in the Body Category as recognition of their leadership. And the City of Boston is collaborating with the World Economic Forum to explore the use of technology in autonomous vehicles[14] to strengthen its image as a city with a strong appetite and track record in civic and technology innovation.

There are also existing examples of agile governance approaches in government. The judicial branch of government, in common and civil law jurisdictions, has implemented agile rulemaking for centuries through the notion of statutory interpretation. Understanding that laws promulgated by the legislative and executive branches of government often have multiple meanings and cannot be constantly revised to keep pace with changing societies and cultural norms, judges have traditionally been given a measure of discretion and creative power in how they interpret legislation. While the degree to which judges have the discretion to interpret legislation varies between jurisdictions and legal systems, it is generally accepted that because legislation can often lack clarity or precision, judges have the discretion to determine the meaning of laws. The legal sector accepts that laws require continual interpretation to maintain their relevance in changing societal contexts without constantly resorting to the legislative and executive branches of government for revised instruments. A similar approach could be deployed for policy-making by adopting a pragmatic approach towards the interpretation of existing policies to govern emerging technologies. For example, Sweden was able to create a regulatory sandbox to test autonomous vehicles in Gothenburg without requesting any changes to national or EU laws.

Defining agile governance also requires clarifying, in this context, what it is *not*. The diffusion of the term over the past few years – first in technology development, then in academic circles and now in public governance – has led to its use in multiple ways. At times, this has created confusion when used simultaneously in reference to different contexts. Most commonly, the term has been attributed to the use of the Agile Manifesto principles in the domain of public service delivery[15] and, more recently, the increasing use of advanced technologies in the day-to-day workings of governments (i.e. e-government or gov-tech). While the general motivation of government officials to do more with fewer resources is a common goal, and technology can be used to make policy-making faster and more responsive (as explored further below), the concept of agile governance for the purposes of the Forum's work does not seek to encompass public service delivery or e-government.

Methods for agile governance

Agility in governance can be enabled by various approaches. Systems and design thinking are two methods that have demonstrated their capacity to tackle complexity, prioritization issues, integrate human-centric views and insights from early prototyping of policies. Given that governments are often criticized for being slow reactors to technology innovation, reframing this approach as one that seeks to navigate the pace of change through adaptive, human-centred, inclusive and sustainable policy-making is an important conceptual shift towards long-term value-based policy design through system and design thinking. System and design thinking go hand in hand as fundamental methods in the reconfiguration of policy-making in the Fourth Industrial Revolution.

System thinking embraces the complexity of an ecosystem by providing a methodology that goes beyond immediate problems and addresses foundational principles and patterns. It also provides a way to embrace and leverage a constantly changing system. Systems thinking can help policy-makers to determine the parameters of complex and dynamic ecosystems, the intended and unintended impact of policies developed and deployed for the ecosystem and how to test key assumptions and hypotheses to foster rapid learning and iteration.

Design thinking aims to develop socially meaningful and targeted ideas relying on co-creation. In particular, its focus on prototyping, testing and iterating provides important tools for how policy-makers can pilot low-cost, low-risk versions of policies to test hypotheses on the impacts of those technologies, and then improve on the policies based on those learnings before launching them on a broader scale across the whole jurisdiction.

The combination of systems and design thinking provides an iterative and cumulative learning process by exploring a complex and fast-moving ecosystem, sense-making of observed variables, and shaping of possible outcomes, while analysing the influence of those outcomes on the status quo.

Leveraging systems and design thinking processes fosters agile policy-making by expanding the range of stakeholders consulted in the development of policies. Integrating stakeholders whose needs are supposed to be tackled by a policy solution helps to identify the actual problem instead of an assumed one. This also encourages focused policy development on the end-user, which cuts down the need for complex regulations. Adopting system and design-thinking approaches fosters a shift from planning and controlling to piloting and implementing policies to get rapid feedback and iteration. This enables a timely and dynamic evaluation process for new and existing regulation by providing stakeholders with the opportunity to share their concerns and evolving needs on an ongoing basis. Feedback loops allow policies to be evaluated against the backdrop of the broader ecosystem to determine if they are still meeting citizens' values and needs.

Governments remain central actors in policy development and enforcement. They define the parameters of governance protocols for technology innovations thereby identifying the outcomes we should be striving for as a collective endeavour. However, only through closer collaboration with innovators and the communities involved in early-stage innovation (from inventors to funders) can policy-makers move closer towards agile governance. System and design-thinking approaches are useful tools, but working with innovators to support new market development for their innovations could, in return, encourage innovators to engage proactively with policy-makers to co-design the governance ecosystem for their inventions.

Tools for agile governance

The aim to govern in a more dynamic and agile manner can broadly be conceptualized in two ways: efforts to work around existing governance structures; and efforts to change the current policy-making system itself. The first is through agile optimization, experimentation and workarounds of existing governance structures and institutions as a less onerous exercise. The second approach is through broad and all-encompassing reforms of existing governance institutions, changing who makes decisions, how they make those decisions, and creating new sources of authority for governance structured to be more agile and human-centred. Few governments, if any, have been able to execute this approach.

While there are a wide range of examples of agile governance workarounds in action, this white paper considers a limited number of illustrations that are relevant to the Forum's conceptualization of agile governance.

a. Policy labs

Many new approaches to policy-making have emerged from the creation of protected spaces within government with an explicit mandate to experiment with new methods of policy development by using agile principles – often referred to as policy or governance labs. Definitions of policy labs vary depending on their mandate, the national context they are established in or outcomes they are focused on. However, most commonly, policy labs seek to bring new policy techniques to government bodies, help to design public services by focusing on end-users, and use data analytics and new digital tools to augment policy development.[16]

However, most policy labs are still in their infancy[17] and are seen as an uncertain structure by the institutions they are embedded in and which they are meant to serve. Many of these efforts have not yet achieved scale to deliver global impact or implement actual policy pilots and generally do not focus on exploring new, unanswered issues, including with regards to emerging technologies. Incumbent governance institutions are often hesitant to assign urgent or priority issues to their policy labs instead favouring existing policy development processes. Equally, many policy labs have not obtained an explicit mandate to scale their activities or implement actual policy pilots before passing the proof-of-concept stage based on smaller-scale, determined projects.

If policy labs are about breaking out of the status quo in an agile manner and developing policy differently, we need to make sure policy labs can contribute to and benefit from the agile governance discussion. Public institutions should provide policy labs with sufficient top cover and space to develop, test and iterate agile policy-making processes without the need to demonstrate quick "wins" to immediately justify their costs. Being agile means identifying quick learnings to move on and fail fast if necessary. Transparency of policy lab activities is crucial and requires both multistakeholder collaboration and the careful selection of platforms or channels to communicate content and results of the labs' activities to public institutions and citizens. Selection of the challenges for policy labs is also important to examine agile approaches in relation to challenges that are constantly changing – for example, regulating emerging technologies.

Finally, policy labs should institutionalize the involvement of non-traditional policy actors beyond big business or academic institutions to include civil society organizations and small-scale innovators. Examples of forward-leaning reforms have been undertaken by the EU,[18] the United Kingdom[19] and Denmark.[20]

b. Regulatory sandboxes

Regulatory sandboxes are safe spaces for companies to test innovative products, services and business models without needing to overcome the normal regulatory and financial hurdles (i.e. licensing) of engaging in the activities in question. Governments use these sandboxes to encourage innovation through the adoption of flexible regulatory frameworks and processes. Sandboxes are often limited to a particular industry or technology, or subject to a time limitation to test innovative products and processes. They create an even playing field for big business and start-ups to experiment with innovative products and processes for a specified period in a real-life environment where risks to industry or the end-consumer are clearly defined and mitigated. It also allows policy-makers to monitor the development, deployment and consequences of the innovation in a controlled environment, which helps inform governance policies that will be needed. Examples of jurisdictions and their regulatory sandboxes include Sweden and autonomous vehicles,[21] Bahrain and financial technologies,[22] and Singapore and energy innovation.[23]

c. Increasing agility through the use of technology

Introducing emerging technologies to existing governance processes can enable more agile, distributed and transparent processes. Blockchain technology is currently being tested for various purposes and processes. One is to enable citizens to decide the extent to which their private data is shared with public and private institutions every time they access the technology. In this instance, policy-makers can ensure that governments have the same access to core information of their citizens as technology developers.[24] This fosters better policies being developed based on up-to-date data, which can provide policy-makers with a clearer understanding of the views, behaviour and priorities of their citizens. Another example is the use of blockchain for increased citizen participation. In Colombia, blockchain was used in the 2016 Peace Plebiscite to increase voting participation of Colombians living abroad. The use of blockchain technology helped to assure the validity and authenticity of the electoral votes cast. The Colombian Ministry of Information and Communications Technologies

noted: "Blockchain is an expression of the current trend towards a new kind of collaboration; in this case, jointly generated security."[25] This illustrates how the use of advanced technologies in a novel way can encourage wider participation while establishing common practice and policy development without recourse to formal legislation.

d. Promoting governance innovation[26]
Integrating processes aligned with agile governance principles can allow for the spread and scale of innovations. The National Center for Public Sector Innovation (COI) in Denmark sought to foster innovation within and across government by developing a step-by-step guide to help replicate innovation in new contexts, encourage self-organization through suggested actions for individual stakeholders and provided a series of guiding questions to support dialogue between innovators and those that wish to use their innovations in a new context. By using a guidebook, the government aimed to make the spread of innovation across government institutions more manageable. The basis for the COI's *Spreading Innovation* guidebook stemmed from a study it conducted in October 2016 across the Danish public sector, which found that almost 80% of public-sector innovations were carried out with third parties and over 70% of innovations were directly copied or inspired by other people's solutions.[27]

e. Crowdsourced policy-making[28]
In an effort to stop declining public trust in governments and enable a more inclusive and participatory rule-making process, some legislators are introducing the idea of crowdsourcing law-making. Aitamurto and Chen[29] explain that "crowdsourcing in policy-making is an open government practice in that it aims to engage citizens in democratic processes, and it also infuses transparency to government at multiple levels. The open government practices emphasize the principles of good governance, including inclusiveness, accountability and transparency." In this way, crowdsource policy-making can "seek to engage citizens in policy-making and search the crowd's knowledge to improve policies"[30] thereby instilling agility in traditional governance systems. An example of crowdsource policy-making is CrowdLaw, a platform that aims to go beyond the public merely contributing opinions and instead focuses on a process where the public, through the use of websites, mobile applications, social media and offline engagement, can propose legislation, draft bills, monitor implementation and supply data to support new laws or amend existing ones.[31]

The Finnish government has sought to improve its capacity to address societal challenges, foster greater engagement with citizens while building public trust and transparency by establishing a digital platform to encourage innovation to develop public services and build a culture of experimentation. *Kokeilun Paikka* or Place to Experiment[32] is a "platform to market innovations; collect feedback, advice and funding sources for innovators; and connect reformers with government". By moving away from "a top-down dictated process to a more co-created – in some cases even crowdsourced and crowdfunded – process

for public sector innovation," the government sought to generate an outcome-focused and adaptable platform that encourages grassroots innovation through multistakeholder collaboration.[33]

f. Promoting collaboration between regulators and innovators
The Innovation Deal[34] initiative by the European Commission helps innovators to address legislative obstacles by shortening the time between the idea stage and bringing the innovation to market. As part of this initiative, the European Commission has issued a call for expressions of interest where any innovator or group of innovators, seeking to introduce a gig economy-related product or service to the market but have encountered a perceived regulatory obstacle, are invited to apply for an Innovation Deal. Successful applicants benefit from access to a close cooperation framework bringing together national, local and EU regulatory bodies to help innovators navigate the regulatory requirements. The initiative also seeks to make regulatory bottlenecks visible and feed into possible further action to address procedural hurdles.

g. Public-private data sharing
Private companies can influence policy by opening their private data for the benefit of society in what GovLab calls data collaboratives.[35] In this new form of collaboration, stakeholders from different sectors – particularly companies – exchange their data to create positive public value. Linkages between private and public IT systems are created allowing more accurate and quicker governance decision-making. One example is the Waze Connected Citizens[36] programme that promotes efficient traffic monitoring. Established as a two-way, data-sharing platform, Waze receives partner input from feeds to road sensors, incorporates publicly available incident and road closure reports from the Waze traffic platform and returns one of the most succinct and thorough overviews of road conditions today. Cities have benefited from real-time information to improve their road management and have achieved measurable reduction in congestion.

h. Direct representation in governance[37]
There are a number of initiatives encouraging increased public conversation and participation in the development and implications of technologies. One such initiative, advocated by Rodemeyer, Sarewitz and Wilsdon,[38] is increased public participation in technology assessment to introduce ideas and discussions on values, and incentives in the research, development and commercialisation of new technologies.

Expanding governance beyond the government

If government alone can no longer provide sufficient governance of emerging technologies in the Fourth Industrial Revolution, then new sources of authority need to emerge to govern these technologies. New models of public-private collaborative governance are needed to expand governance beyond existing public sector institutions.

a. Industry self-regulation

An important example of private sector-led governance of emerging technologies is provided through industry self-regulation. This can take many forms, from setting market conditions, such as price controls, market-entry conditions, product requirements and standard contract terms, to social obligations, such as environmental controls, safety regulations or advertising and labelling requirements. Self-regulation has many traits that make it more agile than formal legislation. Rule-making, monitoring, enforcement and remediation processes can be faster through self-regulation rather than government legislation, which means that consumers can be protected sooner. Self-regulation creates a flexible regulatory environment where guidelines continue to evolve over time providing pathways for innovation. Self-regulation may also help businesses internalise ethical behaviour and principles because the rules are based on social norms and the conduct of their peers rather than top-down prescriptive rules, thereby increasing the impact of the regulation. For example, the Digital Advertising Alliance (DAA) establishes and enforces responsible privacy practices across the digital advertising industry and regularly revises guidelines to adapt them to industry innovations such as Online Behavioural Advertising ("OBA Principles") and Multi-Site Data ("MSD Principles"), and the Application of the Self-Regulatory Principles to the Mobile Environment ("Mobile Guidance").

b. Super regulators

The notion of super-regulators, introduced by University of Southern California law professor Gillian Hadfield,[39] argues for "rules and regulations supplied by competitive private regulators that are overseen as necessary by public regulators," an "approach [that] harnesses the benefits of private regulation but without turning to self-regulation."[40] Instead, appreciating that private governance of emerging technologies is increasingly influenced beyond the traditional sphere of corporate governance. Technology platforms have to play a more active role in managing the external governance of their systems. For example, the EU's data protection law on the right to be forgotten, which gives EU residents the right to ask technology platforms to remove certain personal links from their search engine results. While this principle was created by legislators, the governance and implementation of the principles is left to the ingenuity of private governance.

Versions of these super-regulators are already appearing. Private regulators such as standards bodies, consortiums and alliances working on AI algorithm protocols and internet of things connectivity standards have been emerging quickly based on the understanding that standards and interoperability is required to grasp the economic and societal impact of new technologies. And while parties share an interest in aligning standards that promote technology development and interoperability, individually many companies seek the perceived competitive and economic advantages of building proprietary systems based on standards and protocols. Moreover, as new technologies blur the lines between industries, enable the creation of new business models and impact society on a larger scale, the legitimacy to set standards in the Fourth Industrial Revolution goes beyond the remit of current technology or industry standards-setting bodies.

c. Setting ethical standards

In the absence of an organization that has sufficient credibility to set new technology standards, industry leaders have been calling for the adoption of ethical principles that guide research and industry activities. Examples of such initiatives include the development of the Asilomar AI principles,[41] designed to guide the development of the AI industry, which currently has 3,800 industry leaders as subscribers. As a result, agile standard-setting and interoperability pilots are emerging where solutions are designed for specific societal use-cases. For example, the bIoTope[42] project aims to establish a marketplace for services provided by intelligent systems that can communicate with each other using open standards. The project provides concrete proof-of-concept of internet of-things interoperability scenarios in smart city environments in Helsinki, Brussels and Lyon. It is using open standards to ensure that technologies enable the publication, consumption and composition of information sources and services from across multiple systems.

The World Economic Forum calls these issue-specific multistakeholder networks that are dynamically coalescing experts from across multiple sectors and institutions, Digital Protocol Networks.[43] The purpose of each network is to develop actionable protocols, i.e. practical solutions that address a specific governance gap in the form of an informal framework or standard, including detailed specifications; operational processes; implementation guidelines; verification instruments; maintenance procedures; and/or dispute resolution mechanisms.

d. Creating collaborative governance ecosystems

New forms of governance frameworks can also emerge "as a side product" when businesses step up their role in society. In 2011, for example, Dell, HP, Microsoft Mobile and Philips[44] came together after their products created serious health and environmental consequences in Nigeria due to the lack of recycling options once their lifecycle had expired. They mapped out obstacles in the electronics recycling lifecycle and brought together stakeholders from civil society, business and government to remove the obstacles

identified. Government bodies enacted adequate regulations and an enforcement-enabling e-waste ecosystem began to emerge. In 2017, UNEP and the World Economic Forum joined the initiative to replicate the model across the continent.

e. Creating transparency and trust in technology innovation

In an environment where secrecy on algorithms and data is an important source of competitive advantage, the development of open IT infrastructure and protocols is a key tool for developing governance principles as they are perceived as open, vendor-neutral IT standards and certifications. The Open Group is a global consortium that enables the achievement of business objectives through IT standards. It combines more than 500 member organizations to capture, understand and address current and emerging requirements, and establish policies and share best practices, facilitate interoperability, develop consensus, and evolve and integrate specifications and open-source technologies. The open platform enables members to contribute to standards in a flexible, fluid and collaborative way.

Conclusion

Irrespective of culture, geographic or economic differences, the use and dissemination of advanced technologies is changing the way we live, work and interact as global citizens. It is only through collective and collaborative action, responsible and responsive leadership, and acceptance by policy-makers that public governance, in the Fourth Industrial Revolution, is something that should be a shared endeavour, can we forge a positive way forward. All stakeholders must be part of a global discussion about the ways in which technologies are changing the systems that surround us and impacting the lives of everyone on the planet. Agile governance is a tool to help citizens, companies and policy-makers join forces to build a new public governance model for the Fourth Industrial Revolution, one that seeks to ensure that policies are adaptive, human-centred, inclusive and sustainable. Through the World Economic Forum's Center for the Fourth Industrial Revolution's Agile Governance project, key learnings will be disseminated as an open-source endeavour to foster a culture of knowledge exchange and shared learnings in relation to public governance. The Fourth Industrial Revolution affords us the opportunity to reimagine policy-making to ensure that citizens, companies and governments are all capable of understanding and using advanced technologies while also being able to develop policies for the 21st-century through a collaborative process.

Center for the Fourth Industrial Revolution's Agile Governance Project

The Center is co-designing and piloting new policy and governance frameworks to accelerate the societal benefits of emerging technology while mitigating negative consequences. Through nine focus areas – including AI, blockchain, internet of things, drones, autonomous vehicles, precision medicine, and robotics – the Center will be partnering with leading governments and companies to reimagine governance for the Fourth Industrial Revolution. The Agile Governance project is working across the different project areas to consolidate broader learnings about innovative approaches to policy-making from the Center's pilots, as well as integrate and build on research by leading academics and practitioners, on the conceptual approaches and principles for agile governance.

The Center aims to understand and drive how policy-making and technology governance is changing in the Fourth Industrial Revolution and frame the concept of agile governance as a multistakeholder endeavour. By providing pragmatic guidance on best practices to build agile governance capabilities for public sector, private sector and other stakeholder contexts, this project seeks to accelerate the societal benefits of technological advancement and ensure that these benefits will be accessible to all. The core goal is to develop frameworks for agile governance methodologies and processes, which will culminate in a practical toolkit on agile governance approaches for policy-makers. It will incorporate examples from regulatory sandboxes, policy labs, and crowdsourced policy-making – including best practices and case studies of their effective deployment.

The Center will also explore the bottlenecks that inhibit agile governance or impede the successful use of policy-making tools; when to be agile and the relevant metrics to use to aid decision-making processes; how to prepare and adapt governance systems to follow the pace of change from the complexity of emerging technology (where understanding its implications requires additional expertise); the ability to test emerging technologies in "real-life" environments to understand the consequences of their use; and the available examples of agile governance used cases for emerging technologies.

Acknowledgments

Endnotes

1. 2017 Edelman Trust barometer: https://www.edelman.com/global-results/

2. *Ibid*

3. See, Torgeir Dingsøyr, Nils Brede Moe, Sridhar P Nerur, Venu Gopal Balijepally, *A decade of agile methodologies: Towards explaining Agile Software development*, Journal of Systems and Software, Vol. 85(6), 2012, Pp. 1213-1221

4. See, K. Schwab and N. Davis, *Shaping the Fourth Industrial Revolution*, World Economic Forum, 2018.

5. *Ibid.*

6. February 2001 – Agile manifesto - http://agilemanifesto.org/

7. World Economic Forum's Global Agenda Council on the Future of Software Development and Society, A Call for Agile Governance Principles, elaborated on the principles codified in the Agile Manifesto and reframed their application in the policy-making sphere. http://www3.weforum.org/docs/IP/2016/ICT/Agile_Governance_Summary.pdf

8. See, https://www.wired.com/insights/2013/10/moocs-too-much-hype-or-not-enough/

9. MOOCs are still developing and newer generations of the courses and their governance are addressing the challenges surrounding the first generation of courses to make for more personalised, engaged and relevant courses and programs. Enhancements in speed and scaling of systems providing and governing allocation of public services such as those provided by government in education, energy, transportation, etc. should be implemented with assurances that speed and quantity gains will not obscure the erosion of governance and service quality.

10. Callander and Martin, *Dynamic Policy-making with Decay*, American Journal of Political Science, Vol. 61, No. 1, January 2017, Pp. 50 – 67

11. See, https://e-estonia.com/

12. Technology companies account for 7% of Estonia's GDP and this is rising. See, https://e-estonia.com/e-estonia-state-of-the-future/

13. See. https://designtoimprovelife.dk/zipline-2017-body-winner/

14. See, https://www.boston.gov/news/mayor-walsh-announces-autonomous-vehicle-initiative

15. The concept of "*deliverology*" was coined by Michael Barber in 2011 as the title for his comprehensive guide to system reform and delivery based on his experiences of management in the public sector during his time as the Chief Adviser on Delivery for Prime Minister Tony Blair's Delivery Unit from 2001 – 2005.

16. See, for example, the role of the UK Cabinet Office's Policy Lab, https://openpolicy.blog.gov.uk/category/policy-lab/

17. The overwhelming number of policy labs that are still operating today were institutionalized as such over the past two to three years with only a few forerunners such as the Danish *Mindlab* built in 2001.

18. The EU Policy Lab is a collaborative and experimental space for innovative policy-making. The EU Policy Lab is both a physical space and a way of working that combines foresight, behavioural insights and design thinking to explore, connect and find solutions for better policies. See, http://blogs.ec.europa.eu/eupolicylab/

19. Set up in 2014 as part of the Civil Service Reform plan to make policy-making more open, the UK Cabinet Office's Policy Lab brings new policy tools and techniques to the UK Government through a creative space where policy teams can develop the knowledge and skills to develop policy in a more open, data-driven, digital and user-centred way. See, https://openpolicy.blog.gov.uk/about/

20. Denmark's MindLab is a cross-governmental innovation unit which involves citizens and businesses in creating new solutions for society. It is also a physical space – a neutral zone for inspiring creativity, innovation and collaboration. See, http://mind-lab.dk/en/

21. See, https://www.drivesweden.net/en and https://www.testsitesweden.com/en/projects-1/driveme

22. See, http://www.cbb.gov.bh/assets/Regulatory%20Sandbox/Regulatory%20Sandbox%20Framework-Amended28Aug2017.pdf

23. See, https://www.ema.gov.sg/Sandbox.aspx

24. In the increasingly digital age, data and access to data on large segments of society arguably determines the ability of different actors to influence people, policies and innovations.

25. World Government Summit and OECD, *Global Trends Report on Embracing Innovation in Government,* February 2017, Pp. 82

26. *Ibid* Pp. 96

27. *Ibid* Pp. 98

28. World Government Summit and OECD, *Global Trends Report on Embracing Innovation in Government,* February 2017, Pp. 54.

29. Tanja Aitamurto and Kaiping Chen, *The value of crowdsourcing in public policy-making: epistemic, democratic and economic value*, The Theory and Practice of Legislation, 2017. See, http://dx.doi.org/10.1080/20508840.2017.1282665

30. *Ibid*

31. See, http://www.thegovlab.org/project-crowdlaw.html

32. The dynamic platform enables agile policy-making by encouraging innovation on a continual basis without the need for formal legislative intervention. https://www.kokeilunpaikka.fi/fi/

33. See also, Tanja Aitamurto and Helene Landemore, 'Crowdsourced Deliberation: The Case of the Crowdsourced Off Road Traffic Law in Finland," 2016, Vol. 8(2), Policy & Internet, Pp. 174–196.

34. See, https://ec.europa.eu/research/innovation-deals/index.cfm?pg=home

35. See, http://datacollaboratives.org/

36. See, https://www.waze.com/lv/ccp

37. See, K. Schwab and N. Davis, *Shaping the Fourth Industrial Revolution*, World Economic Forum, 2018.

38. See, *The Future of Technology Assessment*, Woodrow Wilson International Center for Scholars, Washington D.C. 2005

39. G. Hadfield, *Rules for a Flat World: Why Humans Invented Law and How to Reinvent It for a Complex Global Economy*, Oxford University Press (2016)

40. *Ibid* Pp. 248

41. See, https://futureoflife.org/ai-principles/

42. See, http://www.biotope-project.eu/project-partners

43. See, https://www.weforum.org/projects/iot-ai-and-the-future-of-trust

44. See, https://theconversation.com/europes-electronic-waste-has-become-africas-burden-17123

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World Economic Forum
91–93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland

Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744

contact@weforum.org
www.weforum.org