

CRACKING THE CODE

RULEMAKING FOR HUMANS
AND MACHINES



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HIGHLIGHTS DOCUMENT

EXPLANATION

This document provides a high-level overview of the OECD Observatory of Public Sector Innovation (OPSI) innovation primer, “Cracking the Code: Rulemaking for humans and machines”. This working paper was drafted by OPSI within the Open and Innovative Government Division of the Public Governance Directorate of the OECD. It is a resource for public servants to help them understand and engage with “Rules as Code” and its potential implications for government.

ABOUT OPSI

This innovation primer is the third in a series produced by OPSI. OPSI works to identify and promote public sector innovation occurring across the world. As part of this, OPSI seeks to identify “what’s next” in terms of emerging practice and innovative uses of technology. It also aims to provide trusted and practical advice for public sector practitioners interested in the implementation of new ideas and concepts in their local contexts.



Observatory of
Public Sector Innovation

WHAT IS RULES AS CODE?

Emerging from a number of innovative trials in New Zealand and France, Rules as Code (RaC) rethinks one of the core functions of government: rulemaking. Fundamentally, RaC proposes to create an official, machine-consumable version of some types of government rules, to exist alongside the existing natural language counterpart. More than simply a technocratic solution, RaC represents a transformational shift in how governments create rules, and how third parties consume them.

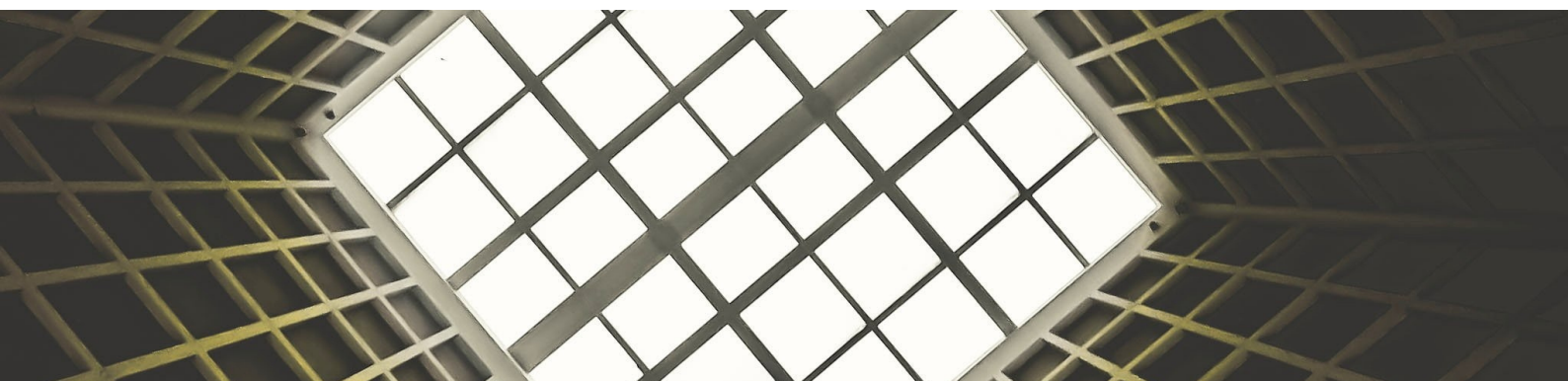
Firstly, if understood literally, RaC may be considered as an output. That is, as a coded version of rules that can be understood and used by a computer. Understood in this way, existing efforts have been extensive and vary in terms of complexity and the extent to which they achieve digitalisation (Wong, 2020). In fact, coded versions of rules exist widely today. For example, businesses have regulatory teams that interpret and translate government rules (written in natural languages) into code that informs often-proprietary software systems.

There is, however, a second component of RaC which has been opened up by the recent work of several public sector teams, often with private sector or academic involvement. The focus of the primer, this dimension sees RaC understood as representing a strategic, systemic and deliberate approach to rulemaking. In this sense, RaC is:

“the process of drafting rules in legislation, regulation, and policy in machine-consumable languages (code) so they can be read and used by computers” (de Sousa, 2020)

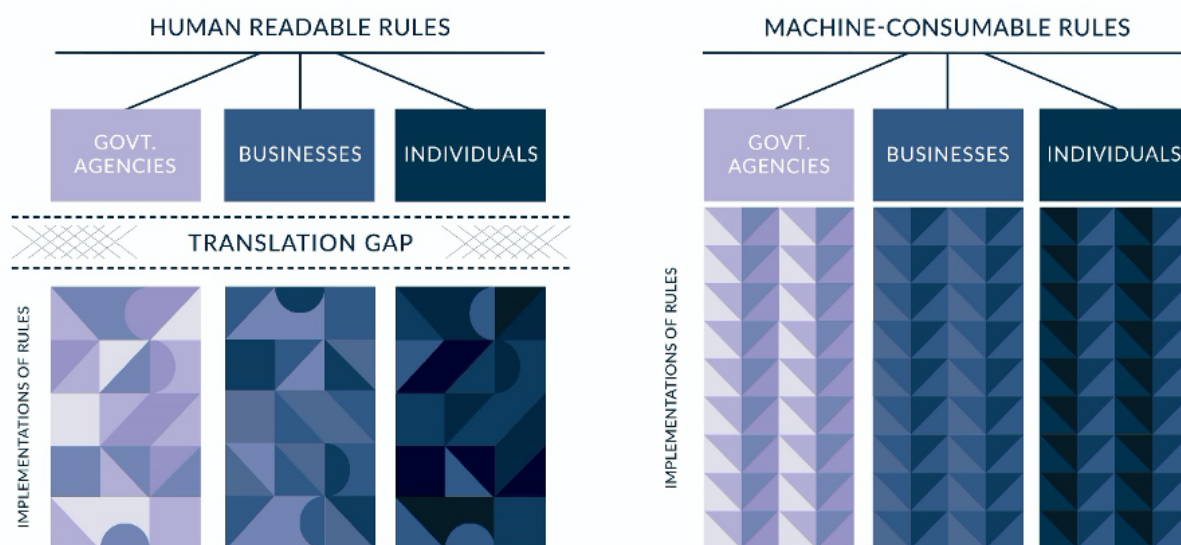
Conceptualised in this way, RaC is about changing when, how, by and for whom rules are made. It moves beyond enhancing existing workflows and processes, and requires deeper and deliberate examination of the rulemaking process. It positions government as the creator of a machine-consumable version of rules from the outset, rather than after the fact.

To achieve this, early initiatives have brought together key stakeholders from the existing rulemaking process to create machine-consumable versions of existing rules. A more complete (but less tested) RaC approach would see this process comprehensively restructured in order to bring forward the creation of machine-consumable versions to the initial drafting stage. This would see government become rule makers of both human and machine-consumable versions of the rules, simultaneously.



RaC could also mean a new way of consuming rules. Currently, governments produce human-readable rules that are individually consumed and interpreted by people and businesses. Each regulated entity, for example, must translate laws into machine-consumable formats for use in business rule systems. A future state with RaC could see official, machine-consumable versions of these rules produced by governments, concurrently with the natural language versions, and exposed through mechanisms such as an API or a software library. This could allow businesses to consume machine-consumable versions directly from government, while reducing the need for individual interpretation and translation (Figure 1).

Figure 1. Consuming Rules



Note: With only a natural language, human readable form of government rules, entities have to interpret and translate rules into coded forms (which can create inconsistencies or errors) multiple times. Figure 1 Shows how creating an official, machine-consumable version of rules could enable their more consistent consumption and use by government (and its agencies), business and people by minimising the translation gap.

WHY RULES AS CODE?

RaC has emerged from the recognition that governments need to design rules for humans and machines in order to better realise their policy objectives. It is a response to a new operating context for governments that has created or accentuated issues emerging from the current rulemaking process. Finally, it is part of a broader movement towards the realisation of digital government.

RaC argues that governments can improve the effectiveness and efficiency of rulemaking processes, achieve better policy outcomes and transform public service delivery. This would be a digital leap forward for one of the oldest functions of government and could have far-reaching implications, not only for how government works, but also for government-citizen and government-business relations.

If government is to be effective, it must keep pace with the speed and direction of change happening around it. If this is accepted, then, it is surely necessary that one of the most fundamental functions of government – rulemaking – does likewise.

NEW CONTEXT

Government rulemaking is being challenged by several significant trends and changes in its operating environment. Governments must deliver effective, proportionate and responsive policies, before ensuring understanding of (and compliance with) those rules once implemented. This is in a context of growing complexity, with issues that cut across multiple policy domains, and which is characterised by rapid change. Further, it comes at a time that citizens report declining levels of trust in governments and their capacity to deliver the policy responses required by new, multi-faceted and challenging policy issues.

Governments themselves have long been grappling with the challenges of rulemaking and enforcement. Red-tape reduction, administrative simplification, 'debureaucratisation', regulatory impact assessments, and many other interventions have been created in an attempt to address such challenges, to varying degrees of (sustained) success. While there have been new additions (e.g. regulatory sandboxes, or the use of behavioural insights (OECD, 2018a)) and notable progress, much has been incremental or focused on enhancing existing operations. Yet, the ongoing concern with these issues – as evidenced by governments returning again and again to simplification and streamlining of rules (e.g. see OECD, 2019e, 2018b) – suggests that a continuation of the same approaches will likely continue to deliver the same frustrations. A new approach – a deeper and systemic response – is required to move past the recurrent concerns and the limitations identified.



THE CURRENT STATE OF RULEMAKING

The current state of government rulemaking illustrates this point. While it has undergone change and reform overtime, it has largely remained immune to fundamental transformation. This has resulted in a number of issues, including that the current process:

- is opaque, complex and hard for members of the public (and sometimes even those making the rules) to understand
- is often linear and siloed, which creates opportunities for misinterpretation of either the initial policy intent or of the rules themselves
- does not ensure that the rules created by governments can be implemented effectively, because of the limitations of government service delivery
- generates rules that are often numerous and interconnected (though without guaranteeing consistency between them), which increases the difficulty faced by individuals, businesses and governments seeking to comply with their requirements
- positions certain individuals (especially, lawyers and software developers) as ‘modems’, that is, as the necessary interlocutors and intermediaries for interpreting the rules and translating these into other forms, such as operational business rules
- only creates a human-readable form of rules, requiring individuals, businesses and governments, to separately interpret, code and implement a version of the rules within individual systems
- limits the scope for policy makers to model and test the impacts of changes to the rules ex ante and to seek public input in the rule development process.

The forces outlined above have led to the sense that governments have to do better in responding to our era’s most pressing policy challenges if they are to meet the growing expectations of their citizens and, most crucially, if they are to effectively execute their fundamental role as rule makers.

PART OF A BROADER TREND

RaC is a part of a broader trend towards digital government. It can be aligned with a range of movements from e-Government, to Open Government Data (OGD), to Government as a Platform (GaaP). In terms of OGD, RaC attempts to provide rules in the form of official and machine-consumable data, thereby extending the movement to make more government data accessible, useable and open. By providing an open, machine consumable set of rules, which can be combined with other open data sets, RaC converts some of the real but implicit nature of government into tangible, and thus observable, data.

RaC can also be seen as aligned with digital transformation, in that it envisages rules as digital instruments from the bottom-up, rather than as an add-on or after-the-fact adjustment. This supports the related movement to GaaP, which reframes governments as providers of public data and infrastructure that can be used by others (i.e. the private sector and government itself) for individual purposes (Andrews, 2019).

In this way, RaC can be seen as a response that is:



deliberate – an explicit choice rather than an inevitable progression, involving a conscious recognition of new realities, including that machines are now consumers of government rules, and that this is something to design for.



strategic – reflecting and integrating with wider shifts, trends and investments, as well as acknowledging that governments should provide what they are uniquely responsible for.



systemic – an integrated and supported, rather than patchwork or partial response that does not recognise the fundamental significance and interconnectedness of rulemaking within the public sector and its administration.

RaC suggests that the actor best placed to provide an official source of digital rules is the government. This represents more than the development of a new technical approach or technocratic 'fix' to an existing problem. It represents a potentially paradigmatic shift in how governments design, implement and provide rules.

RULES AS CODE IN PRACTICE

Following the success of early RaC initiatives, notably that of the New Zealand Government's Better Rules programme (see Case Study) and France's efforts to "transformer la loi en code informatique", global interest in RaC continues to grow rapidly.

CASE STUDY: BETTER RULES, NEW ZEALAND GOVERNMENT

Better Rules is a New Zealand Government initiative, which has helped drive international interest in RaC. Covered in OPSI's Global Trends Report 2019, the Better Rules discovery has inspired similar initiatives as a number of jurisdictions seek to test this approach to RaC. The Better Rules methodology emphasises the use of multidisciplinary teams and human centred design practices to produce machine-consumable code that helps ensure the implementation of rules better matches their original intent. As the Ministry of Business, Innovation and Employment (MBIE) explains, Better Rules is a 'methodology that enables us [the government] to produce logic expressed as a concept model, decision trees, and rule statements. Together these create a blueprint of the legislation... [which can be used] to write legislation in any language. For example, English words and software code.'

The initial Better Rules Discovery occurred over three weeks in 2018. Facilitated by the Service Innovation Lab (LabPlus) and Better for Business, the project brought together representatives from several NZ Government agencies. Highly multi-disciplinary, the team contained business rules specialists, business analysts, legislative drafters, service designers, policy specialists and software developers. Together they mapped the current state of policy development and implementation, before defining a future state 'which was to have human and machine-consumable versions of rules for effective and efficient delivery of services' (Digital.Govt.NZ, 2018). The discovery tested an approach the team thought capable of delivering this future state, by attempting to code two pieces of legislation: the Rates Rebate Act and the Holidays Act (Digital.Govt.NZ, 2018).

Following the Discovery phase, the approach was implemented to develop rules as code for two use cases: "(1) to support a planning tool for parents, expectant parents and caregivers to assess what financial help is available; (2) a calculator to help low income ratepayers find out how much of a rebate they are entitled to and to step them through the application process" (OPSI, 2018).

Better Rules demonstrated that the production of coded rules is technically feasible and provided one potential approach to achieve this. Its key findings included that while 'it is difficult to produce machine-consumable rules if the policy and legislation has not been developed with this outcome in mind', the multidisciplinary team is an effective way of creating RaC. Finally, it resulted in the establishment of a Better Rules work stream within MBIE. Currently, the team is focused on two outcomes:

1. Supporting use cases that demonstrate the value in a government context (including on issues such as identity management and trade regulations);
2. Capability and capacity development (including through the production of explanatory videos and the ongoing development of a facilitated and online course).

Better Rules demonstrated how RaC could be instituted in government. It has played a central role in bringing greater attention to RaC, especially within government, and is acknowledged as having made a key contribution to the global discussion on the concept's importance and viability.

In Australia, Canada, France, Germany and Jersey (United Kingdom), public sector teams are experimenting with the concept and its potential application. Broadly, the primer distinguishes between more strategic and practical or working level initiatives. Where strategic initiatives are primarily focused on interrogating the potential implications of RaC, more practical efforts have tested models and approaches for the production of coded rules. Of course, in many instances, initiatives combine dimensions of both categories. Some of the efforts to date are summarised in Table 1.

Table 1. RaC initiatives

| Initiative | Description |
|---|--|
| Better Rules, New Zealand, Service Innovation Lab and Better for Business | A three-week discovery sprint that developed and tested a multi-disciplinary approach to coding rules. Having helped spark other RaC efforts around the world, Better Rules is now a work stream within the Ministry of Business, Innovation and Employment. The Wellington City Council is also using RaC in the context of urban planning to help inform the city's new district plan. |
| RaC Initiatives, France | The French Government has a number of RaC-related initiatives. This includes the development of the open-source platform OpenFisca, LexImpact (which allows ex ante policy modelling) and a number of services based on coded rules (Mes Aides and Ma Boussole). |
| Impulse Paper, Germany, German Competence Centre for Public IT | The German Competence Centre of Public IT has produced an impulse paper into how machine-consumable rules could be created and used within the German context. |
| Digital Regulatory Reporting, United Kingdom, Financial Conduct Authority and Bank of England | An ongoing program of work designed to explore how regulatory reporting mechanisms can be modernised and optimised. This is a collaboration between the Financial Conduct Authority, the Bank of England, as well as a number of commercial entities. |

Chapter 5 explores a number of these initiatives in detail. In terms of practical or working level initiatives, it further differentiates between three primary RaC approaches. These include:

- **Manual coding, multidisciplinary team** – which sees a team take existing rules, for example, those contained in legislation, and codify them into a set of machine-consumable rules. The rules can then be used for a variety of uses and by multiple actors and can be made available for consumption and use, i.e. via Application Programming Interfaces (APIs).
- **Semantic technologies** - machine-consumable rules could also be derived by using technology to automatically generate code from natural language text (e.g. published legislation). While no existing tool has succeeded in completely and automatically deriving machine-consumable rules from natural language rules to a level of 1-to-1 accuracy, this may be possible in the future as the technology and approaches mature.
- **Domain model based regulation** - involves the government creating models of regulation and laws, which are then converted into software languages as required by third parties. Here, the crucial difference is the provision of an official model of the rules, from which third parties can derive machine-consumable versions.

BENEFITS AND CONSIDERATIONS

What benefits and considerations would attend the testing or use of a RaC approach in government? Table 2 below provides a summary of the potential benefits that could result from the implementation of a RaC approach. This is followed by Table 3, which outlines some of the primary considerations that those seeking to use RaC must understand and manage.



Table 2. Potential main benefits of a RaC approach

| Benefit | Description |
|--|--|
| Better policy outcomes and enhanced service delivery | By reducing or removing the need for interpretation and translation of rules between their human-readable and machine-consumable forms, RaC could minimise the gap between policy intent and implementation. This could deliver better policy outcomes and enhance service delivery. |
| Greater transparency | By making the process of rule creation more transparent, for example, by exposing the coded rules, as well as any changes to these, citizens and lawmakers could have greater visibility over how rules are made. |
| Disintermediation and increased accessibility | RaC extends the trend towards disintermediation enabled by digital technologies into the domain of the law and, by extension, public administration. By making rules more accessible and comprehensible (likely both for machines and humans), users of rules will have less need to rely on (costly) experts to understand their rights and responsibilities. |
| Improved consistency and fairness | An official set of coded rules, made available to be consumed by third parties, is likely to increase the consistency of their application. This could improve fairness and confidence in the rules. |
| De-risking | Current rulemaking creates risk by having individuals hard code rules into multiple systems. Over time, knowledge can be lost and the reasoning behind original coding decisions can become opaque. This can create system risk for entities. |
| Innovation | Opening up the rules of government for third party use and consumption could help encourage public innovation, not least in terms of supporting innovation in terms of public service delivery. |

Table 3. Potential considerations associated with a RaC approach

| Benefit | Description |
|---------------------|---|
| New rules or old? | RaC initiatives must decide whether to code existing rules or, more ambitiously, to create new rules in both human and machine-consumable forms from the outset. |
| Technology choice | How to implement RaC from a technical standpoint, for example, the language, standard or rules engine to use for RaC efforts remains strongly contested. A discussion of key technology considerations is included in the full report. |
| Sharing coded rules | A number of the potential benefits of RaC depend on third parties being able to consume and integrate an official version of coded government rules. Ensuring that rules are accessible and consumable is therefore a key issue, to which a number of solutions have been proposed. |
| Scaling solutions | Most existing RaC initiatives have been experimental and have yet to be scaled. Achieving effective mechanisms and structures to scale RaC approaches will be required if governments are to adopt and embrace the approach. |
| Capability | The adoption of RaC could result in the need for new or different capabilities for rulemaking. Further, it may generate demand for new and rare skill mixes. |
| Governance | Governing RaC-style rules will be a central issue. This may involve considering who should undertake and lead RaC initiatives, as well as the structures and mechanisms required to support (and perhaps constrain) this work. |
| Legal implications | Creating an official set of machine-consumable rules raises a number of legal questions that must be carefully considered by governments. |

FUTURE SCENARIOS

There is no way to predict how (or even if) RaC will be implemented in any country context, let alone multiple jurisdictions. However, consideration of a range of hypothetical scenarios can be useful in teasing out system dynamics about how the public sector may engage with, respond to, or possibly resist RaC. It provides a means of making assumptions explicit and thus more easily appreciated and challenged, as well as helping to highlight where there may be a need for further investigation.

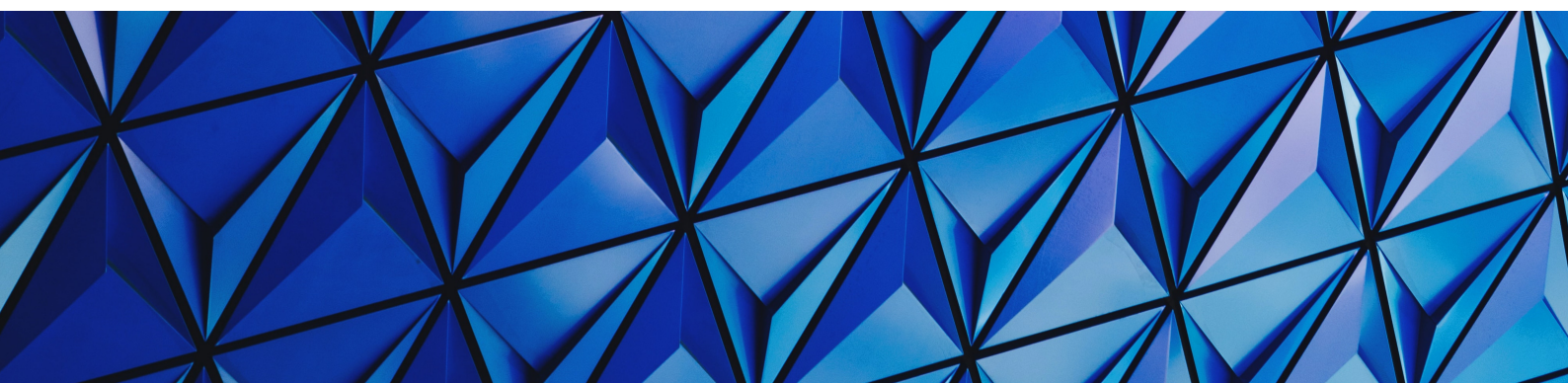
The primer explores three scenarios, which explore the possible use of RaC:

- The “Zero Scenario” explores how things might play out if the broad status quo is maintained in essentially the same way
- Scenario One explores what might need to happen for RaC to be engaged with in a partial manner
- Scenario Two explores how things might evolve into a wholesale adoption of RaC.

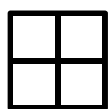
The scenarios help highlight that Rules as Code is by no means the default but that the factors underpinning the need for change will likely be magnified as time goes on, and thus a deliberate approach needs to be taken. Many of the implementation issues involved with RaC can be expected to self-resolve as jurisdictions build their competence. There is, however, a risk that divergent paths could harm the long-term value of RaC; ensuring the interoperability of approaches will therefore be important to delivering on its promise. RaC may also be used in situations and contexts that it is inappropriate for, and this highlights the need to proactively consider governance from the outset.

OPERATIONALISATION

The primer aims to provide practical information to those individuals within government seeking to operationalise RaC in their given contexts. The primer considers who should code the rules and what rules should be coded, highlighting some of the characteristics which may make rules suitable for a RaC approach. Finally, it proposes a number of practical steps that various actors could take to begin investigating or implementing a RaC approach in their own contexts. It also proposes a number of principles that should inform a RaC approach. These are outlined below.



PRINCIPLES FOR A SUCCESSFUL RAC APPROACH



Transparency – the rules generated by RaC projects, and the processes involved in their creation, must be transparent for end-users and citizens. This could be achieved by directly exposing coded versions of rules (which would make rules more transparent for technical experts), but also indirectly through front-end applications (which allow citizens to assess their own circumstances in relation to the rules).



Traceability – requires that the coded rules isomorphically reflect the original rules, that is, ensuring an effective 1-to-1 mapping between the machine-consumable and natural language versions. The thinking and decisions underpinning the generation of coded rules should also be clearly documented and available.



Accountability – governments should endeavour to ensure that the official, machine-consumable version of rules is correct and, as a result, can be trusted. This would require that the government is accountable for the coded rules if errors are made.



Appropriateness and Appealability – Appropriateness requires that consideration be given to the question of if a RaC approach is suitable for a given area or problem. In the event of errors or the unfair application of a rule using a machine-consumable form, there must also be mechanisms that allow the coded version to be corrected and/or appealed.



Availability and Interoperability – Rules should be published openly and with mechanisms that enable their consumption by third parties.



Secure – governments should consider how to provide machine-consumable rules securely. This will assist to guard against cyber risks as well as potential misuse.

PRACTICAL ACTIONS

For policymakers and regulators

- Assess which policies or regulations within their own field(s) of expertise may be suitable for a RaC approach.
- Investigate stakeholders' appetite for machine-consumable rules and options for partnerships to test, trial and experiment with approaches for delivering RaC.
- Consider the frameworks, governance requirements and standards that may be required to achieve maximum utility from RaC within the given jurisdiction or, even, nation.

For those involved in the legislative process

- Investigate and identify methods of drafting which are more conducive to development of RaC-style rules.
- Examine the types of rules most likely to be suitable for the application of RaC approaches.
- Engage and collaborate with the academic community to consider the potential legal and ethical implications that could stem from the development and use of a RaC approach in government.

For service design and delivery experts

- Work with policy experts to understand the problem space(s) being targeted with a RaC approach.
- Research how RaC could maximise value for the people, businesses and governments consuming a given service, while experimenting with service delivery approaches.

For technologists

- Understand what the common issues are in terms of legislative requirements that commonly prevent the realisation of intended policy outcomes.
- Investigate technology options that are most applicable in given jurisdictional contexts, as well as those most suitable for the national sphere. This could include fostering the research and development of new technologies.
- Engage and collaborate with the academic community in order to draw and build on research insights, for example, from the field of computational law.



FINAL WORD

Rules as Code is an innovative concept that has the capacity to fundamentally change the way government thinks about and makes rules. By creating a machine-consumable version of government rules, alongside the existing natural language form, governments may be able to drive better policy outcomes, increase efficiencies and open up new avenues for innovation. Certainly, RaC is strongly connected to the digitalisation of government, that is, it has a strong technological element. Yet, more than this, RaC is a deliberate, strategic approach designed to improve the function of government itself.

Certainly, the challenges and unknowns associated with RaC remain significant. Yet, it seems that the transformative potential of RaC is equally great.

Certainly, the challenges and unknowns associated with RaC remain significant. Yet, it seems that the transformative potential of RaC is equally great. For governments still early in their digital transformation journeys, an idea with the potential to require the deep reorganisation of government and its operation may seem daunting. Yet, in RaC, governments may have a (potentially time-limited) opportunity to shape the conversation, carve out the contours of the concept's development and define the idea in a way that best meets their (democratic) goals. An unwillingness to explore it now, by contrast, may see it lose this advantage to other nations or have it shaped by private, rather than public, needs.

RaC does not promise a panacea that will deliver flawless rules, remove all implementation issues and resolve all democratic trust issues. What it does do is invite a conversation about how we can use technology and innovation to improve the quality of our rules, as well as the processes by which they are made. In this way, RaC represents a starting point for innovators, policy makers, technologists and academics to challenge the status quo and to test, experiment and refine a new way to make the rules that are needed today and in the future.

This text is not an official part of the working paper "Cracking the code: Rulemaking for humans and machines" (Mohun and Roberts, 2020). Rather, it provides a summary of the main ideas and insights, to help make the content of the study accessible to a wider audience. It should not be used as a formal reference or for citation or as a substitute for the full report. Photo credits to Scott Webb on Unsplash.