Rules As Code

Discovery Project and Possibilities for the Future

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This presentation will summarize the Rules as Code Discovery Project, offer lessons we learned, and present a series of options for next steps.
This discovery project supported two main objectives: experience the rules as code process and test whether the process can produce better rules.

1. Experience the rules as code process in the Government of Canada context
   - Assess the feasibility of rules as code
   - Build capacity and experience within the public service
   - Build an evidence base
   - Document lessons learned

2. Begin to test whether rules as code produces better rules
   - Improve the quality of rules
   - Support a more consistent interpretation
   - Reduce costs of compliance
   - New possibilities to improve service delivery
We selected sections 12 and 13 of the Canada Labour Standards Regulations for our use case. This regulation details vacation pay entitlements to eligible employees.

Our process included:

- Identifying **key stages** of the process
- Observing of the benefits and challenges of working in a **multi-disciplinary team**
- Reflecting on what **types of rulesets** would be **best suited** to rules as code
- Learning about **opportunities to improve the drafting process**
- Collecting **lessons learned** and identify **opportunities for future learning**

This regulation has a narrow focus and prescriptive rules. It is a good test case to demonstrate the value of rules as code.

Ultimately, **working through the process yielded the greatest insights**
Learning by Doing: Process Overview

We worked through a process to convert the regulation to code.

- **Concept Model Created**: Fall 2019
- **Ruleset Converted to Code**: Mar. 2020
- **Decision Tree Created**: Feb. 2020
- **Prototype Developed**: Mar. 2020

**Ruleset Selected**

**Annual Vacations**

- If the employee has completed at least 5 years of employment as of the first day of employment after the commencement of work on or after the commencement date, they are eligible for the total number of completed months of service in the employed employment as of the commencement date as of the first day of employment as of the commencement date. The number of completed months of service is determined by the number of completed weeks of employment as of the commencement date as of the first day of employment as of the commencement date.

**Decision Tree Created**

- If the employee is eligible for annual vacation, the vacation pay is calculated based on the number of completed weeks of employment as of the commencement date as of the first day of employment as of the commencement date. The vacation pay is determined by the number of completed weeks of employment as of the commencement date as of the first day of employment as of the commencement date.
First, the team held a series of workshops to **identify key concepts** in the regulation and **define the relationships between them**

### Key Terms* from the Vacation Pay Regulation

- Employee
- Employer
- Date of hiring
- Length of service
- Termination
- Vacation
- Vacation pay
- Medical leave

### Relationships* Between Key Terms

- **Employee** has a **Date of hiring**
- **Employee** is entitled to **Vacation pay**
- **Vacation pay** is paid by **Employer**
- **Medical leave** affects **Vacation Pay**

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**Key Insights**

- Converting rules to code is not as simple as handing a ruleset to a programmer - the process matters.
- Subject-matter experts played an important role to help our team interpret subtleties of the rules and how different concepts related.

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*These are not exhaustive lists*
Step 2: Decision Tree

Next, we converted the regulations into a decision tree to determine the effect of certain variables on vacation pay entitlement. Examples of key questions related to medical leave are depicted below.

Did the employee take medical leave?  
- yes  
  - Was it more than 17 continuous weeks?  
    - yes  
      - Has he/she been employed more than 5 years?  
        - yes  
          Subtract leave from employment duration and calculate vacation pay  
        - no  
          No impact  
    - no  
      No impact  
  - no  
    No impact

Key Insights

- Rules as code are best suited to prescriptive rulesets like vacation pay, though even these can be challenging. In this case we had to consult experts to understand technicalities of how medical leave affected the vacation pay calculation.

- Using a decision tree helped our team close the gap between how the regulation was drafted and how it would be applied in practice by testing how the rule would perform in different scenarios.
Step 3: Coding and Prototype Development

After completing the models, we **coded the regulation** and **developed a simple prototype** based on the coded rules.

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### Key Insights

- Encoding rules and building a prototype was the 'easy part' of this project. The **greatest source of value is the process** to identify concepts, relationships, and decision points.

- Though not tested in this project, future projects will face technical challenges to develop an **application programming interface** (API) - an interface that could allow a business to link encoded rules directly to their business systems.

[https://rulesascode.habitatseven.work](https://rulesascode.habitatseven.work)
Lessons Learned: Processes

We demonstrated how rules as code could be applied in the Government of Canada context, we could reflect on their use cases and potential benefits.

Learning Objective

1. Experience the rules as code process in the Government of Canada context
   - Assess the feasibility of rules as code
   - Build capacity and experience within the public service
   - Build an evidence base
   - Document lessons learned

Key Insights

- This process is best suited to rulesets that are prescriptive and able to be quantified – in other words, this process works best when we can reduce rules to yes/no, true/false, and if-this-then-that statements.
- We expect parallel drafting of rules as text and as code will add time to the drafting process, but we see the potential for efficiency and time savings after a rule is converted to code (e.g. quicker deployment of a ruleset).
Lessons Learned: Processes (continued)

Working through the process together built internal capacity and rules as code experience across the regulatory community.

Learning Objective

1. Experience the rules as code process in the Government of Canada context

   - Assess the feasibility of rules as code
   - Build capacity and experience within the public service
   - Build an evidence base
   - Document lessons learned

Key Insights

- Public servants who participated in the project learned new skills and improved their understanding of how rules of code could be applied in practice. This capacity can be leveraged to equip departments pursue future rules as code initiatives.

- The multi-disciplinary team we assembled included public servants with different skillsets, expertise, and perspectives. The multi-disciplinary team was an asset to the project, with team members asking challenging questions and considering the project from multiple perspectives.
Lessons Learned: Better Rules

The rules as code process offers opportunities to draft higher quality rules

Learning Objective

2. Begin to test whether rules as code produces better rules

- Improve the quality of rules
- Support more consistent interpretation
- Reduce costs of compliance
- New possibilities to improve service delivery

Key Insights

- One of the biggest potential benefits we see is better connecting how rules are drafted and how they are implemented

- We simulated how our ruleset could be applied in our prototype application. Based on our test, we could make corrections and improve accuracy. If rules were encoded in parallel, live testing could help drafters write better rules

- Our experience showed us that rules as code will likely change both the drafting process and the substance of the rules we draft
Lessons Learned: Better Rules (continued)

Encoding rules offers opportunities to **improve service delivery** and facilitate greater regulatory **compliance**

**Learning Objective**

1. Begin to test the hypothesis that rules as code produces better rules
   - Improve the quality of rules
   - Support more consistent interpretation
   - Reduce costs of compliance
   - New possibilities to improve service delivery

**Key Insights**

- After working through the process to interpret the meaning and intention of the vacation pay regulation, we see significant value to encoding a rule that others could access as an **authoritative source** and accurate interpretation of a complex rule.
- The scope of this project did not include a public-facing element or the development of an API to link encoded rules to other business applications. The team recommends that future projects test these capabilities to consider effects on compliance costs and service delivery.
The demonstration project was effective. It quickly and cheaply demonstrated that it is possible to convert legal text into machine-usable code. Building on this success, there is more to learn as we explore how rules as code could be applied.

Coded rules will likely be considered to have “non-official” legal standing. What does that mean for the practical applicability of coded rules?

What approaches, vocabularies, languages, and platforms should be standardized as we move forward?

How would a rules as code process change the process of drafting a new ruleset if done in parallel? What about documents incorporated by reference?

What would it look like to demonstrate an entire use case (including development of an API and a public-facing end product)?

What capacity and skillsets would be required for drafters and for regulators to be able to effectively work alongside someone with technical coding expertise?
Future Opportunities

We have opportunities to take on other work related to rules as code. Some of these opportunities include:

**Rules as Code This Year**

1) **Simulate a process where a new ruleset is developed in parallel** with a rules as code process to study how drafting timelines could be affected and whether rules as code could improve the quality of the ruleset.

2) **Cover the entire use case for a ruleset**, including the development of an API and a public-facing component.

3) **Test the rules as code method on a different kind of ruleset** (e.g. policy or standard).

**Other Rules as Code Work**

1) Assemble **guidance** and other resources for the Government of Canada Regulatory Community, including lessons learned, use cases, and advice on methods and techniques.

2) Contribute to the development of **common standards, frameworks, and guidelines** for rules as code in the Government of Canada.
Scott McNaughton
Senior Project Lead
Innovation and Policy Services Branch
Canada School of Public Service
Scott.Mcnaughton@canada.ca
@scott_pm

Questions?