

Scrutinizing the Sustainability of Software that Shapes legal norms

27/09/2023

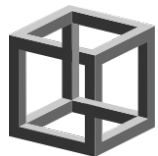
Paulus Meessen

IPA Fall Days

WHO AM I?



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COHUBICOL
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AUTOMATION OF TAX AND BENEFITS LAW



On Normative Arrows and Comparing Tax Automation Systems

(Link to the paper is in the program)

On Normative Arrows and Comparing Tax Automation Systems

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ABSTRACT

Automation of legal norms can only exist because of compromises made in translating laws in natural languages to code (executables) in formal languages. Tax and benefits law is canonically considered one of the least compromising domains of law in terms of this nuance. In this paper, I compare two domain-specific languages used in the automation of tax and benefits law: Catala, which is proposed for use by the French Tax Authority, and Regelspraak, which the Dutch Tax Authority uses. The comparison is based on a top-down modeling approach, which does not try to go all the way down to the technical differences but aims to identify the points at which the two approaches diverge in the way the norm is shaped. It becomes evident that a lot of decisions that affect normativity are made inside the technical components of these systems. Safeguarding legal protection at the creation of automation of norms will likely require cross-domain efforts.

CCS CONCEPTS

• **Software and its engineering** → *Domain specific languages*; • **Applied computing** → *Law*.

KEYWORDS

legal automation, domain-specific languages, norm engineering

ACM Reference Format:

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1 INTRODUCTION

In this paper, I set out to explore the variety of transformations that norms undergo in the process of legal automation. By comparing the data pipeline of two domain-specific languages in tax automation many norm-shaping transformations become evident. The ultimate goal is to use this understanding to safeguard the fundamental legal protection that stands to be eroded by legal automation.

It is a well-known issue that formal languages cannot contain the nuances of natural languages and that the procedures of the law – which safeguard the protection the law provides [18] – are rooted in the use of natural language [5]. In this capacity, legal automation

will always be a compromise between the (idealized) benefits of automation and the erosion of legal procedure.

The automation of tax and benefits law has been a little less controversial in the academic literature: claiming the near mathematical quality of the rules for computation [13], or the ‘well-settledness and large body of case law; causing most cases to be routine’ [4]. The individual rules in these regulations are commonly presented as mathematical functions to be calculated and seemingly require little legal interpretation. Computing with rules has engaged the engineering community since the early days of automated reasoning and declarative programming languages [16] and on the outset calculating tax rules appears to be a well-scoped problem:

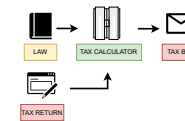


Figure 1: Simplified model of tax automation system

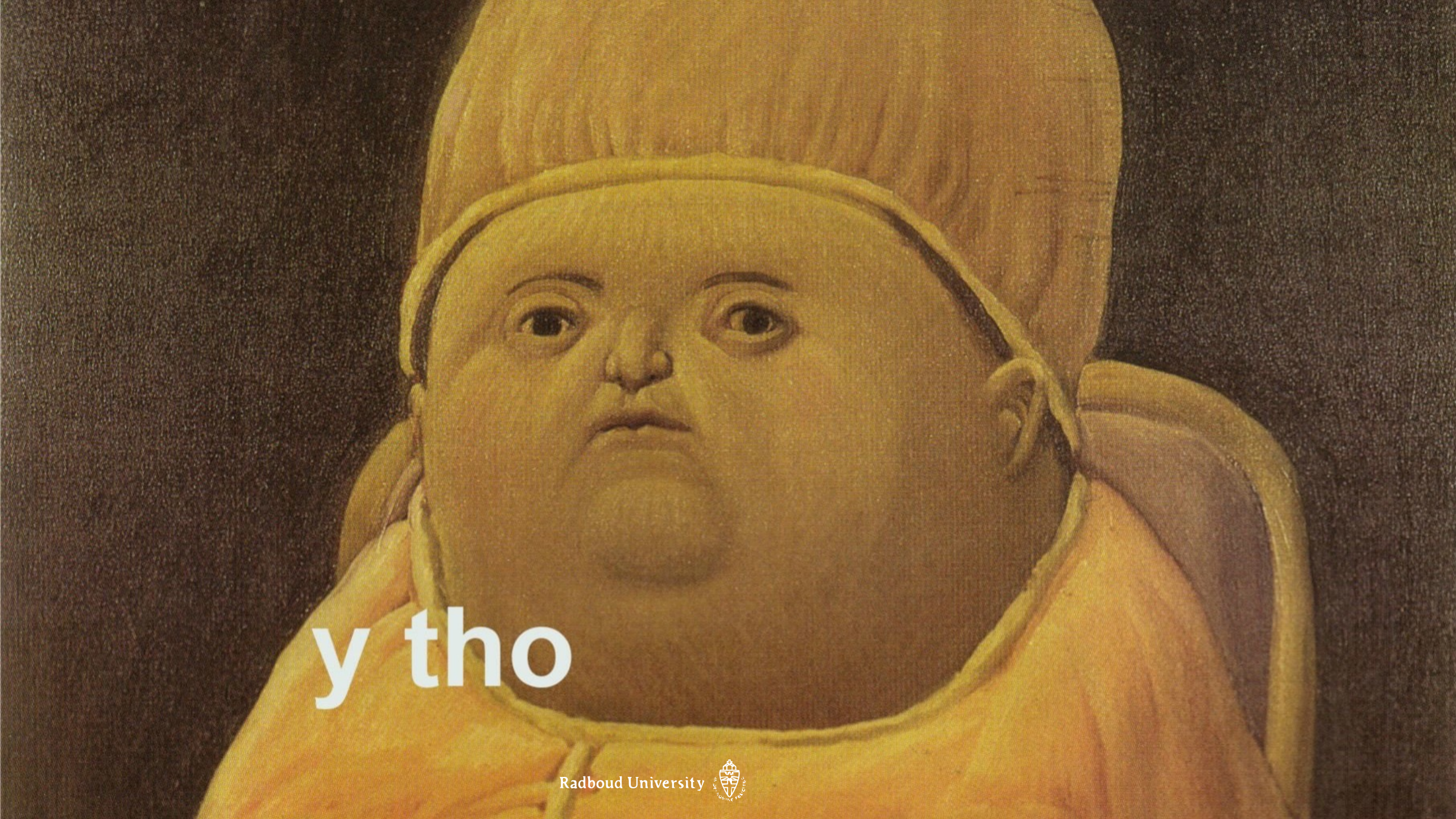
In figure 1 we see an abstract model of a tax calculator that has been programmed based on a set of laws from the tax code. Yellow represents the legal domain, green is Software Engineering. Such calculators are a practical necessity of automated fiscal administration. The calculator takes as input a (structured) Tax Return and should be able to compute the corresponding Tax Bill. At the outset it should be clear that this calculator is shaped by the tax code; however, the reality of how the norms in the tax code affect one’s tax bill is entirely shaped through the technology.

Creating a rule engine to correctly and efficiently compile the set of legal rules into executable software for the real world is still not a well-demarcated problem: One has to account for the mode of legal reasoning that is used in a specific jurisdiction [8]. Such nuances may also exist between various sub-fields of tax and benefits law. Furthermore, one must decide on a (sub)set of laws relevant to the task. This can also involve other sources of law or unwritten rules of administration. Testing the correctness of these rule engines requires setting up a benchmark of relevant real-world labeled data of matching tax returns and tax bills. Producing that benchmark requires fiscal experts or the availability (sensitive) accurate historical tax data, and means for comparative testing are not always readily available.

Some requirements are present for all tax and benefits law calculation systems, such as correct arithmetic on financial data. However, this paper will focus on the automation of reasoning with rules.

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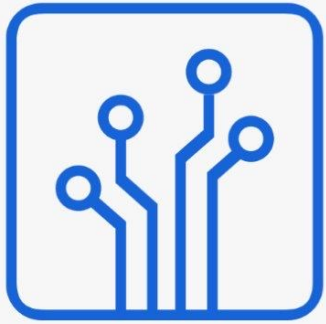
SUSTAINABILITY



y tho

A photograph of two lion cubs in a savanna. The cubs are lying down in tall, dry, golden-brown grass. The cub on the right is looking towards the right, while the cub on the left is looking towards the left. The background is a dense field of similar grass, creating a textured, warm-toned environment.

AFFORDANCES



RegelSpraak



Catala



RegelSpraak

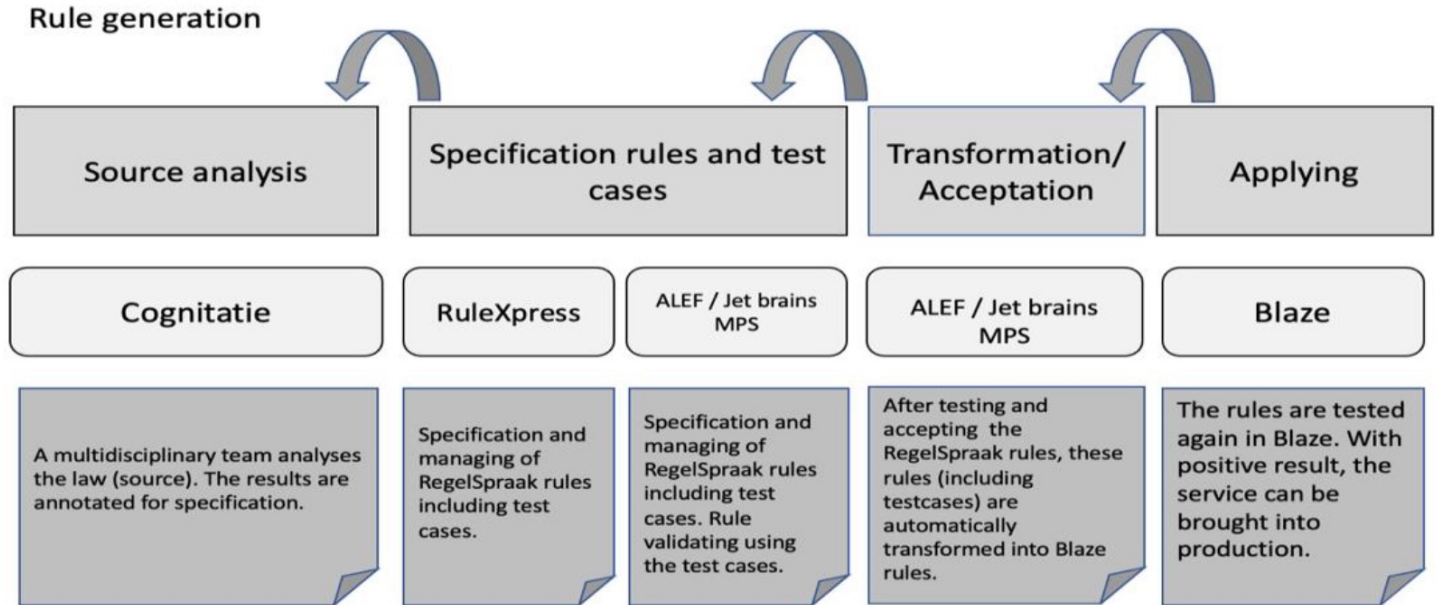


Figure 7: Rule generation

Regel vermoedelijk onroerende zaken of rechten op onroerende zaken in Nederland 01VJ
geldig vanaf 1-1-2018

Een natuurlijke persoon heeft vermoedelijk onroerende zaken of rechten op onroerende zaken in Nederland indien hij aan alle volgende voorwaarden voldoet:

- hij is een buitenlandse belastingplichtige IB
- hij voldoet aan ten minste één van de volgende voorwaarden:
 - zijn waarde in Nederland gelegen onroerende zaken over het vorige belastingjaar is groter dan 0
 - zijn waarde rechten op in Nederland gelegen onroerende zaken over het vorige belastingjaar is groter dan 0



Catala



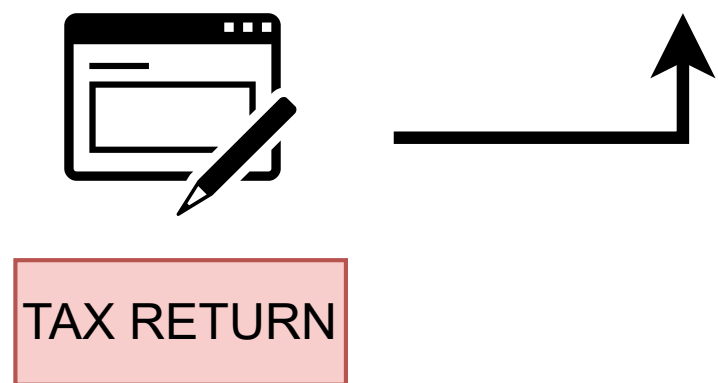
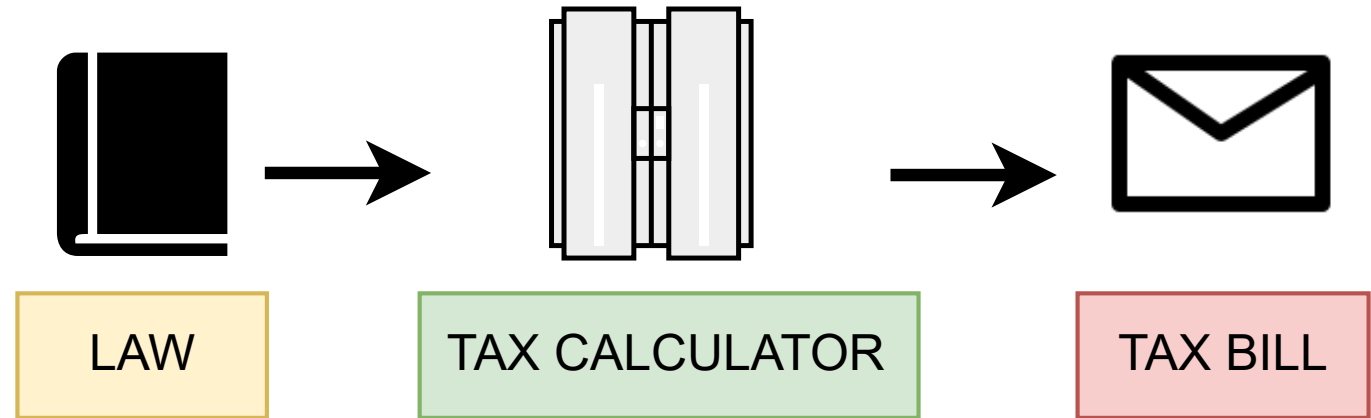
Denis Merigoux

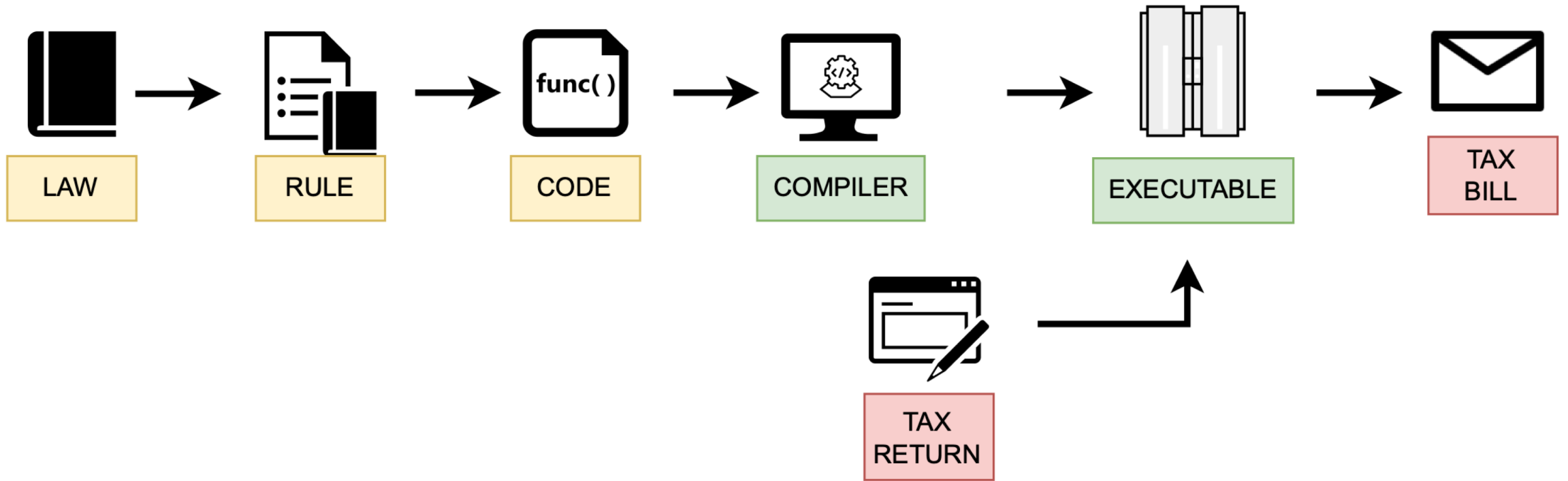
Catala works by annotating legislative texts with their code translation. Here is a quick example from the US Tax Code:

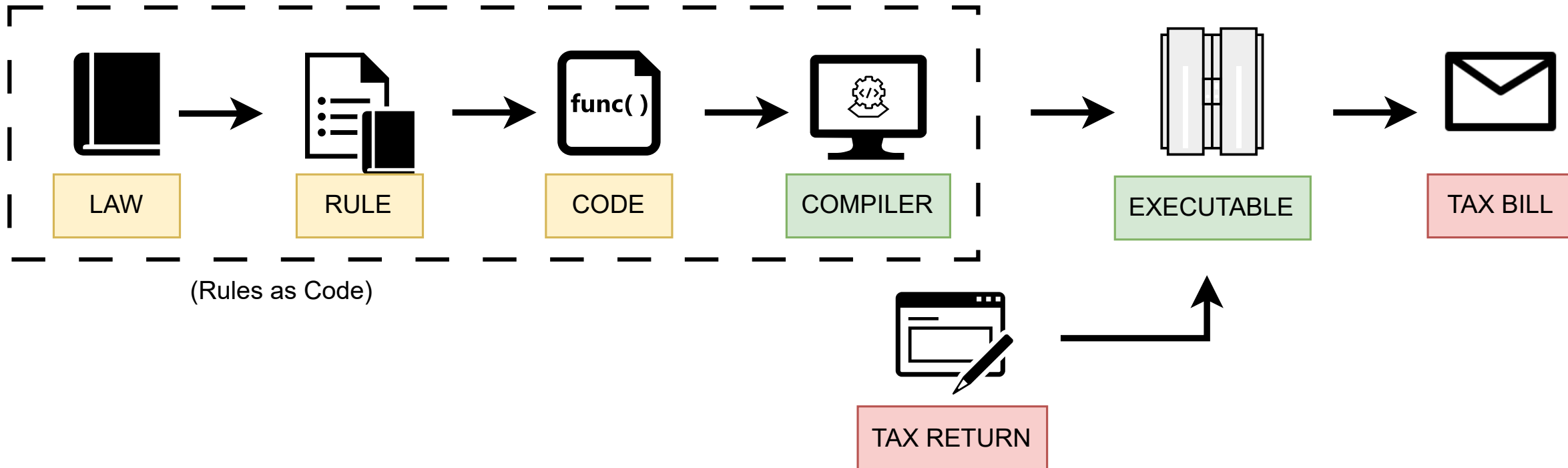
Section 132 - (c) Qualified employee discount defined - (1) Qualified employee discount
The term “qualified employee discount” means any employee discount with respect to qualified property or services to the extent such discount does not exceed—
(A) in the case of property, the gross profit percentage of the price at which the property is being offered by the employer to customers

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./section_132.catala_en
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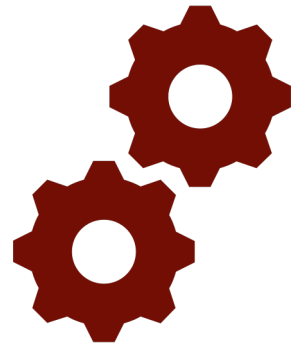
```
42 scope QualifiedEmployeeDiscount :  
43   definition qualified_employee_discount  
44     under condition is_property consequence  
45   equals  
46     if employee_discount ≥  
47       customer_price * gross_profit_percentage  
48     then customer_price * gross_profit_percentage  
49     else employee_discount
```







SOLUTIONS



Affordances of **human factors** in
software engineering methodology



**Formal methods for validation and
verification (?)**

Thank you for your attention!

For future questions feel free to contact me at:

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