Normative Systems Design
Dealing with Complexity:
A Design Methodology for Large-scale
Applications of Legal Knowledge-based
systems

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Topics
- Normative systems
- The POWER-approach
- POWER support
- Support for policy making
- Support for operations
- Examples

Key aspects of regulations
- Quick changes => time-to-market
- Deregulation
- Operational feasibility
- Administrative costs
- Accountability
- Client-oriented
- Chain control
- ...

Demands of the chain of processes from regulations to operation

Problem (in the society)
Policy & legislation drafting
Operational guidelines development and transfer
Interpretation and compilation with operational policy
Application, operation, law enforcement
CLIENT
COMMUNICATION

Aims of the POWER-approach
The logic that implicitly lies beneath the regulations becomes explicit

Develop a method for the translation from rules and regulations into formal descriptions that a computer can reason with
Power-applications

Concrete example

The operational results

The formal logical model is the basis for different products:

- Educational material
- Forms
- Operational guidelines
- Automated (knowledge-based) systems

Organizational Positioning POWER

The quality instrument Power
**Governmental interests**

Checking the regulations
- Feasibility study
- Legal quality test

- Effects of regulations
  - Checking against the goals (simulation)
  - Administrative costs

- Operational support
  - Decision support
  - Client orientated services
  - Reduction of TTM & TCO

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**Knowledge management and communication**

- Regulations
  - Concept
  - Text
  - Policy

- Conceptual model
  - Data
  - Activity
  - Policy

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**POWER in the design process**

- Forms
- Conceptual model
- Intranet / internet
- Systems (e.g. decision support)
- Instructions
- Education-material
- Information-material

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**Approach(1): Basis method**

- Legal sources are the basis
- Looking from different angles
  - Globally & detailed
  - Different interpretations
  - Implementation directed & implementation independent
- Exact and unambiguous
- Using the natural language’s grammar

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**Approach(2): Representations**

- Scenarios
- Knowledge model (KM): What
- Task model: how, in terms of the KM
- Process model: how, in the business context
Scenario’s are used for determining the scope

Providing insight in the domain using scenarios
- decision tree how the legal source has to be understood
- means of communication to the (legal) experts
- domain scoping in new projects
- input for risk-control

example: scenario’s Subsidy for Day Nursery on discussion group via Lotus Notes

Strategic aims of the scenario’s

Why
The earlier the operations are in scope when drafting regulations the better operations and control (and auditing) can be optimized.

Normative Systems

Knowledge bases
Impact Analysis
Process model
Process Representation
Knowledge based component
System Generation

Connection to the legal sources

Abstract overview of the method

FRANKLY, THE JOB IS A REAL NO-BRAINER.
Translation of legal sources into formal specifications

- Does not depend on the analyst that conducts the process.
- Is repeatable and predictable.

Legal Source \(\rightarrow\) Translate \(\rightarrow\) Conceptual model

Preserve Traceability

- To apply modifications.
- To communicate inconsistencies.
- To justify decisions.

Legal Source \(\rightarrow\) Conceptual model

Reuse Components

- Independent of applications in which specifications are used.
- Composable.
- Refinement into software components.
- Reusable models and software.

Translation : First Step

- Hereafter continue only on specifications.
- Merely information from legal source.
- Inconsistent.
- Take modeling performance into consideration.

Legal Source \(\rightarrow\) Conceptual model

Refactoring : Next Steps

- Merely formal specifications.
- Combine and adapt.
- Consistent for an application.
- Traceable to legal source.

The method step by step

- In : legal source.
- Out : conceptual model.
- The legal source is hierarchically structured in structure blocks.
- The references, terms, definitions, norms from one structure block are put in one package of the conceptual model.
References

- Self-contained modelling as PackageReference.
- Several forms and combinations.
- Will be solved later. If unsolved, we find an inconsistency.
- Creates hypertext.

Terms

- As Types and Attributes.
- Definitions and references.
- References will be linked to definitions. If unlinked, we find an inconsistency.

Rules

- As Invariants.
- Described in specification language OCL.
- Define and reference the types and attributes.
- Can lead to complicated inconsistencies.

Translation patterns

- Standard interpretation of legal linguistic constructions, such as “In referentie wordt verstaan onder term ...”. (In reference is denoted under term ...).
- Separately described, automated support potential.
- Increase consistency and modelling performance.
- Indien de gecombineerde heffingskorting door artikel 8.1.7 zou worden beperkt tot een niveau beneden het gezamenlijk bedrag van de algemene heffingskorting en de voor de belastingsplichtige geldende arbeidskorting, kinderkorting, aanvullende kinderkorting en combinatiekorting wordt indien de belastingplichtige in het kalenderjaar gedurende meer dan zes maanden dezelfde partner heeft, de gecombineerde heffingskorting verhoogd tot het gezamenlijk bedrag van de voor hem geldende algemene heffingskorting, de arbeidskorting, de kinderkorting, de aanvullende kinderkorting en de combinatiekorting.
- De verhoging van de standaardheffingskorting bedraagt maximaal het bedrag van de door de partner verschuldigde gecombineerde inkomensheffing verminderd met zijn gecombineerde heffingskorting.
- Dit artikel is niet van toepassing indien de belastingplichtige bij de aanvang van het kalenderjaar de leeftijd van 27 jaar niet heeft bereikt en in het kalenderjaar gedurende meer dan zes maanden in belangrijke mate door zijn ouders is onderhouden.

For each package

- Packagereference in lid 1

  artikel 8.1.7

  «packageReference»

   Artikel 8.1.7

- Terms in lid 1 :
  - combined levy reduction
  - general levy reduction
  - tax payer
  - work reduction
  - child reduction
  - additional child reduction
  - combined reduction
  - partner
  - « applicable for him »
  - « has during more than six months in the calendar year »

- If the combined levy reduction were limited to a level below the total amount of general levy reduction and the work reduction, child reduction, additional child reduction and combined reduction applicable to the tax payer by article 8.1.7, the combined levy reduction shall, if the tax payer has the same partner during more than six months in the calendar year, be increased till the total amount of general levy reduction, work reduction, child reduction, additional child reduction and combined reduction applicable to him.

For lid 1

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  - combined levy reduction
  - general levy reduction
  - tax payer
  - work reduction
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  - combined reduction
  - partner
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For lid 1

- Translation patterns in lid 1:
  - "if term were ... by reference"
  - "till a level below"
  - "the total amount of"
  - "shall be increased till"

For lid 1

- Rules in lid 1:
  - For taxpayer:
    - selection (~ art. 8.1.7, combined levy reduction < general levy reduction + applicable work reduction + applicable child reduction + applicable additional child reduction + applicable combined reduction) & (hasDuringMoreThanSixMonthsInTheCalendarYear <> nil) → combined levy reduction = applicable general levy reduction + applicable work reduction + applicable child reduction + applicable additional child reduction + applicable combined reduction

Remarks?

- Is "the general levy reduction applicable to him" identical to "the general levy reduction"?
- If so, can the phrasing be simplified?
- If not, what is the association between tax payer and general levy reduction?
- And between tax payer and combined levy reduction?

This article is not applicable if the tax payer at the beginning of the calendar year has not attained the age of 27 and has been supported by his parents in a significant degree during more than six months in the calendar year.
KB-approach as enabler for future developments

A generic E-gov Architecture

Summary benefits KB-approach

- Transparent translation of legal sources
- Unambiguous interpretation
- Consistency checking
- Better use of knowledge
- Chain approach: connecting different design processes
- Diminishing legal reparation
- Communication
End of presentation...

AND THEN YOU'D BE SAYING, "I GOTA GET ME SOME OF THAT."

ANY QUESTIONS?