An IT-Independent Reference Model for IT-Supported, Interactive, Regulation Based Services

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Abstract. In 2012 some Dutch government services organizations, academia and innovative companies decided to establish a co-creation, named Blue Chamber, with the aim to develop a national protocol to "translate regulations" into a durable, IT-independent model or specifications for interactive regulation based services. Regulation here means the union of laws and decrees, both government and ministerial. Such a protocol acts like a process and each process requires a conceptual data structure or IT-independent reference model. After 5 years of research, development and validation, version 1 of the Reference model is ready for publication. The Dutch Government has decided to provide IT-based services and enforcement actions based on as many laws and decrees as appropriate. The core of this Reference model will be described in this paper. The CogNIAM variant of Fact Based Modeling has been used to develop the Reference model, using field-testing with the associated prototypes.

Keywords: IT-independent durable model for regulation based services
Legal services · Legal relations · Legal facts · Fact Based Modeling (FBM)
Legal domain reference protocol

1 Introduction

The Netherlands, like many other countries, has a number of governmental bodies responsible for the execution and enforcement of the applicable regulation. Regulation in this paper means the union of laws, government decrees, ministerial decrees and several other policies, including decisions by the courts. The intent of the regulation needs to be faithfully applied in all practical scenarios or cases. The legislation

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describes roughly speaking which rights and duties are applicable for a specific citizen or enterprise and under which circumstances; it furthermore describes the consequences of legal facts. For a faithful application of the regulation in all practical scenarios it is needed to model explicitly all the semantics *intended* in the practical scenarios or cases.

In Sect. 2 we describe very briefly the AS-IS situation as of 2013. In Sect. 3 we describe the TO-BE situation as of 2017. In Sect. 4 the Conceptual Architecture for regulation based services, as developed in the period 2013–2015, will be briefly described. In Sect. 5 we present the principles on which the Reference Model for IT-supported, interactive, regulation based services is based. In Sect. 6 we present the core of the IT-independent reference model, a domain model for IT-independent, interactive, regulation based services. In Sect. 7 we present a summary and suggestions for the road ahead.

2   The AS-IS Situation as of 2013 for Regulation Based Services

In the initial period of Q1 2012 through Q3 2013 the focus of the Blue Chamber was to describe the then current situation.

We quote a part of the first report [6] of the Blue Chamber below.

"In recent decades, public administration has changed under the influence of digitization. These changes affect the processes of implementing public services. Both the large-scale processes for handling cases of large groups of citizens, and processes for the treatment of individual cases in complex situations are affected. Examples can be found in the area of benefit provision, granting of subsidies, licensing and taxation. Central government, provincial governments and municipalities strive, as much as possible, to process applications for licenses, benefits and the provision of other public services electronically."

Intermediate results of the Blue Chamber have been reported in [1, 4, 5, 7–9, 19], [20] and [21]. The approach adopted by the Blue Chamber has several concepts adopted from [2, 3, 10, 11, 15].

3   The Goals for the TO-BE Situation as Seen in 2017

In the first report of the Blue Chamber, the TO-BE situation, was described as follows: "In legislation rights and obligations are defined: among citizens, citizens towards the government and vice versa. Legislation contains concepts, rules and conditions that directly affect the actions of citizens, businesses and government organizations. These concepts, rules and conditions form the basis for the services and processes of public implementing bodies. For the following reasons, it is important to be able to distill concepts, rules and conditions from the legislation in an unambiguous and repeatable manner:

A. It promotes legal certainty for citizens and prevents unnecessary disputes and proceedings in court.
B. It enhances the transparency of government. The government can show that what they are doing is in accordance with the democratically established legislation.

This includes providing insight into the rules that give the authorities a margin of discretion to do justice in special cases.

C. It simplifies implementation of legislation in services and processes. Thus, orders from politics and public demands can be accommodated more rapidly.

D. It improves an implementing body's capacity to, as part of ex ante feasibility tests, to provide feedback on proposed changes in legislation. This contributes positively to the effectiveness and efficiency of the implementation.

E. It provides insight into the coherence of the complex of legislation. Consequently, generic and specific elements in processes and services can more easily be distinguished. This offers possibilities for reuse, not only within an organization, but also between organizations.

In short, the added value of a repeatable approach to the organization of the implementation of legislation comes from the ability to transform legislation into legitimate and meaningful services for citizens and businesses and to perform this in a truthful, efficient, multidisciplinary and timely fashion [6].

This is still the TO-BE situation as of 2017.

4   The Durable Architecture for the TO-BE Situation

Since late 2013 it became clear in the co-creation group that there was a need for an overall durable architecture covering the main groups and results involved. The status of it as of mid-2016 has been reported in [19].

After many lengthy discussions in 2016 it became clear that one has to distinguish two different phases in this process, the preparation phase and the phase in which the citizens and companies consume the regulation based. The preparation phase is hardly known to the average citizen. Why should the citizen care about this? The preparation phase is on the other hand essential for the quality of the IT-supported, interactive, regulation based services (Table 1).

The actor group in preparation phase 1 consists of members of Parliament, and members of government and civil servants legally trained to produce regulations. Often the coalition agreement is one of the most important starting documents in the process of defining new (versions of) regulations.

For the regulation based services there is another set of actors very important, namely the judges in the courts. In time they come after the regulation based service has been consumed, but they have a similar effect on the services thereafter as the original regulation as their decisions have a clear effect on similar cases of services.

Regulations are produced to provide services for the citizens and enterprises, or require them to perform certain duties. These services are in The Netherlands primarily IT-based. The IT based services outnumber the lawyer assisted services by far, although there is hardly any mention of IT-supported services in the academic education of legal experts in The Netherlands.

The traditional textual representation of the regulation is not adequate to be used as drawings for the IT regulation based service engineers.

Table 1. Different phases in implementation of IT supported, interactive, regulation based services

	Preparation phase			Service consumption
	1	2	3	
	Formulate and decide on a new (version of) regulation	Translate regulation into the IT-independent specifications for IT-supported, interactive, regulation based services	Translate IT-independent specifications into a specific IT-solution	
Major actors	Members of Parliament and regulation specification experts	Multidisciplinary team consisting service experts, regulation experts and durable specification experts	Software engineers	Citizens and companies
Major challenge	To be completed	From logically informal to logically formal	From IT-independent, logically formal to IT-dependent, logically formal	
Legally formal	Yes	Yes	Yes	Yes
Logically formal	No	Yes	Yes	Yes
IT-independent	Yes	Yes	No	No

What is needed for IT-supported, interactive, regulation based services is a complete specification that takes the regulation as input and produces a testable IT-independent specification of the interaction between the government service providers and the citizens or enterprises. This is a multidisciplinary effort and in principle independent of IT such that new IT technologies can be based on the durable specifications or model. The actor group 2 in preparation phase 2 consists of legal experts, service experts, specification experts and service architects.

An essential task of the actors in preparation phase 2 is to provide the two-way references between the durable model of the services and the regulations as it is required in The Netherlands that all regulation based services need to be based on approved regulations. This is also needed for impact analysis and certification. Often this is also referred to as annotation services. However the concept annotation service in the traditional legal field consists of a free format text; we mean here with annotation the classification of pieces of texts in the regulations to one of the elements of the classification scheme or Reference model. The specifications of the durable model can be represented with traditional Word, PDF or Excel documents, or by the so-called a

fully classified model, a representation that can be consulted with a logical language. An organization has a choice. No matter what the choice is, there is a need to know which requirement is based on which pieces of texts in the regulations.

Actor group 3 consists of the engineers of the IT-supported services. The engineers take as input the logically formal and legally formal IT-independent specifications of the interaction and the function of the services (the durable model) just like a builder of a large office block receives as input the drawings of the architect, and build the services. The goal is to maximize the functionality that provides the automatic mapping from the durable specifications into an executable IT-supported service.

Actor group 4 consists of the citizens or enterprises that receive the services of the government service provider or the duty dispatching service.

5 The Principles That Have to be Satisfied by a Reference Model for IT-Supported, Interactive, Regulation Based Services

In the section we present the principles upon which the Reference model is based.

5.1 Legality Principle

One of the requirements for which the law makers are not willing to compromise, is that the services provided should be fully based on the regulation and faithfully represents the intent of the regulation in all relevant practical cases. Hence that means that the durable model must represent the full semantics as intended in the regulation (knowledge level II [16]) to apply to all the foreseen cases or scenarios (knowledge level I). This means that the language to describe the durable model (knowledge level II) must be capable of describing explicitly what the semantics as specified in the regulation mean in the associated practical cases (knowledge level I). Here we see a strong link between the level I of the knowledge triangle (the level of the facts) and the domain specific regulation, knowledge level II. Further description of the elements at knowledge level II can be found in [16].

5.2 The Knowledge Microscope Principle

The approach taken here is that of observation, detect patterns and draw generalized conclusions. This principle is re-used from a well-accepted principle in natural sciences: "Use a microscope, describe what you see and generalize towards a consistent theory".

In this approach we make use of the so called knowledge microscope. Hence put a sufficient set of regulation texts under the knowledge microscope and a representative set of associated services and conclude which knowledge elements are needed to fully describe the semantics for all relevant practical cases. This process is not new and listens to the term ex-ante in legal textbooks.

The knowledge microscope is operated by a durable knowledge modeler (2nd, 3rd and 4th author) who submits questions on concrete scenarios to a legal expert (1st author). Specifying a durable model is a multi-disciplinary task, not a durable modeler as a hermit.

6   The Core of the Reference Model

Several regulations have been analyzed in the last 5 years to find out which constructs are observable that play a role in the regulation based services.

It is the intent of the group to publish the complete Reference model after it has been discussed in a number of external groups in the coming months.

The main aspects of the Reference model are the following:

I. Make a clear distinction between law (objective perspective) and rights and duties of an individual legal subject (subjective perspective).
II. Define explicitly the context that applies to the regulation based services. A context may consist of any number of texts, not necessarily consecutive, from one or more different regulations.
III. Define the legal subjects, within the context and distinguish the objective and subjective perspective.
IV. Add to this the state aspects, the legal relationships, forming the legal situation of a legal subject, and the conditions that apply to the legal relationships.
V. Add to this the transition aspects (Legal facts) between a legal situation and the legal consequences that lead to a different legal situation.

6.1   The First Shell: The Legal Subjects Within the Context and Subjective Perspective

If there are no legal subjects, there is no law or regulation. Legal subjects are natural persons or legal constructs like foundation, union or company. Be aware that each jurisdiction (country, and sometimes a part of a country) has its own set of legal constructs (Fig. 1).


Fig. 1.   The legal context

6.2   The Second Shell: Legal Subjects and Legal States

A legal relationship type is a relationship type between two legal subject types, one of which holds the right side, while the other legal subject holds the duty side, with respect to a certain item (e.g. the power to modify the existing number of working hours in a labor agreement). This is part of the law, hence the objective perspective (Fig. 2).

Law
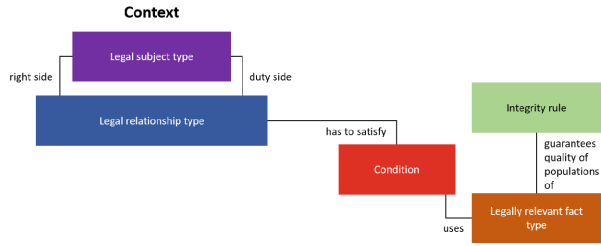
Fig. 2. Legal subjects and legal states

Different cases and scenario's happen in the world of the subjective perspective, and therefore each individual legal relationship has a start date and sometimes a known end date.

In the law a legal relationship has an associated set of conditions that must be met to make the legal relationship valid.

Associated with every condition in the case are one or more fact instances of fact types that have to be properly specified. These fact types could be named legally relevant fact types. Please note that each legal fact is a legally relevant fact, but only some legally relevant facts are legal facts.

There are a number of quality control rules (integrity rules) that apply to the legally relevant facts. It is unfortunate that lawmakers seldom specify the complete set of integrity rules. These are required for the specification for IT-supported, interactive, regulation based services. Of course having them all explicitly available takes some jobs away. At the time of writing of this paper a discussion has emerged whether POTUS (President Of The United States) can pardon himself. This is a typical example of a missing integrity rule. We have observed in the last three years that many integrity rules are missing in Dutch regulations. If the US constitution had been specified with this Reference model as guideline, then it would certainly have included the integrity rule that POTUS can pardon himself.

The code in the Constitution says:

`Section 2. \1\The President [...] shall have Power to grant Reprieves and Pardons for Offences against the United States, except in Cases of Impeachment.`

Here clearly the integrity rule is forgotten to specify explicitly: `No President has the power to pardon himself.`

In the years since 2013 the research of various Dutch regulations has resulted in the observation that there are at least 7 kinds of legal relationships, three kinds of claim-duty and two kinds of power-liability, one liberty-noright and immunity-nopower, that can be grouped into the four kinds of legal relationships similar to the Hohfeld classification of ref. 10.

So far we have only discussed the legal subjects and the legal states. As we live in a dynamic world, we need transitions from one legal state to another, as we will see in the third shell. Legal transitions are usually called legal facts in traditional law books.

6.3   The Third Shell: Legal Subjects, Legal States and Legal Transitions

The term for a legal transition in the traditional law textbooks is legal fact. A legal fact may result in the creation of zero, one or more legal relationships, in the modification of an attribute of zero, one or more existing legal relationships and/or the ending of zero, one or more legal relationships, with the rule that there is at least one of these three, guaranteeing that the legal situation before and after the legal fact are different.

There are two subtypes of legal facts, one with an active legal subject, which can be further subtyped into a legal act (of a legal subject) and an act with legal consequences of a legal subject; in the other subtype no legal subject is an actor and this can be further subtyped into events with legal consequences and time laps with legal consequences (Fig. 3).
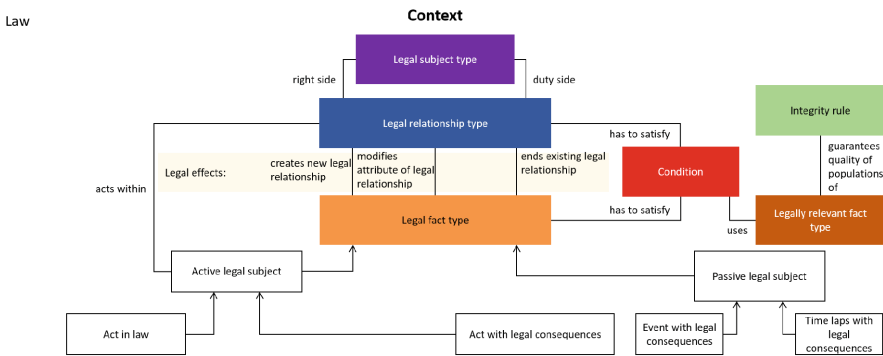

Fig. 3. Legal subjects, legal states and legal transitions

The reference model has been prototyped using a language workbench in which the reference model has been implemented as a set of Domain Specific Languages. Based on these language specifications the interactive regulation based service have been written of a specific law. The language workbench was configured in such a way that based on the specifications a simulation (ex-ante) could be executed of the interactive regulation based service. During the simulation the legal position of each of the legal subjects is shown. Based on the legal position a list of possible acts is derived. Based on this list an act can be executed. Executing the act resulted in legal consequences which changed the legal positions of the legal subjects.

7   Conclusions and Future Work

The Blue Chamber has adopted the knowledge microscope principle. A working group of the Blue Chamber will present the Reference model later this year in open sessions in The Netherlands. The Reference model is the result of observation and generalization. There is at the time of writing no single ISO, OMG or W3C standard modeling language that has the representational power required by the Reference model. Hence

one needs a smart combination of various standards and of course some interfaces between the various standards. It is currently under consideration that the Blue Chamber will publish a proposal for such a standard language.

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