# Developing and Maintaining Durable Specifications for Law or Regulation Based Services

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**Abstract.** The Netherlands has enacted many laws. The responsibility for the execution of associated services and enforcement of this legislation is assigned to a substantial number of governmental bodies. Where possible, the associated services are performed digitally. The interaction between citizens/businesses and government as often implicitly described in legislation is the basis for the durable specifications of these services. One of the organisations in charge of developing and delivering these services is the Dutch Tax and Customs Administration (DTCA). DTCA is facing several challenges in developing and maintaining durable specifications for these services. This paper proposes to combine FBM with the case based semantics of rules for durable specifications. The need was established to extend the work of Hohfeld with a clear distinction between legal relations and legal acts, add time travel and the strong connection between the expected and actual cases with the laws and regulation.

**Keywords:** Regulation based services · Legal relations · Legal acts · Time travel · Case and rule connection · Fact based modelling (FBM)

## 1    Introduction

The Netherlands has a substantial number of governmental bodies responsible for the execution and enforcement of the Dutch legislation. This legislation is the basis for interaction between citizens / businesses and the government. The interaction is designed and realized by the government in cooperation with society. The laws are at some points very precise and at other points intentionally ambiguous. The legislation describes roughly speaking which rights and duties are applicable for a specific citizen or business and under which circumstances.

There are different kinds of laws, from laws covering more than one domain to very specific laws, covering exactly one domain. One example of a multi-domain law is the General Administrative Law Act (Algemene wet bestuursrecht, abbreviated Awb). This law prescribes many of the interactions between government and citizens / businesses and vice versa in a standardized and systematized way applicable in many domains. This law describes in outline the rights and duties of citizens /

businesses and government regarding decisions on permits, benefits, administrative fines, and the objection and appeal against such decisions. Specific laws in the field of the DTCA are Income Tax Law 2001 and the Law on VAT (Value Added Tax) 1968.

When designing the implementation of a specific tax law, like the Income Tax Law, attention has to be paid to other multi-domain regulations, one could say more general laws such as the State Tax Act (Algemene wet inzake rijksbelastingen, abbreviated Awr), which sets out the general framework for levying tax described in various tax domain laws.

## 2     Dutch Tax and Customs Administration

The Dutch Tax and Customs Administration (DTCA) is a part of the Ministry of Finance. DTCA is responsible for services covering benefits, customs and the collection of taxes.

The IT-department of DTCA has extensive experience in the development and exploitation of rule based systems. Rule based systems are used to deal with an enormous number of different situations and complex calculations. DTCA's biggest system is covering the income tax and is executing over 3000 rules for several different purposes. The rules are executed in different environments, some in a custom-built rule engine and some in a COTS (Commercial Of-The-Shelf) rule engine. Other rules are implemented in programming code.

Besides specifications of rules DTCA makes use of process models, a data model and specifications for (electronic) forms. For instance the specifications for the tax forms for income tax cover more than 500 pages, containing more than 1000 variables. The specification of the calculation rules for income tax cover more than 100 documents. DTCA faces several challenges in maintaining the specifications of their legacy systems:

a. Ensuring the integrity of the process models, data models, rules and concept definitions is becoming more complex which each change in legislation.
b. Drawing up and changing the specifications to be in line with new legislation seems to take longer each time.
c. Validating the specifications by legal experts is a process, which is difficult to manage.
d. Traceability of the specifications to the underlying legislation is often lacking.

In the quest to search for solutions for these challenges, DTCA defined a new approach in creating and maintaining specifications. This approach is called 'Wendbare wetsuitvoering' (Agile execution of legislation) [13].

### 2.1     DTCA's Approach 'Agile Execution of Legislation'

The approach consists of four steps that must be executed for the design of services necessary to implement a specific piece of legislation. The approach aims to provide greater flexibility and agility in the implementation of changes in laws and/or regulations.

Since the spring of 2012, a number of people from DTCA, other government organisations, the academic world and businesses are working together, under the name 'The Blue Chamber', an example of co-creation [2, 3, 4, 5, 6]. The group is named after the room in a castle where the first ideas around this cooperation were developed. The members of 'The Blue Chamber' are collaborating in their quest to develop a protocol for creating and maintaining durable and tested specifications directly based on legislation.

Figure 1 shows the conceptual architecture of the Blue Chamber. It shows the complete development of services from initial idea (left) to their actual delivery (right). The approach of DTCA focusses on the yellow part in the middle. This is the creation and maintenance of durable specifications for services that can be tested by the various stakeholders.
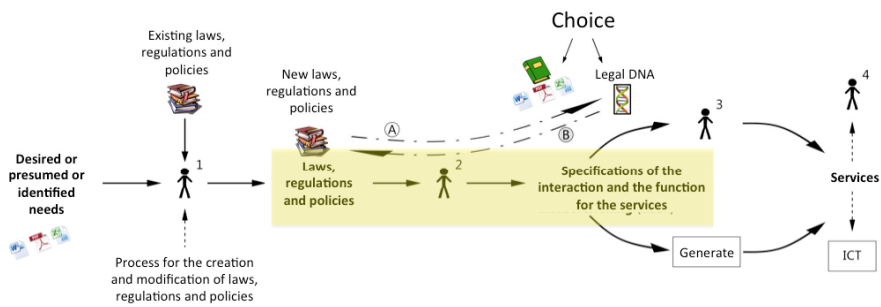


**Fig. 1.** Conceptual architecture of the Blue Chamber

DTCA's approach aims to create a traceable "translation" of the applicable legislation (the union of laws, government decrees and ministerial decrees) into durable specifications that are the complete basis for designing processes and information systems [8, 9, 10, 13]. The term translation, in the previous sentence, has to be interpreted in a broad sense. The "translation" includes explication, detailing and extending. Developing these durable and tested specifications is performed in a multidisciplinary group. Hence the symbol of actor with the number 2 attached represents a group of actors from various disciplines.

In the approach described, we assume that frequent changes occur in laws, regulations, policies and objectives of the organization. To be promptly informed as service provider of these changes and have the possibility to anticipate, the environment (including the legislative process) is constantly monitored for possible changes by the service organisation.

An overview of the complete approach is depicted in the figure below.
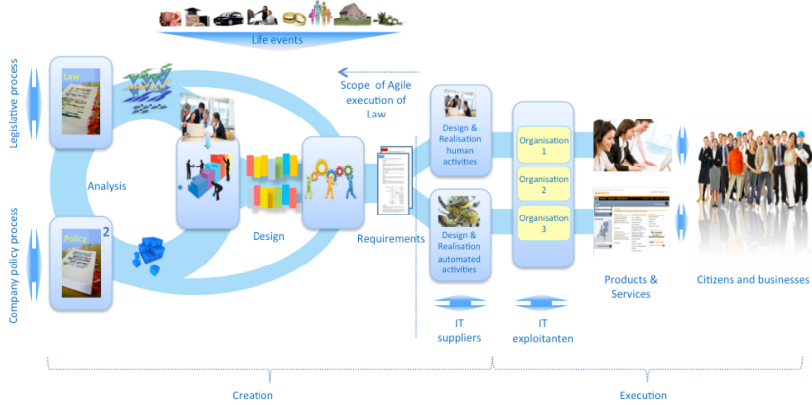


**Fig. 2.** Overview of the approach 'Agile execution of legislation'

For every new piece of, or change in existing legislation, the following steps are executed:

1. Analyse the (changes in) legislation and implementation policies. Main result of this step is a structured set of references for the specifications based on this legislation.
2. Analyse goals and objectives of the organization itself. These steps give a structured set of references for the specifications based on internal policy documents.
3. Design the specifications for the services of the organization and the interaction with citizens and businesses.
4. Design the specifications for the derivation of legal consequences.

The results of the analysis of legislation and internal policies consist of structured descriptions of rights, duties, legal concepts, fact patterns, concept descriptions, legal actions, legal actors, legal documents and legal rules. They also include integrity rules, which are often left implicit in legislation. The results of the design steps consist of services, events, actors, fact patterns and various kinds of rules [1, 11]. They are brought together in knowledge models, which can be used in developing or generating service applications.

After these steps implementation of the specified services can be assigned to specific business units, based on their expertise. This will ensure that services are implemented as efficiently as possible.

Although the approach suggests a sequence, the steps can be executed in parallel and will often have an iterative pattern. After these steps the specifications are ready for the design, realization and implementation of services in the form of processes and information systems.

# 3    Case "Tax Assessment"

## 3.1    Analysis of Legislation

Legislation is purposely formulated as independent as possible of the structure of the service organization that has to implement it. Laws and regulations leave some and well defined possibilities to the implementing organizations to make decisions regarding implementation and enforcement. These choices are often enshrined in implementation policies of the organization that has to deliver the services. The implementation policies will, within the framework of the law, lead to tightening or adjustment of the original requirements.

Legislation and implementation policies are formulated in natural language. A natural language, as opposed to a formal language in general, does not directly support the unambiguous formulation of specifications. In order to create durable, clear, valid and testable specifications [1, 11], we will need to translate legislation and implementation policies into a formal yet understandable language in which the specifications can be expressed and documented, as well as traced back via an annotation to the original legislation [13], and can be tested in a multi-disciplinary group on a reasonably representative set of foreseeable cases, in terra juridica called ex-ante. This understandable language is necessary to enable the different expert's to work together and to effectively validate the specifications, a very crucial step. This translation process is for a very long time, at least tens of years, to come the work of a human expert.

The analysis includes the clearing of elements in legislation and internal policies that have been left implicit, such as relations to general legislation that is applicable in the specific domain we are working on.

Three of the categories of rules we distinguish during the analyses of legislation are:

- Rules regarding legal relations
- Rules regarding legal actions
- Derivation rules.

Rules regarding legal relations are legal rules, which determine the legal situation of a kind-of-right party and the associated kind-of-duty party and are intended to guide the behaviour of legal actors. Legal actions are actions by one single party, performed within the context of a legal relation the acting party is part of. Derivation rules are the rules that describe how to derive legal consequences from legal facts.

In this case we will focus on the rules regarding legal relations and legal actions. Rules regarding legal relations describe the legal relations that exist between two parties [7, 11] and legal rules describe in our case the intended interaction between the government and the citizens. The valid rules are determined by evaluating the actual legal relations. These actual legal relations determine the legal status of the legal role. Based on the valid rules regarding legal relations the legal actor is allowed or obliged to perform these legal actions. Performing a legal action will result in a new set of legal relations and one or more new legal facts. The new legal relations

determine the new legal status or situation of the two actors involved in each legal relation. Based on the new legal status and the new set of legal facts a new set of valid rules regarding legal relations can be determined.

Two examples of rules regarding legal relations are shown below:

Article 6, of the Income tax law, first section, first sentence.
1.  With respect to taxes levied by assessment or by payment on declaration, the inspector may invite the person, who in his opinion is likely to have to pay tax, to file a tax declaration.

Please be aware that the meaning of the term invitation is not the same as commonly understood. It actually results in a duty. This is one of the kinds of things that make automatic generation of specifications only possible in an ivory tower. Developing durable specifications is a human task of the highest order. Of course a well developed and tested protocol is also here welcome. Representative scenarios or cases, an essential part of Fact Based Modelling, are also an essential part of this protocol [12].

Article 6, second section.
2.  The person who submits a request for an invitation to the inspector is in any case invited to declare tax.

The first section of article 6 describes that the actor, 'the inspector', is empowered to execute a legal action (fundamentally creating a duty!)  'invite to declare tax' towards the indirect object, 'the person, who in his opinion likely to have to pay tax'. There is no obligation on the part of the inspector to do so. The inspector may execute the legal action.

The second section of article 6 describes two possible legal actions. The first legal action describes that the actor 'the person' is allowed to execute the legal action, 'request for an invitation' towards the indirect object 'inspector'. The second legal action describes that the inspector shall execute the legal action 'invite to declare tax' towards the actor 'person'.

In rules, like the one above, we find actors and a legal action. The rules also have a kind of legal relation in the sense that e.g. an actor has the right or obligation to execute the legal action. Hohfeld [7] described the first comprehensive classification of different types of rights and duties from actors towards each other was.. In this way the first and second section of article 6 describe the possible interactions between the inspector and citizens/businesses and the government. Rules regarding legal relations consist of the following elements[1]:

- The party that holds the kind-of right side of the legal relation.
- The party that holds the associated kind-of-duty side of the legal relation.

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[1] Norm [2] is a synonym for rule regarding legal relation.

- The condition; the legal facts, which should be met before the legal relation comes into existence.

In this case we have limited our analysis to assessment taxes (aanslagbelastingen), a specific type of tax. This specific type of tax is used in the Netherlands for income tax, corporation tax, inheritance and donation tax. The general procedural rules for assessment tax are described in the State Tax Act, a multi-domain law. These rules apply to all tax legislation and describe the possible interaction between the tax inspector and the taxpayer. We have analysed possible legal relations and legal relations described in articles 6 until 11.

The concept of legal relations is the same as jural relations [7]. A legal relation is a legal relation between two parties. The relations describe the rights and duties of the parties towards each other. The legal actions are assigned to the following classification:

1.  Actions that are requested by a legal actor from another legal actor that is liable to that request are classified as legal acts that may be done (e.g. request a postponement for declaring tax). These actions are classified as 'power/liability'.
2.  Actions required from a legal actor are classified as legal acts that must be done (e.g. declare tax). These actions are classified as 'claim/duty'.

This classification is necessary to be able to define the services. This way of analyzing the legislation resulted in important questions regarding the meaning in the possible scenarios of several legal relations and associated legal actions. One of those questions was whether granting postponement was the same as extending the period for declaring tax. Actually one should know from every phrase if is it is the same as another. Like whether 'to file a tax declaration' (Article 6, first section) is the same as 'to declare tax' (Article 6, second section). In the end we discovered that the meaning of these rules and the phrases in it is not only derived from the legislation itself but is also determined by the real world cases or scenarios.

The rules that describe the legal actions that must or may be performed by the legal actor. When a legal action is performed, the corresponding legal relation is created. Based on this legal relation the valid rules regarding possible legal relations are determined. Based on this valid rules the possible legal actions can be determined.

For instance the legal relation 'invitation' can be written as the following fact pattern [5]:

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The taxpayer <taxpayer number> is invited on date <invi-
tation date> to declare tax in the period from <date
from> to <date to> by tax inspector <tax inspector num-
ber>.
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The variables in these fact types or patterns can be referred to in rules to derive other legal consequences if necessary.

The time at which the action is performed is the 'invitation date' of the fact pattern 'invitation'. After the action 'Declare tax', the corresponding fact with the pattern 'invitation' is considered not to be applicable any more.

A state transition diagram can be created, representing a well known perspective of the model. The state transaction diagram is depicted in figure 3.

We present a state transition diagram, as this is for many a well known diagramming technique. We are aware that we need more legal semantics to represent case diagrams as have been introduced in [2, 7, 11].
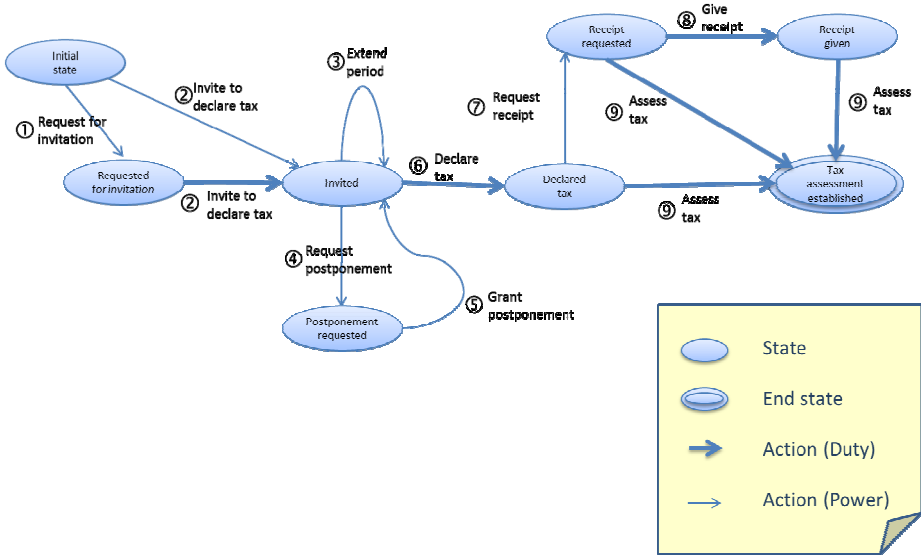


**Fig. 3.** State transaction diagram from a part of assessment tax

This state transition can be used to develop a citizen portal containing actions that have to be done by the citizens (duties) and actions that can be done by citizens (powers).

## 4     Conclusions and Future Work

The combination of modelling the interaction with legal relations in combination with fact based modelling gives DTCA the possibility to have a complete set of durable specifications which are more manageable, testable (validatable) [1, 11] and from which the traceability to the legislation is ensured [13].

Just recently the management of DTCA announced a large reorganization. This reorganization will take several years and will eliminate more than 5000 jobs. Massive investments will be made to speed up the development of digital services. One of the ambitions is to create a portal for Dutch citizens and companies with integrated information regarding all their aspects of taxes and benefits. Other ambitions are to renew all of the legislation based back office applications. The approach 'Agile execution of legislation' should be able to support this de-juridification of the information provided by the back office systems in order to provide integrated information for Dutch citizens and companies.

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