Fact Based Legal Benefits Services

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Abstract. One of the organisations in charge of developing and delivering legal services in the Netherlands is the Dutch Tax and Customs Administration (DTCA). Next to Tax and Customs, DTCA is also responsible for benefits (like housing allowance, health care insurance allowance, childcare allowance). The benefits services of DTCA were one the first services which were based on a fact based approach. This paper shows how the benefits services of DTCA are designed, tells about the current challenges and future plans.

Keywords: Legal services · Benefits · Fact based modelling (FBM)

1 Introduction

The Netherlands has several 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 focusses on which rights and duties are valid for a specific citizen and under which circumstances.

There are different kinds of laws, from laws applying to more than one domain to very specific laws. 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. 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 process against such decisions.

When designing the implementation of a specific tax law, like the Income Tax Law, attention has to be paid to aforementioned more general laws like the State Tax Act (Algemene wet inzake rijksbelastingen, abbreviated Awr), which sets out the general framework for levying tax.

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.

Every year DTCA needs to change their services based on the changes in legislation. The changes in legislation cover more than 100 pages each year. DTCA faces several challenges in maintaining the specifications of their legacy services:

a. Ensuring the integrity of the process models, data models, rules and concept definitions is becoming more complex with each change in legislation.
b. Drawing up and changing the specifications to faithfully 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).

2.1   DTCA's Approach 'Agile Execution of Legislation'

DTCA is working on an approach to create specifications for the services they deliver. The main requirements for the results of the approach are:

- Durable specifications, which are independent from information technology.
- Traceable to legislation and internal policies.
- Understandable and can be validated by various domain experts

The approach consists of four steps which 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 [1].

2.2   Collaboration with 'The Blue Chamber'

Since the spring of 2012, a group of professionals from government organisations, the academic world and businesses are working together, under the name 'The Blue Chamber'. The group is named after the room 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 the intention of the legislation.

Figure 1 shows the conceptual architecture as envisioned by the Blue Chamber. It shows the complete development of services from initial idea to their actual delivery. The approach of DTCA focusses on the yellow area which is about the creation and maintenance of durable specifications for services.
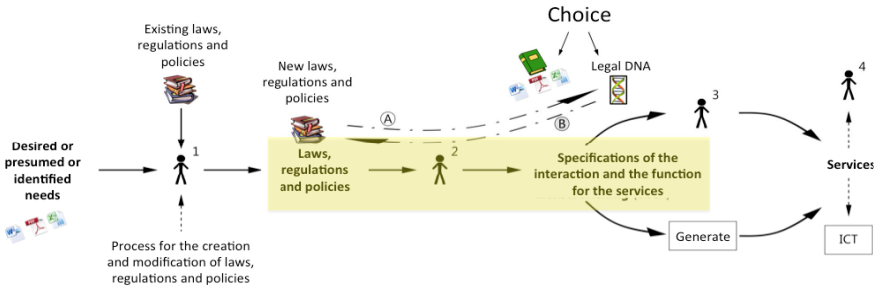
Fig. 1. Conceptual architecture of the Blue Chamber

This paper describes the approach of the benefits department to create specifications which can be used to generate ICT, which deliver services to citizens and businesses(right lower part of figure 1). ICT (Information and Communication Technology) is the Dutch term for what is internationally referred to as IT.

DTCA's approach aims to create a traceable "translation" of the applicable legislation into durable specifications that are useful for designing processes and information systems to provide services. 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 done in a multidisciplinary group.

2.3   An Overview of the Approach

In the approach described we assume that frequent changes occur in laws, regulations, policies and objectives of the organization.
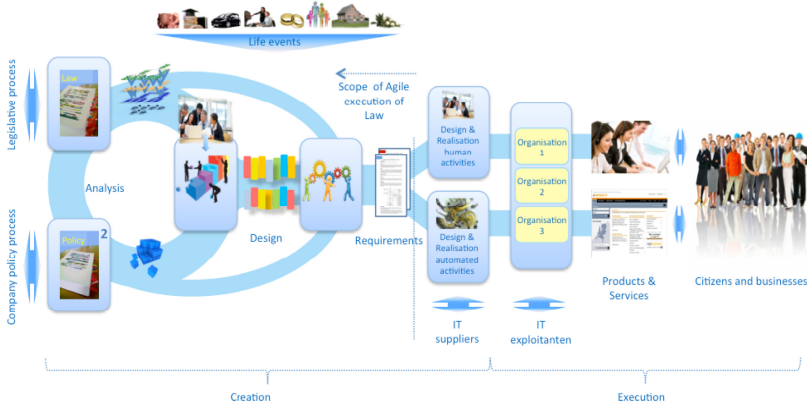

Fig. 2. Overview of the approach 'Agile execution of legislation'

To be promptly informed of these changes and have the possibility to anticipate, the environment (including the legislative process) is constantly monitored and advised on the impact of possible changes.

An overview of the complete approach [1] is depicted in figure 2. For all new legislation, or changes in existing legislation, the following analysis and design steps are executed:

The Analysis of Legislation and Internal Policies

1. Analyse the (changes in) legislation and implementation policies. The main result of this step is a structured set of annotations on this legislation.
2. Analyse internal policies, goals and objectives. These steps give a structured set of annotations on internal policy documents.

The Design of the Services

3. Design the services specifications of the organization and the interaction with citizens and businesses.
4. Design the derivation of legal consequences.

The results of the analysis of legislation and internal policies (result of step 1 and 2) 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 (3 and 4) consist of services, events, actors, fact patterns and rules. They are brought together in knowledge models, which can be used in manually developing or generating service applications. During the development of these knowledge models knowledge engineers are working closely together with the legislators and service experts.

After these four steps, implementation of the specified services can be assigned to specific business units, based on their expertise.

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   The Benefits Services

Next to Tax and Customs, DTCA is also responsible for benefits. Examples of benefits handled by DTCA are housing allowance, health care insurance allowance, childcare allowance. The benefits legislation is relatively new compared to the tax legislation. That is why the services executing this legislation are also relatively new and developed based on current knowledge with the latest technology.

The services landscape of the benefits department roughly consist of 3 major services:

- The portal service
- The service for determining facts
- The service for determining legal consequences

The figure below shows a screenshot of the citizens portal. The citizen's landing page shows an overview of the benefits which have been claimed , the possibility to inform the benefits department on new live-events, like change of address, change of income, new child is born or change of composition of the household. It also shows the status and results of the processing of the last life events from this citizen or from other sources like other governmental departments.
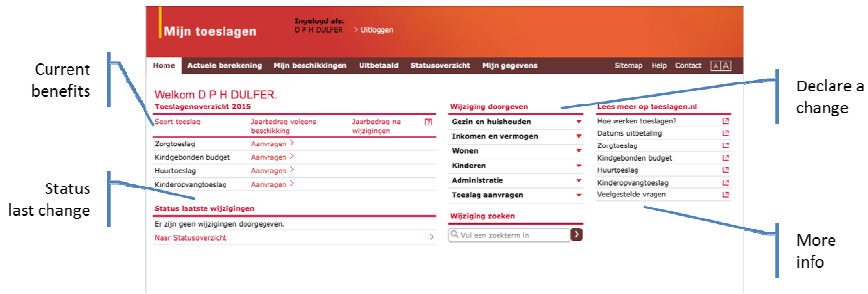

Fig. 3. The customer portal for benefits.

Each of these services have their own administration, with respectively:

- Assertions
- Facts
- Legal Facts

The definitions of these three terms are as follows:

- An assertion is a claim on an actual state of affairs or a value judgment, which can be true or false.
- A fact is a claim on an actual state of affairs or a value judgment, which is true according to DTCA. So a fact is a subtype of an assertion.
- A legal fact is defined as a fact to which a legal rule is applied to derive legal consequences. So a legal fact is a subtype of a fact.

An example covering all three is as follows:

- Assertion: Benefit applicant A claims that his income will be € 35.000 in 2016.

- Fact: According to DTCA, the income of benefit applicant A in 2016 is €40.000.

- Legal fact: The fact above was used to determine that applicant A is entitled to a health care insurance allowance of €900 in 2016. This use turns the fact into a legal fact.

An overview of the major services and administrations is presented in figure 4. Customers makes assertions in the Customer Portal. Based on internal risk rules DCTA determines the facts, based on the assertions available. The DCTA applies the relevant legal rules and the result is one or more facts describing the legal consequences.
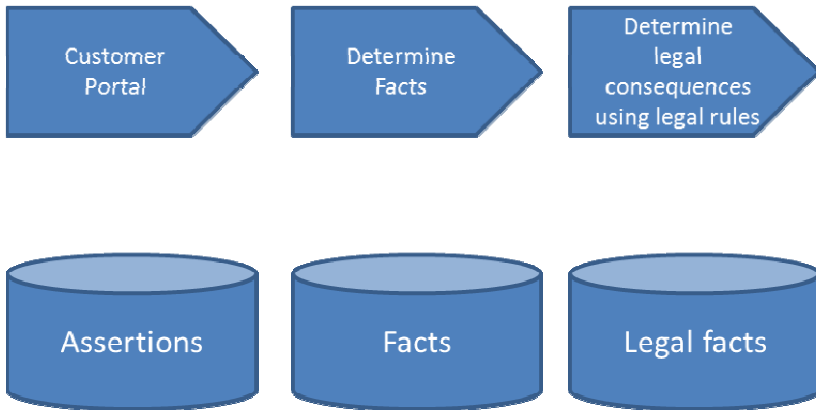
Fig. 4. Overview of the major benefits services.

The benefits department faces several challenges in maintaining the specifications of these services:

a. Ensuring the integrity of the overall specifications of the portal service, the service for determining the facts and the service for determining legal consequences.
b. Drawing up and changing the specifications in conformance with new legislation seems to take longer each time.
c. Managing the process of validation of the specifications by legal experts is difficult.
d. Traceability of the specifications to the legislative source is often lacking.

3.1   The Derivation of the Legal Consequences

The service which supports the derivation of the legal consequences is specified with a high level domain specific language. An example of such a high level specification is shown below in two classification rules which are specified relative to a given citizen:

```
A blood relative is a citizen who
is a blood relative in a straight line or
is a blood relative in the second degree sideline.

A blood relative in straight line is a citizen who
is a descendant or who
is an ancestor.
```

Definitions of the concepts blood relative in the second degree sideline, descendant and ancestor are defined similarly but omitted here. In the concrete syntax of the rules above, the names of concepts are underlined in order to distinguish them from other

language elements. The abstract syntax tree for the first previously mentioned rule is presented below:

```
Set definition
  name = blood relative
  type = citizen
    Set Clause = Or
     Left = Membership
        Set = blood relative in a straight line
     Right = Membership
        Set = blood relative in the second degree sideline
```

Based on specification like the once above source code generators produce C# code based on the specifications of the 8 services which can be executed. The list of benefits services is presented in Table 1.

Table 1. List of benefits services.

Service (Dutch description)	Service (English description)
AWIR-service	Multi benefits service
Betalen Toeslagen service	Benefits payment service
Huur-service	Housing allowance service
Kantoortoedeler service	Office work dispatcher service
Kinderopvang-service	childcare allowance service
Kindgebonden Budget-service	Child-related budget allowance service
Signalering Kindgebonden Budget service	Child-related budget allowance signaling service
Service Zorg-service	health care insurance allowance service

The specification environment for this service is recently migrated to Jetbrains MPS (https://www.jetbrains.com/mps/). MPS (Meta Programming System) is a configurable language workbench for creating Domain Specific Languages. This language workbench has functionality to generate source code like Java. Functionality to generate source code can be created to generate rules for a rule engine or other programming languages like C[3]. In an FBM conference the question will arise: how are the facts, fact patterns, associated rules and descriptions managed? In MPS definitions rule type patterns and fact type patterns are defined at language level and rules and fact types are defined at language level. An example of the new way of creating specifications in MPS is shown in figure 5.
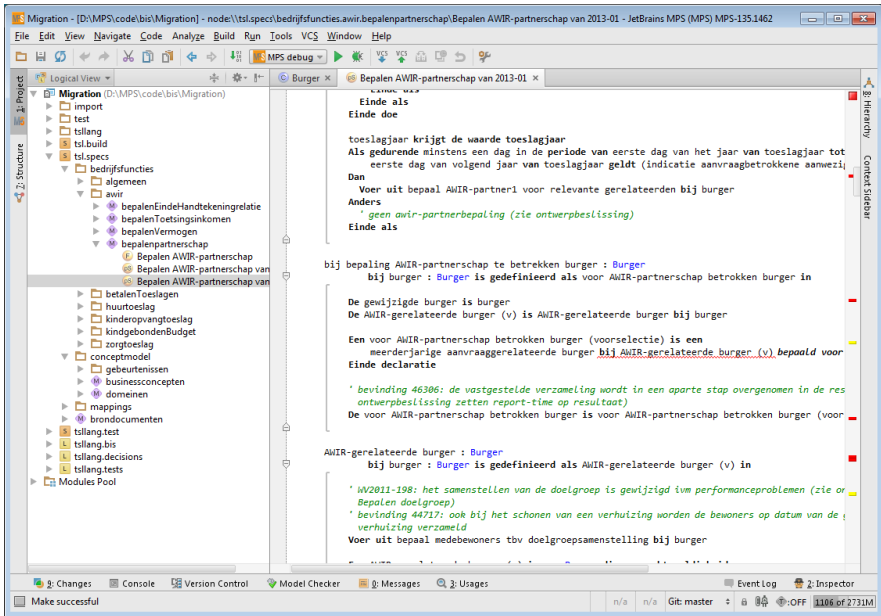
Fig. 5. Example of the specifications in MPS.

The specifications of the service for determination of the legal consequences are never the bottleneck in changes of the benefits legislation. The main reasons for this are:

- Specifying is developing, if it is specified there is no need for coding software. The source code is generated and 'correct by construction'.
- There is a strong correlation between legislation and the specifications, formal and understandable to modelling experts, which makes updating the specifications relatively easy.

Domain experts are able to validate the specifications, since the specifications look very much like natural language. Due to the fact that MPS supports multiple notations of the same concept[2], it possible to adjust the notation based on the preferences or language of the domain expert.

The specifications in the functional language 'conceal' date and time operations. In the information model date and time concepts are avoided. Instead in the specifications generic operations are used to handle changes of facts. For instance 'date of birth' is not in the information model. Instead a fact is known 'citizen is alive'. This fact is changed when the events 'birth' and 'death' occur. So the fact 'citizen is alive' is true from 'date of birth' until 'date of death'.

Using generic date and time operations in the specifications allows us to abstract from the maintenance of the history of facts. This reduces the amount and complexity of the specifications. Specification like 'the income of you and your partner may not exceed € 32.655 per year' means a sum of all your incomes of each month added to the sum of all the incomes of each month of your partner. (Or partners in case of changing partners in one year).

All assertions received have a start date and some have an end date, else it is assumed that the assertion is valid until a point in the future. The service used to determine the facts is executing rules to create a single truth from the different assertions known. In the specifications, assertions from life-events or other sources (government partners, etc.) are classified based on for instance the authority of the source. The specification of the service to derive legal consequences assumes that all facts which are received are true in a legal sense. Based on these facts, legal consequences are derived. An overview of the process in this service is described in figure 6.
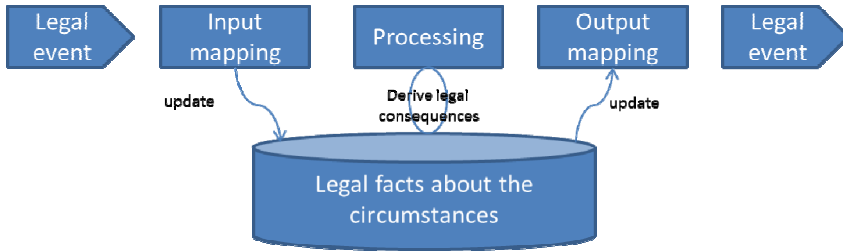

Fig. 6. Overview of the service for deriving legal consequences

The service receives legal events containing the new facts. After the mapping the legal rules to derive legal consequences are applied on these facts, resulting in new facts. These facts are mapped on output events that represent the results. The resulting legal events may trigger other services to process the effects of other legislation or to start a payment service or messaging service to inform the citizen.

4   Conclusions and Future Work

The specification process described here delivers DTCA traceable, verifiable and easily maintainable specifications of its legislation. These specifications are fully automated converted by MPS into source code that is correct by construction.

DTCA will investigate whether the specification environment of the benefits services can be extended toward the other areas like the portal and the determination of facts from life events or other sources.

Mid 2015 the management of DTCA unfolded plans to renew its business processes, applications and infrastructure. Substantial 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. The portal provides an integrated information view regarding all aspects of taxes and benefits.

Another ambition is to renew all of the back office applications, which execute legislation. The 'Agile execution of legislation' approach should be able to support a less formal interaction between government and citizens and companies and a less formal defined shared information position.

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