

# Geonovum

## Study INSPIRE Extensions

Michel Grothe, Jandirk Bulens, Thorsten Reitz



## Introduction

- It is a study
  - to find patterns & provide guidelines
  - No static document, but an accessible, dynamic website
  - Enough for professionals
- Covers the full chain
  - From data preparation to publishing
    - Organisational and technical
  - Data collection not included
- Joined effort NL & EU
  - Including user input all member states
- Follow up is needed

## In short..

- Why?
- What?
- How?
- Who?
- When?



## Why?

- How can we use INSPIRE to support specific policy and business processes effectively?
  - **Observation:** Extensions provide the opportunity to build new, efficient business processes on top on INSPIRE.
  - **Example:** New spatial planning act in the Netherlands coming into force in 2018
- What are the steps to create an interoperable INSPIRE Extension?
  - **Observation:** High uncertainty about the methodology towards an interoperable INSPIRE Extension
  - **Example:** How to transform existing data into harmonized services while maintaining the richness and the value of the data to its present and foreseen use the data

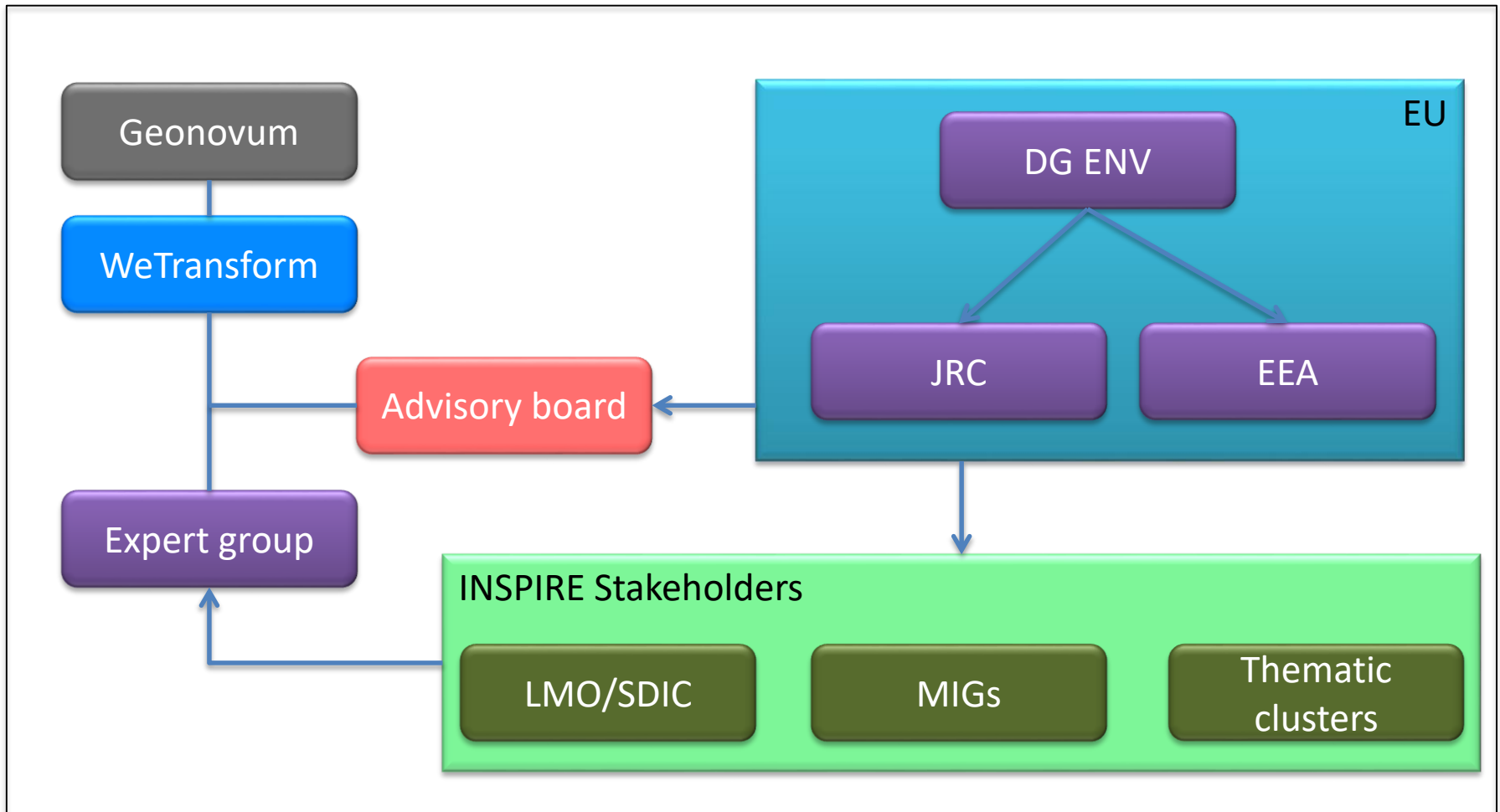
## What?

- We provide guidance that helps pick **organisational and technical** patterns to extend INSPIRE models, depending on the specific wishes to extend.

## How?

- In this project a study is carried out to
  - make an inventory on best practices in extending INSPIRE models
  - find patterns that can be useful to be followed by data providers member states.

## Who?



## Inside the project

- Geonovum initiated this project
  - Overall coordination
- Wetransform is contracted by Geonovum
  - carry out the body of the work.
- Support is supplied by DG ENV, EEA and JRC
  - taking care of organising the domain with an expert group, and facilitating the communication with the expert group and internally.
- The expert group
  - INSPIRE experts specifically in the field of modelling and implementing INSPIRE models from the data specifications



## Outside the project

- An advisory committee
  - will ensure the overall project quality
- The stakeholders
  - represented by Spatial Data Interest Communities (SDICs) and Legally Mandated Organisation (LMOs).
  - The pool of experts for maintenance and implementation
  - two INSPIRE Maintenance and Implementation Group (MIG-T and MIG-P)

## Composition?

### **Project group**

Jandirk bulens

Michel Grothe

Paul Janssen

Linda van derBrink

Thorsten Reitz

### **Expert group**

Morten Borrebaeck

Debbie Wilson

Stefania Morrone

Katharina Schleidt

Sylvian Grellet

Paul Janssen

Linda van den Brink

### **Advisory board**

Michael Lutz

Robert Tomas

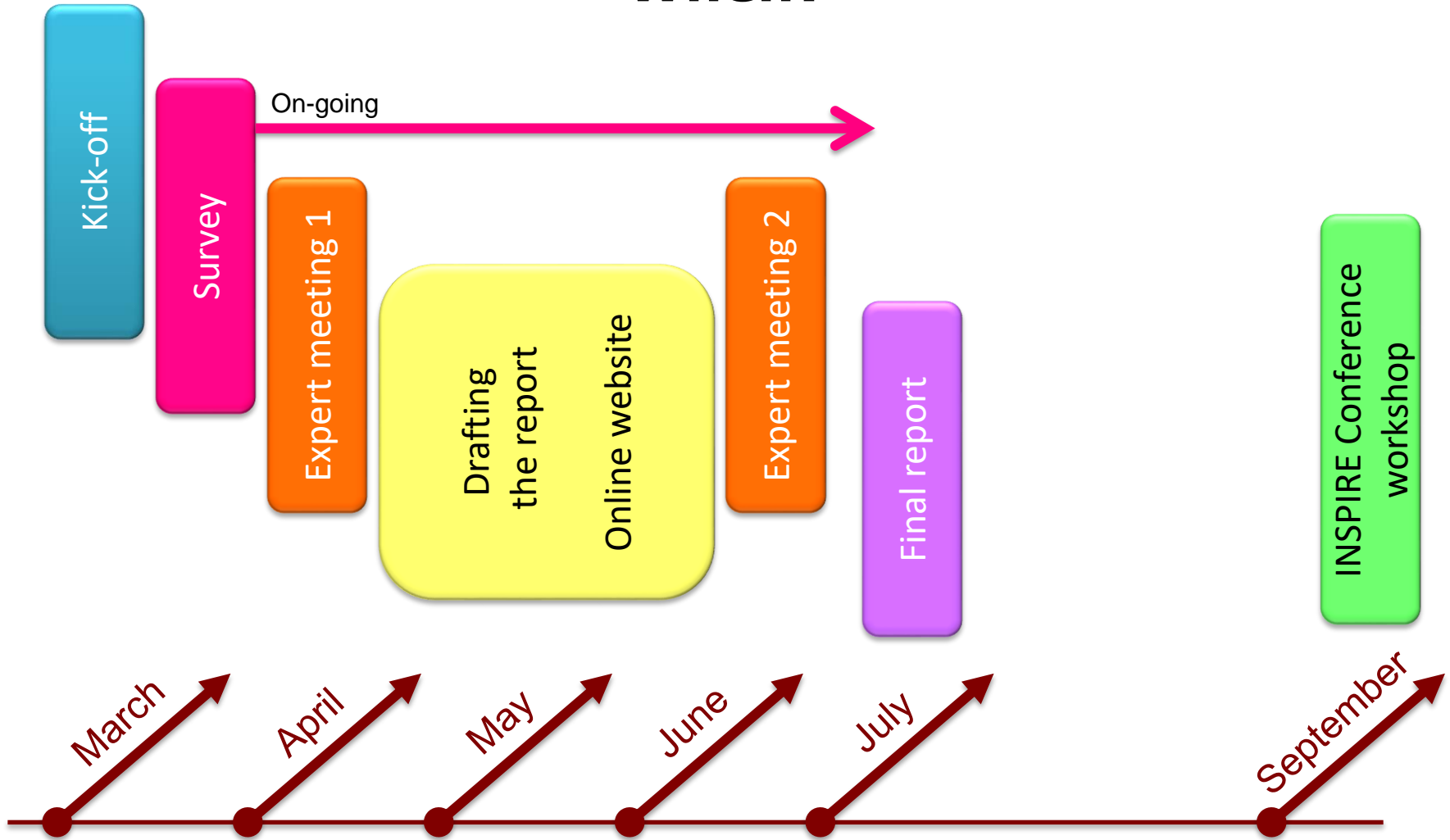
Joeri Robbrecht

Robin Smith

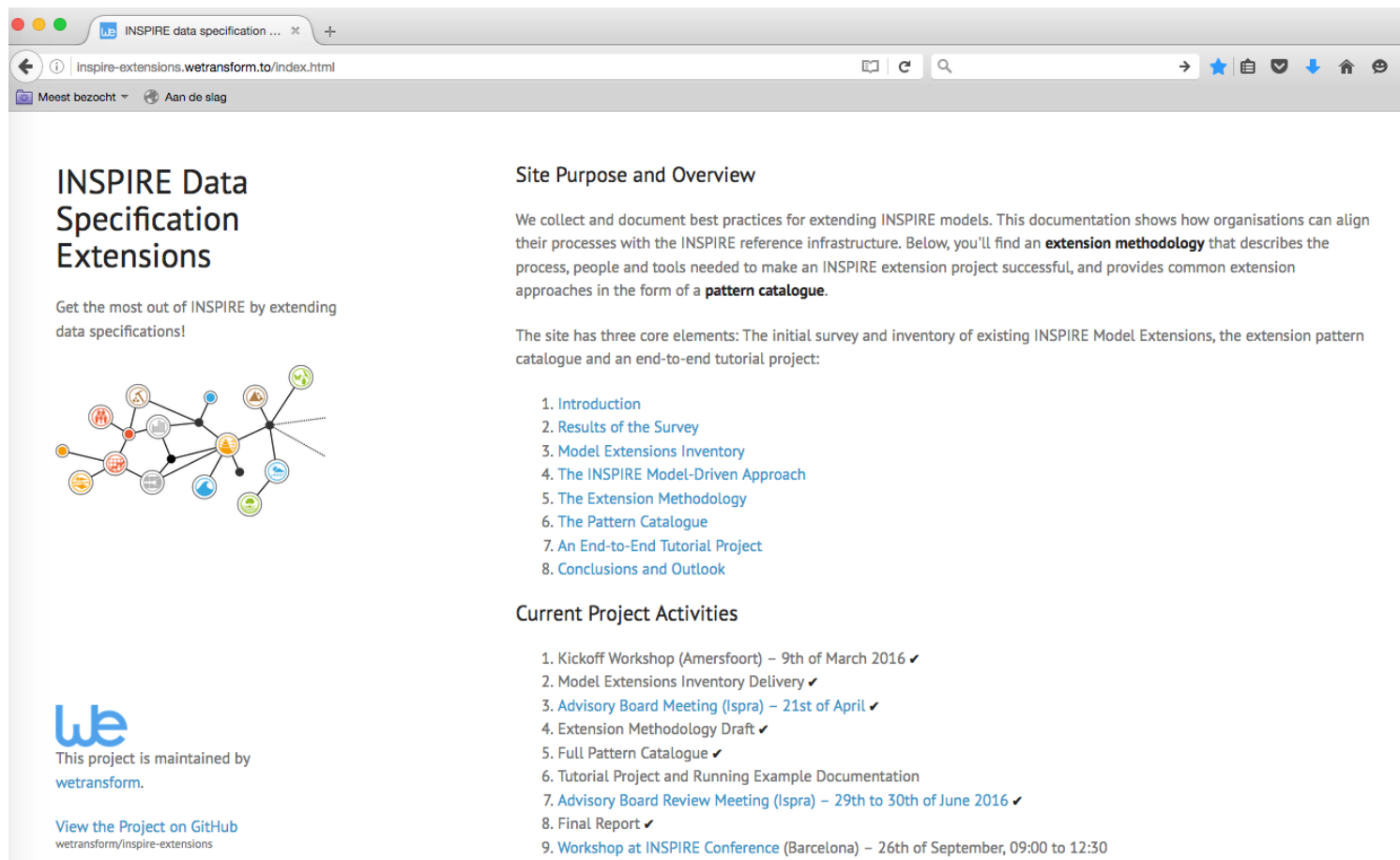
Christian Ansorge

Michel Grothe

## When?



# Results




INSPIRE data specification ... x

inspire-extensions.wetransform.to/index.html

Moest bezocht Aan de slag

## INSPIRE Data Specification Extensions

Get the most out of INSPIRE by extending data specifications!



This project is maintained by [wetransform](#).

[View the Project on GitHub](#)  
wetransform/inspire-extensions

### Site Purpose and Overview

We collect and document best practices for extending INSPIRE models. This documentation shows how organisations can align their processes with the INSPIRE reference infrastructure. Below, you'll find an **extension methodology** that describes the process, people and tools needed to make an INSPIRE extension project successful, and provides common extension approaches in the form of a **pattern catalogue**.

The site has three core elements: The initial survey and inventory of existing INSPIRE Model Extensions, the extension pattern catalogue and an end-to-end tutorial project:

1. [Introduction](#)
2. [Results of the Survey](#)
3. [Model Extensions Inventory](#)
4. [The INSPIRE Model-Driven Approach](#)
5. [The Extension Methodology](#)
6. [The Pattern Catalogue](#)
7. [An End-to-End Tutorial Project](#)
8. [Conclusions and Outlook](#)

### Current Project Activities

1. Kickoff Workshop (Amersfoort) – 9th of March 2016 ✓
2. Model Extensions Inventory Delivery ✓
3. Advisory Board Meeting (Ispra) – 21st of April ✓
4. Extension Methodology Draft ✓
5. Full Pattern Catalogue ✓
6. Tutorial Project and Running Example Documentation
7. Advisory Board Review Meeting (Ispra) – 29th to 30th of June 2016 ✓
8. Final Report ✓
9. [Workshop at INSPIRE Conference](#) (Barcelona) – 26th of September, 09:00 to 12:30

**<http://inspire-extensions.wetransform.to/>**

- [Introduction](#)
- [Results of the Survey](#)
- [Inventory of Model Extensions](#)
- [The INSPIRE Model-Driven Methodology](#)
- [The Extension Methodology](#)
- [The Pattern Catalogue](#)
- [An End-to-End Tutorial Project](#)
- [\*\*Conclusions and Outlook\*\*](#)

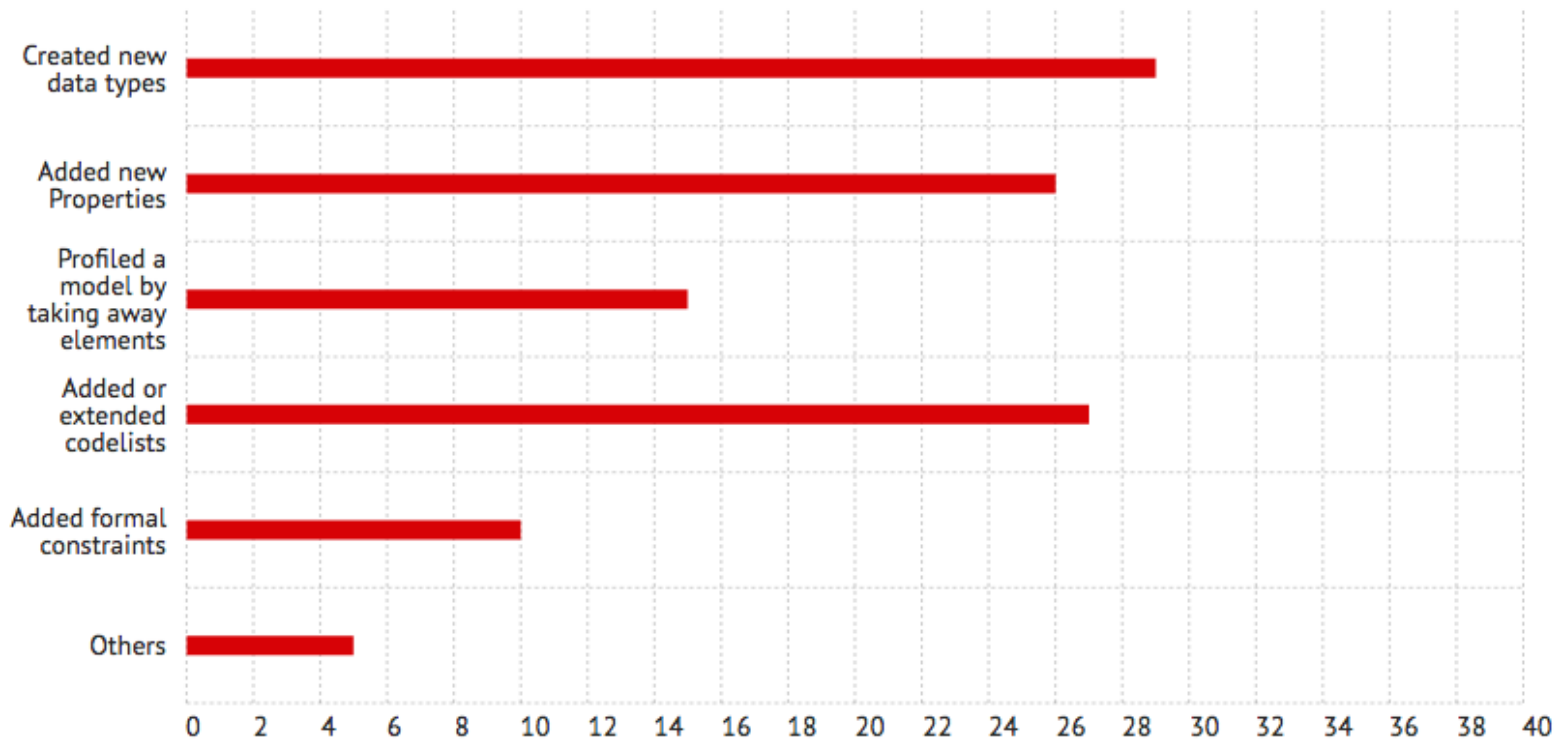
## The survey

- 117 people responded to the survey between April and June
  - You can still submit entries!
- Good overall response rate (3%)
  - High focus group response rate in the INSPIRE Maintenance and Implementation Groups (between 10 and 20%).
- Low rate of incomplete responses (3%)
- 37 existing data models related to the INSPIRE data specifications are documented.

# What was done?

**Question 2.3:** Compared to the INSPIRE Data Specifications, what have you done to create your data model?

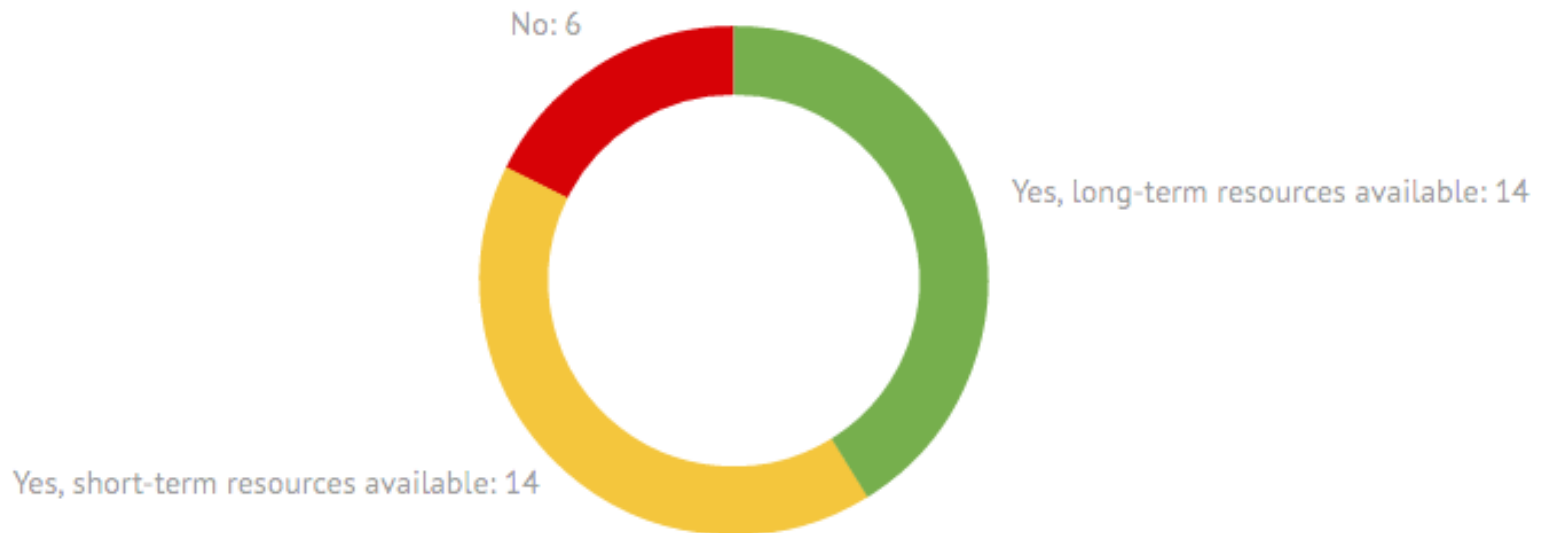
36 responses



## Do it next time?

**Question 2.12:** Will you continue to develop the data model?

*34 responses*

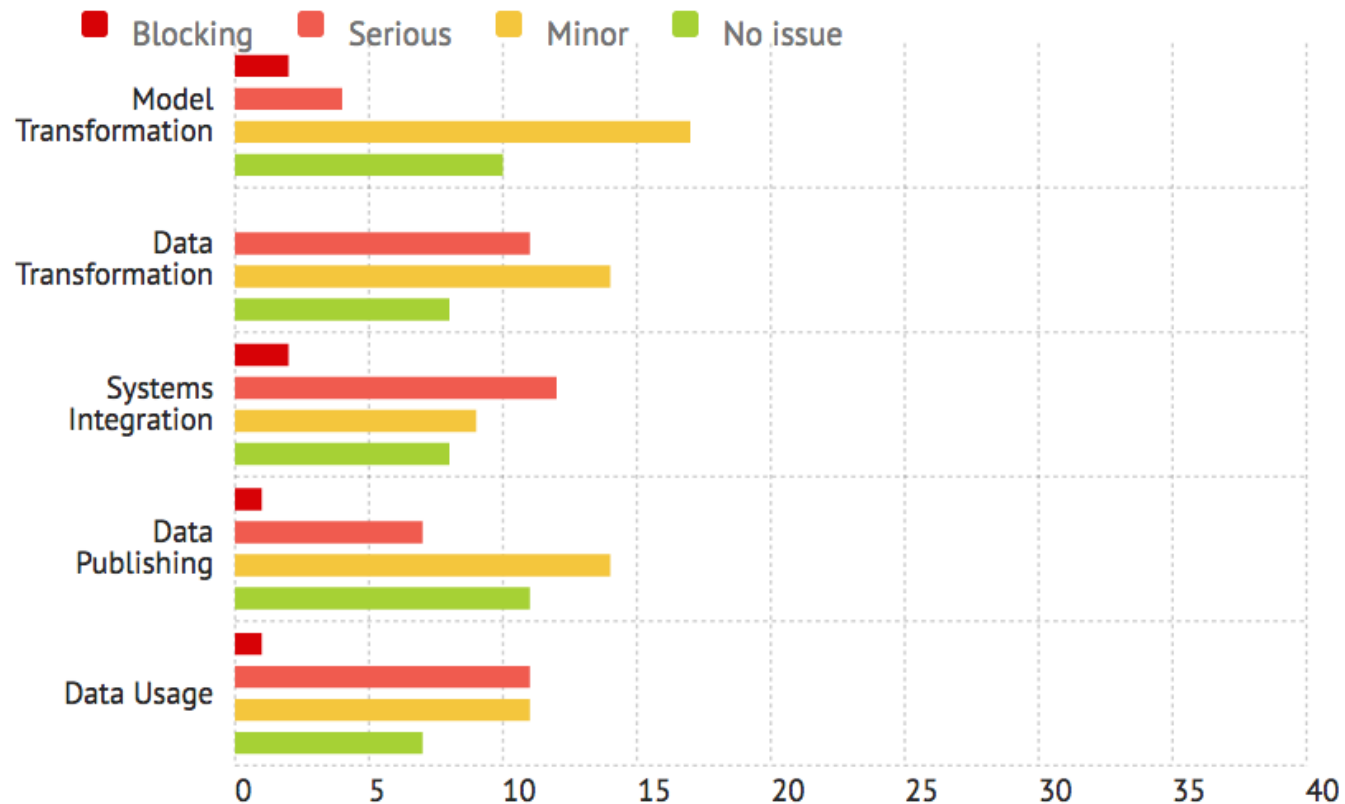




# Challenges?

**Question 2.18:** Which challenges did you encounter when implementing the data model?

35 responses



# Inventory models (up to 4/4/2016)

## Browse Models by Date

- [Geological Database of Catalonia \(1:250000\) \(added 18.05.2016\)](#)
- [ZSIN - the Integrated System of Information about Real Estates \(added 18.05.2016\)](#)
- [Geographic Reference Information - Hydrography \(added 10.05.2016\)](#)
- [SOSI Vegnett \(Road Network\) and Linear Referencing \(added 10.05.2016\)](#)
- [BuildingsExtended2D \(added 10.05.2016\)](#)
- [Nutrification \(MDI-DE\) \(added 10.05.2016\)](#)
- [Redes de Transporte \(Spanish Transport Networks\) \(added 10.05.2016\)](#)
- [Querbauwerke \(added 10.05.2016\)](#)
- [INSPIRE for Dutch Provinces \(added 10.05.2016\)](#)
- [LISA \(Land Cover\) \(added 10.05.2016\)](#)
- [IMKL2015 \(Information model cable and pipelines\) \(added 23.04.2016\)](#)
- [EAGLE Data Model \(added 22.04.2016\)](#)
- [GeoSmartCity Buildings 2D-Energy \(added 22.04.2016\)](#)
- [GeoSmartCity Extended Utility Networks \(added 20.04.2016\)](#)
- [ELF Data Model \(added 19.04.2016\)](#)
- [SOSI Planned Land Use \(added 19.04.2016\)](#)
- [Example Model 2 \(added 14.04.2016\)](#)
- [Example Model \(added 09.04.2016\)](#)


## Model Driven Approach

- Consistent and well-structured approach
- Ability to model cross-theme relationships
- Effective re-use and detection of inconsistencies and errors
- Easy generation of encodings and other artifacts such as feature catalogues and mapping tables

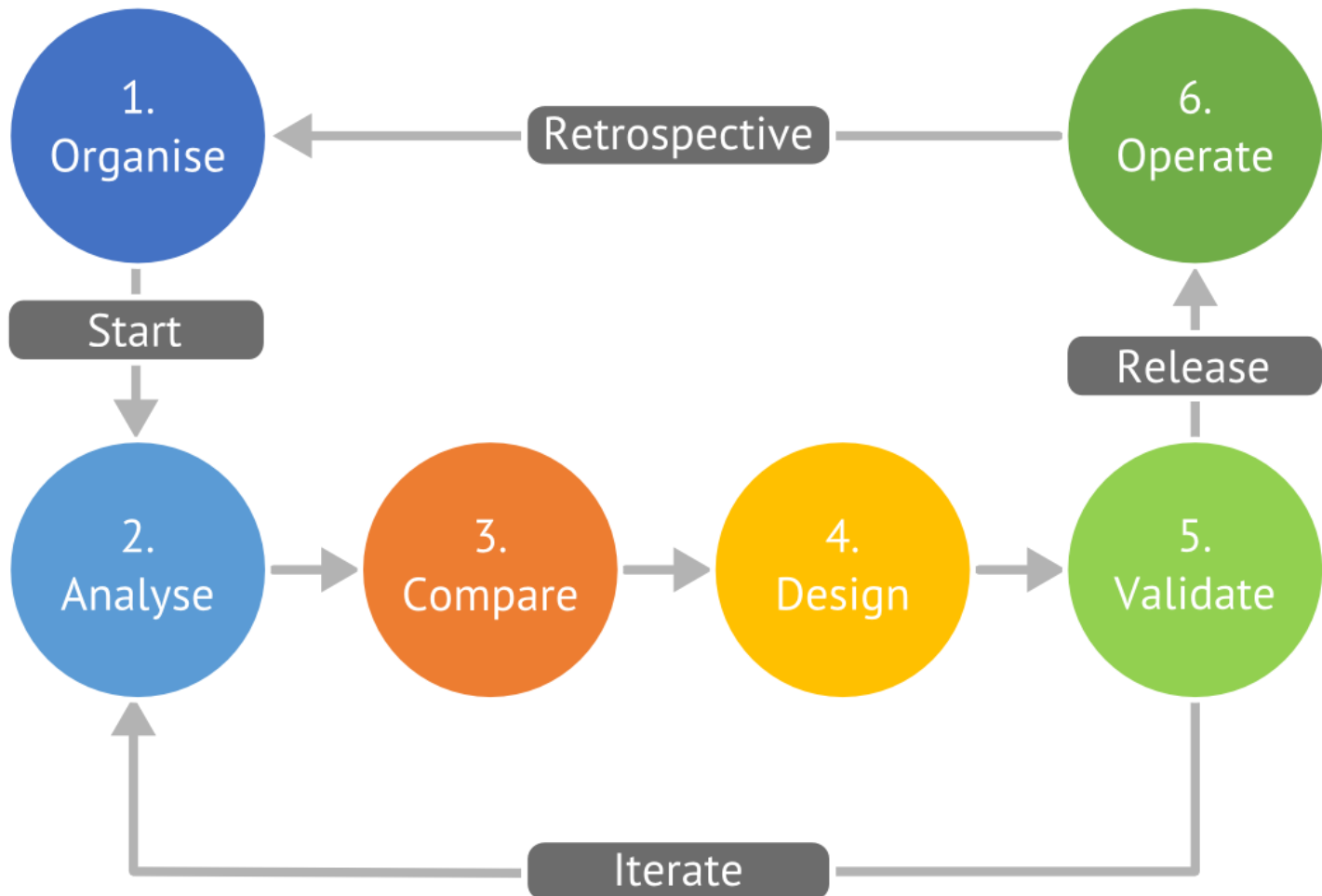
## **From Use Case to Data Specification**

1. Organise a thematic working group
2. Collect Use Cases
3. Identify user requirements and Spatial Object types
4. Determine required level of interoperability
5. Perform as-is analysis and gap analysis
6. Design a draft model
7. Test the model and consult stakeholders
8. Iterate over the model and feedback cycle
9. After release, maintain the model

## Process of extending models

- **Organise:** Build your working group
- **Analyse:** Identify and analyse requirements
- **Compare:** Compare the requirements with existing models and INSPIRE Data Specs 
- **Design:** Create or modify your model extension
- **Validate:** Test and validate
- **Consult:** Invite all stakeholders and the public
- **Operate:** Deploy and operate the model extension in view and download services

## The process



## Pattern catalogue

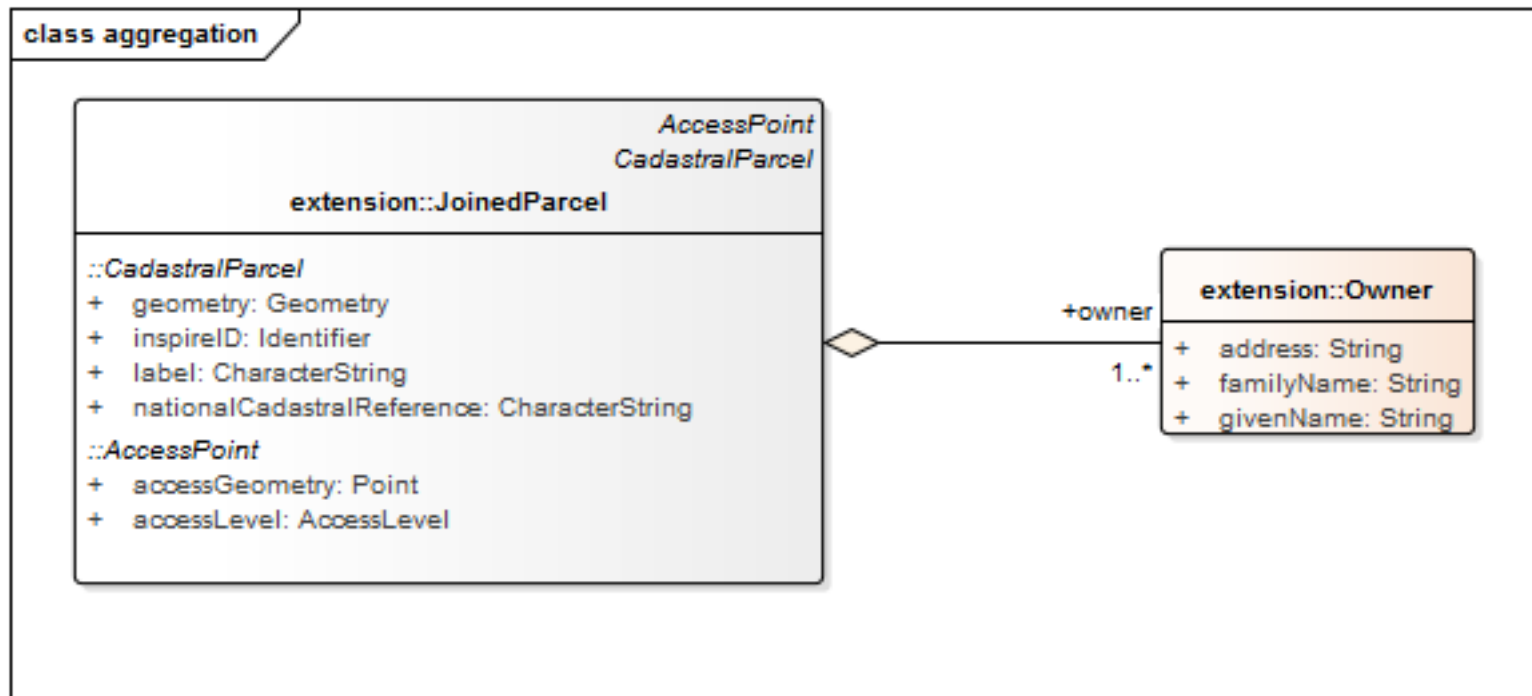
- Patterns for Model compliance
  - INSPIRE Generic Conceptual Model
  - CityGML Application Domain Extension
- Patterns for adding classes and properties
  - Aggregation
  - Inheritance
  - Association
  - Composition
  - Multiple Inheritance
- Patterns for modifying properties
  - Adding Constraints
  - Codelist Extension

## For each pattern

- Structure
- When to use, when not to use
- XML schema example
- XML instance example
- Implementation considerations
- Examples in the Model inventory



# Structure



## XML schema example

```
1 <?xml version="1.0" ?>
2 <xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
3           xmlns:cp="http://inspire.ec.europa.eu/schemas/cp/4.0"
4           xmlns:gml="http://www.opengis.net/gml/3.2"
5           xmlns:ex="http://www.wettransform.to/ie-examples/aggregation/1.0"
6           elementFormDefault="qualified"
7           targetNamespace="http://www.wettransform.to/ie-examples/aggregation/1.0"
8           version="1.0">
9   <xs:import namespace="http://inspire.ec.europa.eu/schemas/cp/4.0" schemaLocation="http://inspire.ec.europa.eu/s
10  <xs:import namespace="http://www.opengis.net/gml/3.2" schemaLocation="http://schemas.opengis.net/gml/3.2.1/gml.
11  <xs:element name="Owner" type="ex:OwnerType" substitutionGroup="gml:AbstractFeature" />
12  <xs:complexType name="OwnerType">
13    <xs:complexContent>
14      <xs:extension base="gml:AbstractFeatureType">
15        <xs:sequence>
16          <xs:element name="givenName" type="xs:string" minOccurs="1" maxOccurs="1"/>
17          <xs:element name="familyName" type="xs:string" minOccurs="1" maxOccurs="1"/>
18          <xs:element name="address" type="xs:string" minOccurs="1" maxOccurs="1"/>
19        </xs:sequence>
20      </xs:extension>
21    </xs:complexContent>
22  </xs:complexType>
23  <xs:element name="JoinedParcel" substitutionGroup="cp:CadastralParcel" type="ex:JoinedParcelType"/>
```

## XML instance example

```
12 http://www.wetransform.to/ie-examples/aggregation/1.0 ./aggregation.xsd"
13 numberMatched="3" numberReturned="3" timeStamp="2016-05-31T10:55:38.697+02:00">
14 <wfs:member>
15   <ex:JoinedParcel gml:id="_3">
16     <cp:beginLifespanVersion xsi:nil="true" nilReason="unpopulated" />
17     <cp:geometry><!-- ... --></cp:geometry>
18     <cp:inspireId>
19       <base:Identifier>
20         <base:localId>3</base:localId>
21         <base:namespace>http://www.wetransform.to/ie-examples/inheritance/</base:namespace>
22       </base:Identifier>
23     </cp:inspireId>
24     <cp:label>My Joined Parcel</cp:label>
25     <cp:nationalCadastralReference>urn:wetransform.to:ie-examples:inheritance:3</cp:nationalCadastralRefere
26     <ex:joinedParcel xlink:href="#parcel_1"></ex:joinedParcel>
27     <ex:owner xlink:href="#owner_1"></ex:owner>
28     <ex:owner xlink:href="#owner_2"></ex:owner>
29   </ex:JoinedParcel>
30 </wfs:member>
31 <wfs:member>
32   <cp:CadastralParcel gml:id="parcel_1">
33     <cp:beginLifespanVersion xsi:nil="true" nilReason="unpopulated" />
34     <cp:geometry><!-- ... --></cp:geometry>
```

## End-To-End Tutorial

- **Data Modelling:**
  - Enterprise Architect 12.0
- **Schema Transformation:**
  - ShapeChange 2.1.0 (Open Source)
- **Data Transformation:**
  - hale studio 2.9.4 (Open Source)
- **Service Publishing:**
  - deegree 3.3.18 (Open Source)

## Analysis

- Story

- It's late on a rainy Friday afternoon. I am in the middle of reviewing an article when my boss Alex calls. He sounds agitated and tells me that there is a problem, so he needs me to help him. Ten minutes later, we sit together at the bar of the pub across the road. Alex tells me about the meeting he has had in the last two days in the capitol city, with many other directors of public authorities.
- ....

*In this tutorial, we build a custom variant of the existing CDDA INSPIRE extension. If you need to deliver CDDA data, please use the official extension, and not a custom variant we might build using this tutorial.*

## Follow up ideas

- Continue to develop the site into an official registry for extensions
- Add a simple self-registration form for more extensions instead of the survey
- Improve the statistics, model links, and pattern identification using concrete models, by using automated analysis
- Make sure we get access to the actual model for as many extensions as possible
- Include extensions in the interactive data specifications [find your scope](#) tool
- Add sandboxes for interactive work with data models to tutorial project
- Add interactive model exploration tools to each model extension entry for which we have a formal model (XSD, UML)
- Add a section on UML modelling requirements and best practices, such as UML model presentation and the integration of all relevant ISO 191xx requirements



We plan to continue this work, so please continue to submit contributions!

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