Nasjonalt senter for
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Socio-technical Requirements for Expert Users to Design Structured User-Interfaces for OpenEHR-based Electronic Health Records

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Background

- The main purpose of medical quality registers:
  - to contribute to better quality for the patient,
  - to reduce unwanted variation in the quality of treatment and care.
- In Norway:
  - 51 National Medical quality registers.

«Good health registers, better health"

The Norwegian Minister of Health – Bent Høie

The aim of the paper

- Describe and discuss the socio-technical challenges related to expert users designing and electronic openEHR-based forms in relation to:

The complexity of the design tools

The compromize between instant benefit and long-term requirements

The need for extensive governance for user-designed software

The importance of contextualization

Research question

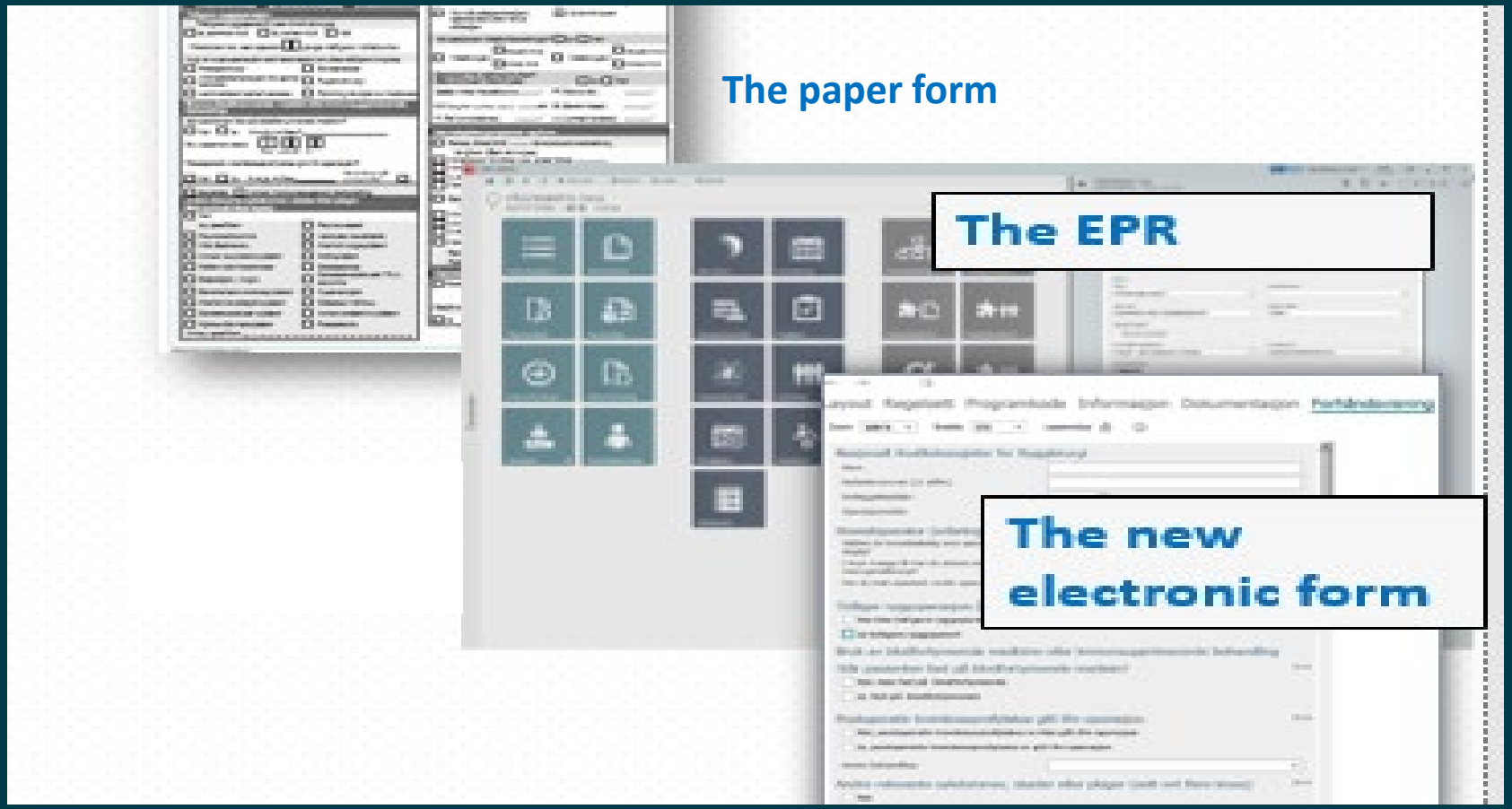
- ***Which socio-technical challenges are addressed when expert users design openEHR-based forms?***

The empirical project

The implementation of an openEHR based EPR system

Collaboration with the Norwegian registry for spine surgery

Design an electronic registry form to include in the openEHR based EHR system

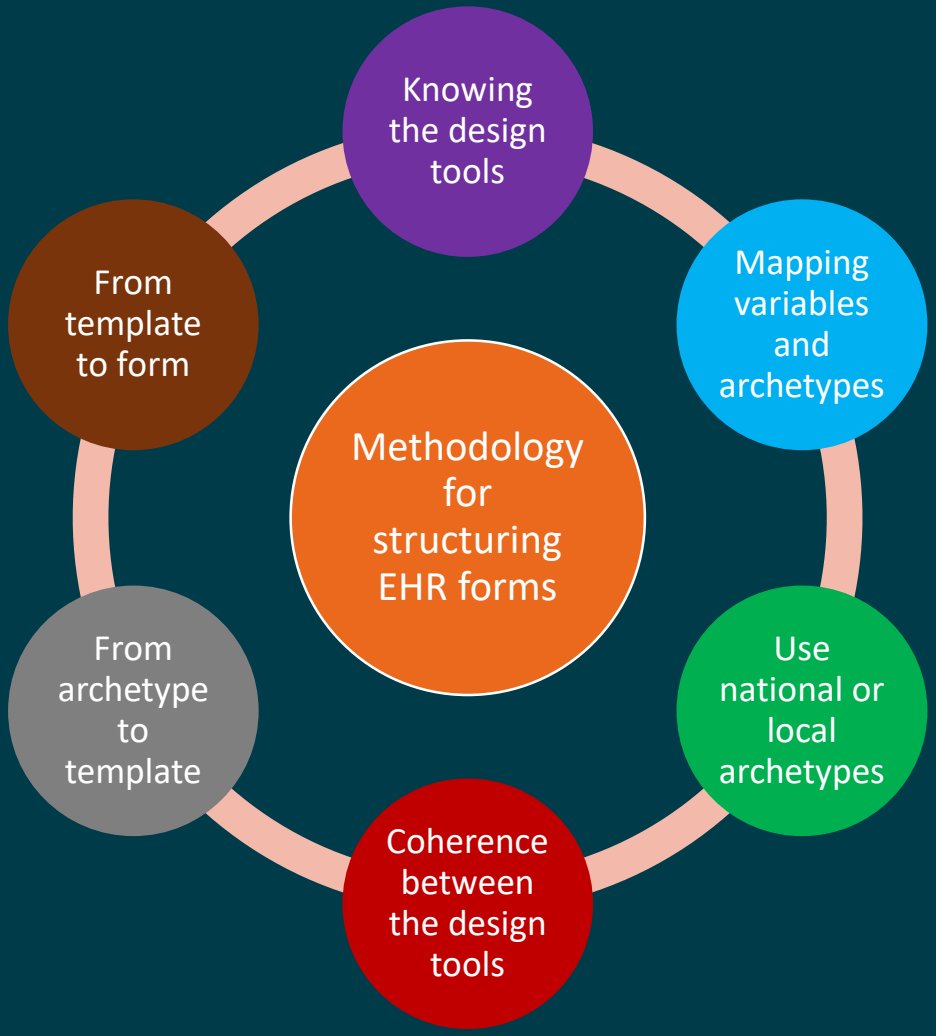


Method

- We have used a qualitative action research approach, with the objective of contributing to a co-constructive learning process for stakeholders in the implementation program, the surgeons, developers, and the researchers
- The study was done according to Creswells three elements of action research
- The data collection is described as follows:

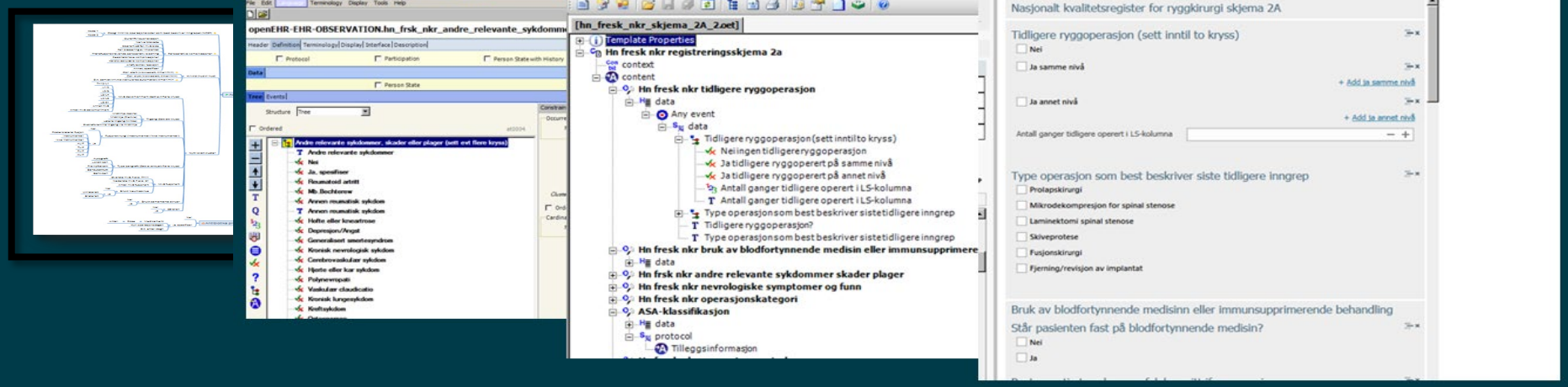
Data collection from November 2018 to March 2019	
Participatory observation	**Meetings/workshops with:**
• Participated in the design process • Mapping variables to archetypes • Design archetypes • Designing templates (OET/OPT) and the form	• The vendor • Clinicians • Project management • Members of OpenQ-reg Registry • National Archetype Administration
In total 320 hour	**In total 50 hours**

The design process



The Design tools

1 2 3 4

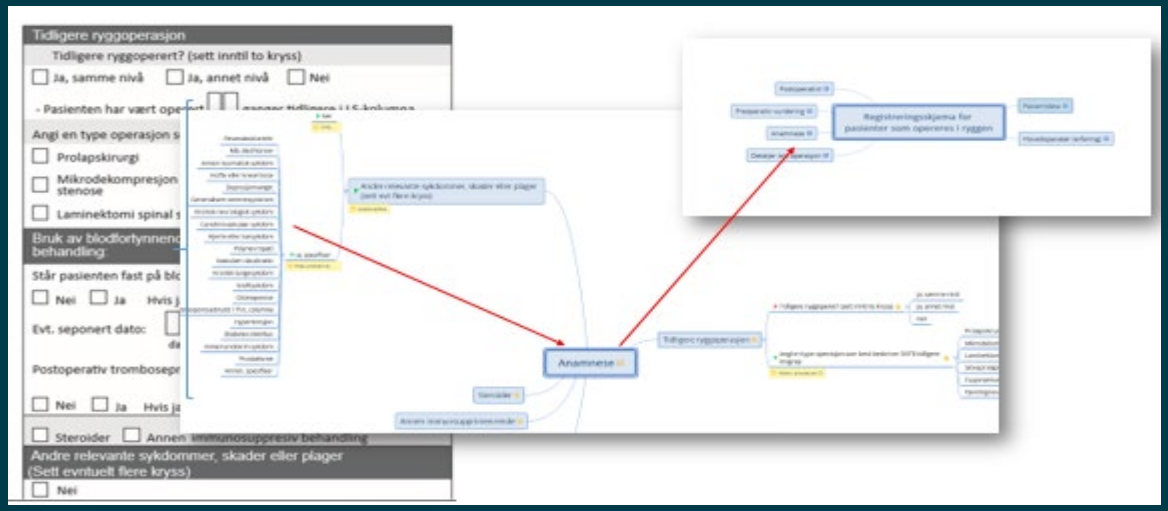


1) The mind map was used to get an overview of the variables in the paper-based form.
2) The Archetype Editor was used to design archetypes
3) The Template Designer was used to align and constrain archetypes into a template for this specific use case.

4) The Form Designer was used for configuration the template into the registry form – the user interface for clinicians.

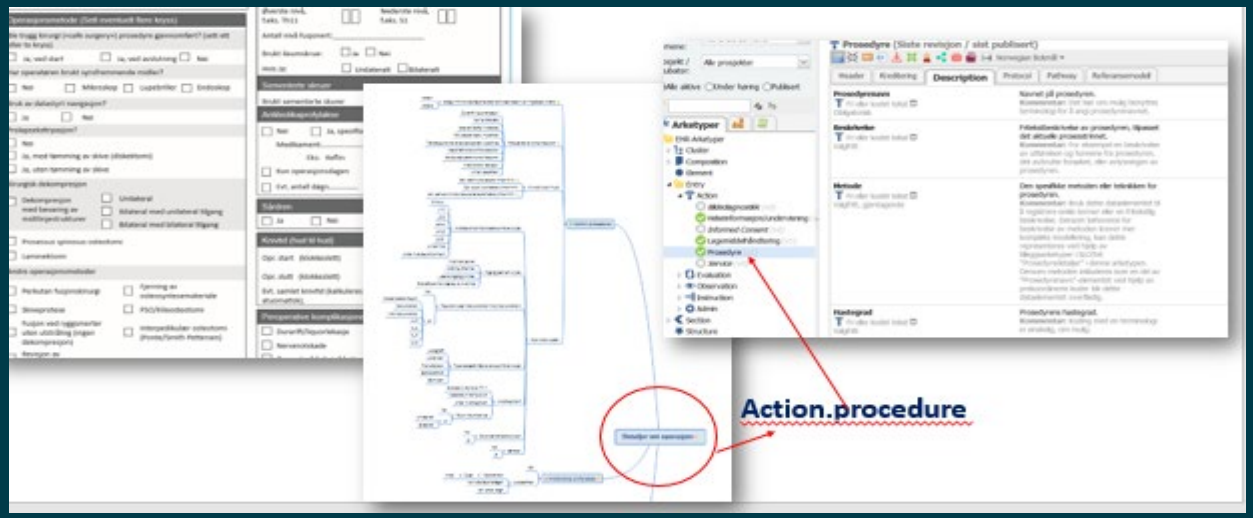
Expert users designed the structured registry form for the EHR

Mapping variables and archetypes



Variables identified and placed in a mind map in XMind

Variables mapped against existing archetypes

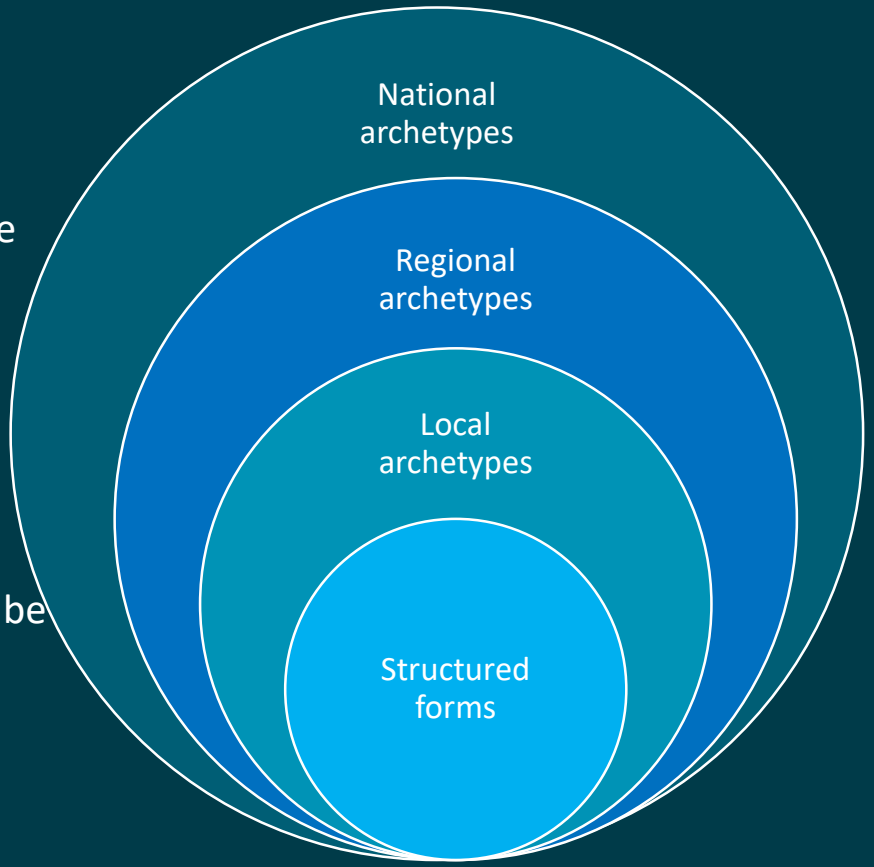


Use National Archetypes or Develop Locale

- It is preferable to use national approved archetypes to ensure semantic interoperability of clinical information

- National archetypes
  - High quality nationally approved information models
  - Reusable
  - Complex data models that demands extensive adjustments
  - Time consuming to fill out

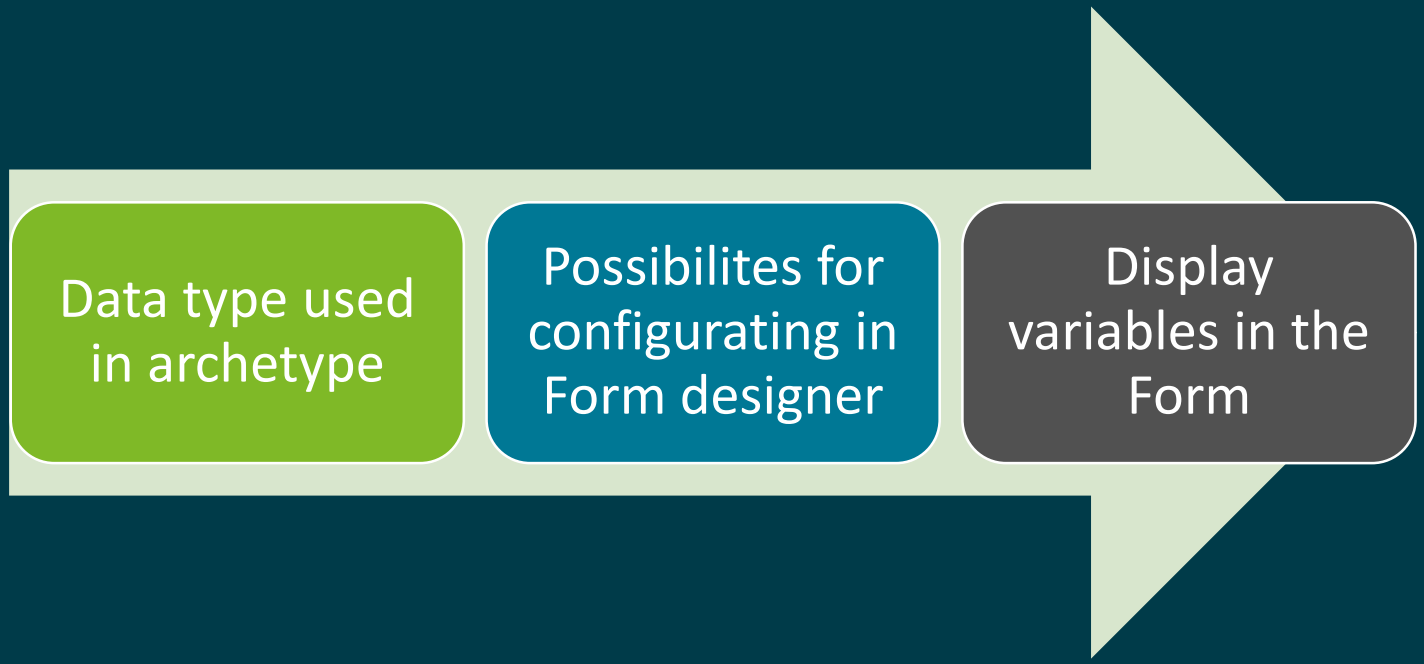
- Local archetypes
  - Simple data models
  - Only locally approved by the design team, NRUA and the vendor
  - Contain several clinical elements that cannot be reused separately
  - Have to be reused as a whole



The decision was made to design mainly local archetypes

Coherence between the Design Tools

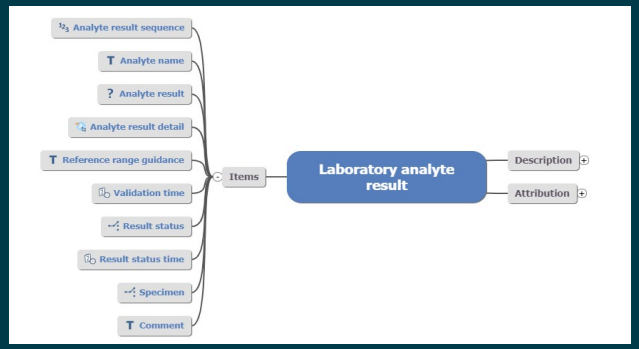
- To design local archetypes, the Ocean Informatics' Archetype Editor was used
- The Archetype Editor has a given set of data types used to design clinical variables as data elements in an archetype
- If it was uncertain how the variable would be used in the form, it was possible to design different data elements representing the same variable

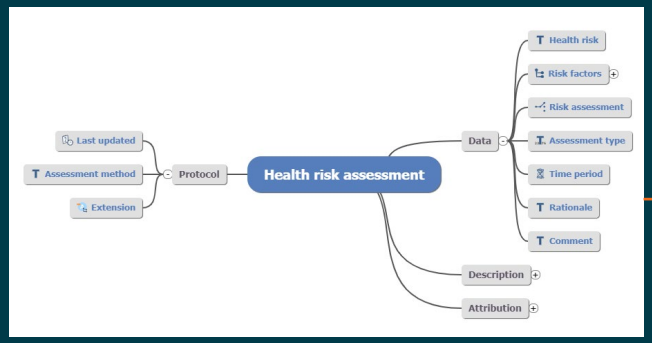


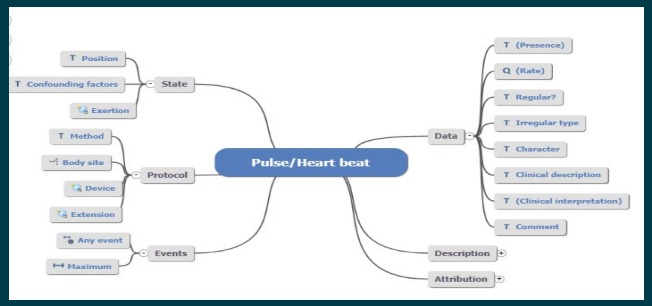
From Archetypes to Template

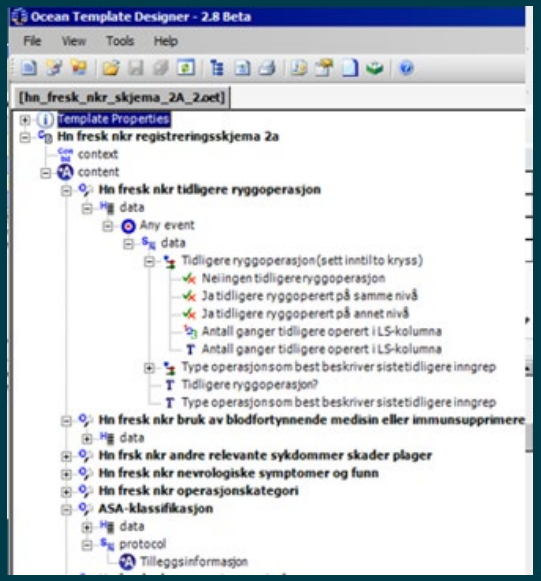
The archetypes were assembled in a template by using Ocean Informatics' Template Designer.

Archetypes were constrained in the Template Designer, in terms of making data elements/variables inaccessible.

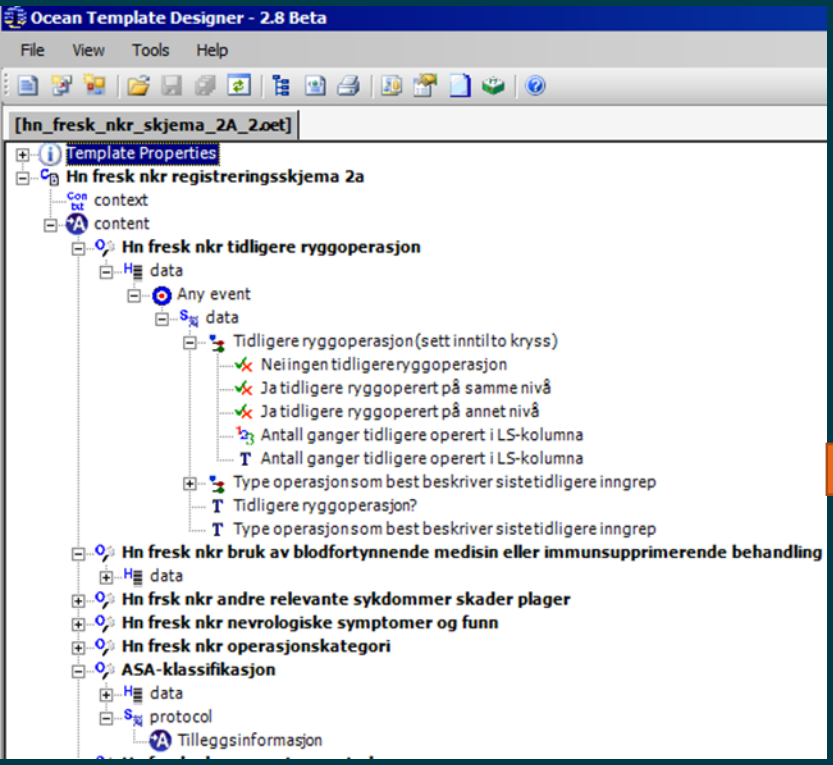








From template to form



- The template is exported to DIPS Form designer
- Dependencies, relations and calculations are added
- User interface defined in collaboration with clinicians

Methodology for Structuring EHR Forms

Tasks	Collaborating partners	Responsible part
Archetype work		
Mapping archetypes and existing variables	Expert users, NRUA, clinicians,	Expert users
Decide to using local or national archetypes	Expert users, NRUA, Vendor	Expert users
Designing local archetypes	Expert users, NRUA, Vendor, clinicians,	Expert users
Template Design		
Design a template from the archetypes	Expert users, Vendor, NRUA	Expert users
Constrain archetypes if needed	Clinicians	Expert users
Forms design		
Upload template to the Form Designer	Expert users	Vendor/ICT department
Define dependencies, annotations, calculations etc. between archetypes	Expert users, clinicians, Vendor and/or ICT consultants in health organizations	Vendor/ICT department

Socio technical challenges of the design process

The complexity of the design tools

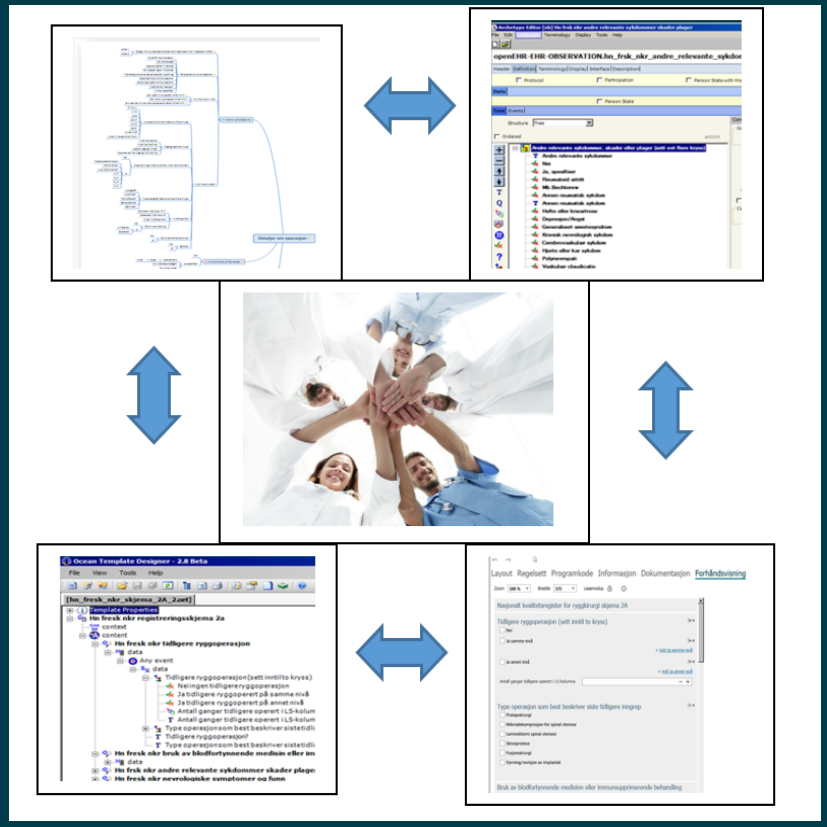
The compromise between instant benefit and long-term requirements

The need for extensive governance for user-designed software

The importance of contextualization

The complex design tools

- The four design tools available for the expert users are quite complex to use
- Everyone can download the mind map tool and the tools from Ocean Informatics.
- Using the tools requires extensive training of the expert users
- Each step conducted in each of the different tools are interdependent to make the overall infrastructure evolve
- Important to include clinical experts and technical competence to end up with a user friendly form
- This demand for expert users taking the role as translators between ICT and clinical practice



Compromise between instant benefit and long-term requirements

Bootstrapping. Efficient design process for instant use, low hanging fruits

Adaptability: Designing robust archetypes for scaling and long- term use

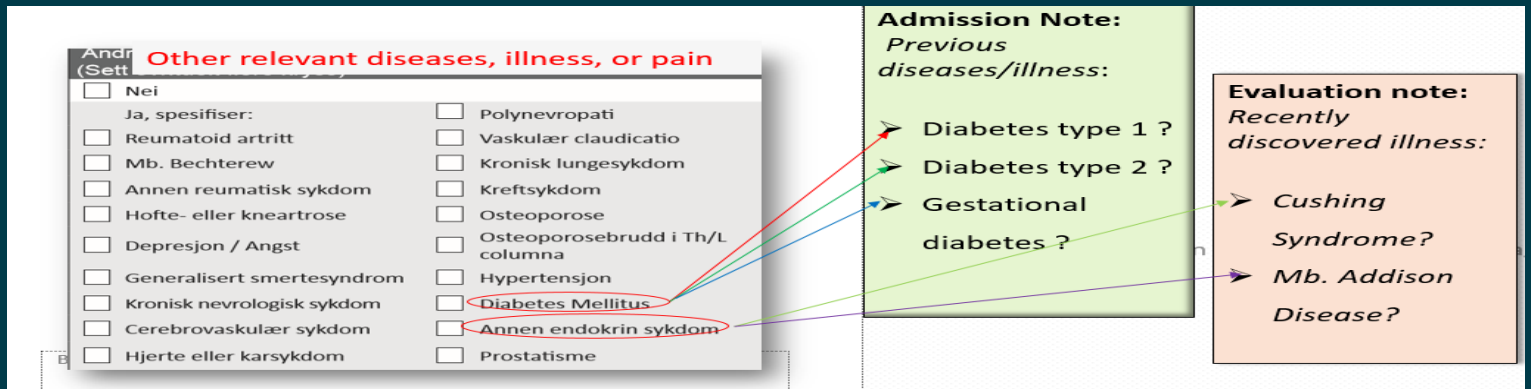
The need for extensive governance for user-designed software

- Structuring user interfaces is a complex infrastructuring process

- Demands for an extensive IT governance organization for
  - Storing and retrieving local and national archetypes used
  - Storing variables, forms, and dependencies for forms

The importance of contextualization

- Nationally approved archetypes are developed through a thorough design process managed by high-qualified expert users
  - developed as maximum datasets to be useful in any clinical context and for different clinical specialties
  - National approved archetypes constitute the basis for semantic interoperability in openEHR-based systems
- This adheres to the II design principle of standardization, and the importance of communicating through defined clinical standards
- Maximum datasets, need to be contextualized, i.e., constrained and tailored to specific use contexts
- In line with the openEHR specification, configurations must be done by local health care organizations



Conclusion

Expert users must designing high quality structured forms

Balance between an efficient design process and robust archetypes

Establish extensive governance for user-designed software

Contextualize national high quality archetypes to different local contexts

Thanks for listening ☺