Pattern-based architecture of a system for systematic review of clinical trials

Margreth Venaely Kileo

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Introduction

What are clinical trials?

• Are research studies used to find the best ways to detect, prevent or treat a certain disease.

• Used by clinicians, researchers or medical decision makers as medical evidence to inform their treatment decisions and improve patient care.

[Logos for UMCG and University of Groningen]
How do clinicians or medical decision makers find enough evidence for medical decisions?

- Perform a systematic Review of medical literatures
Introduction

What is systematic review of clinical trials?

Formulation of research question

Search Abstracts/titles (5645 search results)

Abstracts screening
  Reviewer 1
  Reviewer 2

Reviewers meet and agree on the selected abstracts/titles

Full-text articles screening (141 articles) & data extraction
  Reviewer 1
  Reviewer 2

Reviewers meet & agree on the extracted data

Data analysis and report writing
Various IS to store clinical trials

Lack of IS to support screening activities

Research question

MEDLINE
EMBASE
Clinical Registries

Abstracts/Titles
Protocols

Incl. abstracts
Excl. abstracts

Incl. abstracts
Excl. abstracts

Incl. Protocols
Excl. Protocols

Full-text articles

Incl. Trials
Excl. Trials

De- duplicated clinical trials

Analysis & report writing
Introduction

What is the problem definition?

• Clinical trials are scattered
• Clinical trials are not accessible or reusable
• Lack of IS to perform systematic review in a single point of view
Introduction

Research questions

How can software patterns improve the quality of software architecture of a system for systematic review of clinical trials?
Architectural vision

User
- Reviewer
- Computer scientist

Personnel
- Project Manager
- Developers
- Other

CLINICAL REVIEW SYSTEM

Abstracts Databases

Clinical Trials registries

Review Manager
ADDIS
## Requirements

<table>
<thead>
<tr>
<th>Key drivers</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Usability</strong></td>
<td>Reviewers, computer scientists, RevMan/ADDIS</td>
</tr>
<tr>
<td><strong>Interoperability</strong></td>
<td>Abstracts databases, Clinical trial registries</td>
</tr>
<tr>
<td><strong>Re-usability</strong></td>
<td>Computer scientists, Reviewers, RevMan/ADDIS</td>
</tr>
<tr>
<td><strong>Intergrability</strong></td>
<td>Computer scientists</td>
</tr>
<tr>
<td><strong>Scalability</strong></td>
<td>Project Manager, Developers</td>
</tr>
</tbody>
</table>
Functional requirements of the new system

• Searching

• Abstracts screening

• Full-text screening

• Process clinical trials
Analysis

Software patterns

• Express a relation between a certain context, a problem and a solution to support software engineering design and best practices

• Used to provides the design approaches of the entire software architecture
Pattern-Driven Architectural Partitioning

1. Identify most priorities drivers
2. Select candidates architecture patterns per driver
3. Apply the patterns to partition system
4. Assess impact on drivers
5. More pattern?
   - Yes: Repeat steps 2-5
   - No: Patterns trade-off w.r.t to drivers
6. More pattern?
   - Yes: Repeat steps 2-5
   - No: End
For example: we need to decompose the front-end server of our new system, consider **usability** as the most priority driver. Examine the **Model-View-Controller pattern** as the pattern that can solve the design problems.
Analysis

The architecture of front-end servers

View layer
Control layer
Integration layer
Data access layer

System not yet decomposed (back-end servers and external data sources)
## Analysis

### Identify (16 patterns)

<table>
<thead>
<tr>
<th>Patterns</th>
<th>Key Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model-View Controller</td>
<td>Usability, reusability</td>
</tr>
<tr>
<td>Dispatch-View</td>
<td>Usability, Re-usability</td>
</tr>
<tr>
<td>Layers</td>
<td>Intergrability, Re-usability</td>
</tr>
<tr>
<td>Look-up broker</td>
<td>scalability</td>
</tr>
<tr>
<td>Share repository</td>
<td>Re-usability, Intergrability</td>
</tr>
<tr>
<td>Broker (trader system)</td>
<td>Interoperability, scalability</td>
</tr>
<tr>
<td>User information and Aggregation (search adapter)</td>
<td>Usability, Interoperability</td>
</tr>
</tbody>
</table>

- **Used to decompose front-end servers**
- **Used to decompose back-end servers and external data sources**
Results

• Reduce manual work of performing systematic review

• Data are stored in a well structured format

• Reduces duplication of effort for reviewers

• All steps of systematic review can be performed in a single point of view.
Conclusion

• The systematic review of clinical trials is time consuming and manual work

• This design increase the efficiency of systematic review
Future research

• The process for data extraction still not yet automated.
• Implementing a collaboration mechanism in our system.
• Identify common name for clinical trials
Thank you