Motivation
Motivation

Continuously Improved
Motivation
Motivation

Mobile Data Collection
Motivation

Mobile Data Collection

- Higher Data Quality
- More Data
- Faster Data Acquisition
- Anywhere
Motivation

OpenSignal

Various Roles

Validity

Environment

Display Shapes

Sensors

Various Platforms

Different Versions

Device Fragmentation

Display Shapes

Various Roles

Sensors

Validity

Environment

Display Shapes

OpenSignal

OpenSignal

OpenSignal

OpenSignal
Vision

- Extensible Approach
- Ensure Validity
- Platform-Independent
- Offline Availability
- Simple Deployment
- Flexible Adaptations
- Robust Execution
- Domain-Specific Customizations
Concept
Concept

Domain Experts | Collection Issues | IT Experts | Mobile Devices

- Evolving Instruments
- Multilingualism
- Implicit Domain Expert Knowledge
- Communication Problems
- Complex Logic and Structure
- Sensor

Cigarettes Consumption

How many Cigarettes do you smoke each day?

Do you smoke in your flat?

- yes
- no

Evolving Instruments

Sensors

Mobile Data Collection

Electronic Questionnaires

Sensor Framework

Crowd Sensing
Concept

Meta Model

Process Management

Design & Modeling  Deployment  Enactment & Execution

Domain Expert
Healthcare

Configurator

Mobile Application

Runtime Environment

QuestionSys
Process-Driven Mobile Data Collection
Idea & Mapping

1) Instrument
- Model Data Collection Instrument Using End-User Programming Approaches
- Customizable Executable Components
- Well-Defined Mapping Between Instrument and Process Model

2) Mapping
- Questionnaire Instance \(\rightarrow\) Process Instance
- Questionnaire Model \(\rightarrow\) Process Model
- Page \(\rightarrow\) Process Activity
- Question \(\rightarrow\) Process Data Element

3) Process Model
- Navigation Operation Based on Already Given Answers

4) Mobile Process Engine
- Mobile Data Collection Application
- User Interface
- Mobile Process Engine
- Sensor Framework
- UI Generator with Custom Control Elements
- Process Technology (e.g., Process Model)
Architecture

Process-Aware Instrument Configurator

Flexible Mobile Data Collection Clients

Web Service & Database

Anonymized Execution Log Files (XML)

Domain Expert
e.g., Study Director

Domain Expert
e.g., Analyst

Domain Expert
e.g., Interviewer

Participant
e.g., Study Subject

Cigarettes Consumption

How many Cigarettes do you smoke each day?

Do you smoke in your flat?

Yes
No

Cigarettes Consumption

Underage Alcohol Usage:
(age < 18) && (alc = true)

Age
18
Alc
Yes

Anonymized Execution Log Files (XML)
Modeling Data Collection Instruments

- Select a Questionnaire
- Select an Element (e.g., Question)
- Show a Preview of Selected Element
- Configure and Edit Element
Modeling Data Collection Instruments

Drag and Drop Elements to Pages
Modeling Data Collection Instruments

Lessons Learned

• Reduce complexity
  • No explicit data elements
• No pools / lanes
• Change modeling direction
  • top → bottom is better readable
• “Correctness by Construction” approach
• Avoid Deadlocks

Drag and Drop Pages for Modeling a Questionnaire

Model Complex Navigation Logic
Executing Modeling Data Collection Instruments
Executing Modeling Data Collection Instruments
Contribution
Summary

The QuestionSys Framework
- Configurator supports mobile data collection lifecycle
- No programming skills needed
- Combine manual and automated tasks
- Process management technology in a broader use

I) Manually Created
II) Automatically Generated, Manually Executed

Changes to the Model are Directly Propagated to the Smart Mobile Device → No Programming Skills Needed

Executing Process Model
Outlook & Future Work

Lifecycle & Prototypes:
- Cover last two phases of lifecycle
- Realize additional “transformers” (e.g., PDFs)

Experiments:
- New experiment focusing on “learning effect”
- Include experts from psychological & medical domain

Develop Instrument Metrics:
- Develop metrics for data collection instruments
- Assess well-established instruments using these metrics
Thank you for your kind attention.

Questions?