

Industrial Case 1: Reuse Center

This protocol reports on the sessions that researcher of our team have attended for the Reuse Center case.

The protocol comprises notes from **10 sessions** with architects and **3 workshops** with stakeholders, that we attended as passive observers.

Background Information

The Reuse Center (RUC) is a CIS that was developed in a joint R&D project between an Austrian company partner, who is a provider of software development tools for industrial automation systems, and CDL-Flex at TU Wien. The company has 20+ years experience in developing programming tools and platforms for the automation industry. The RUC complements an IDE product that is used for programming PLCs (Programmable Logic Controllers) with the programming language ST (Structured Text) according to IEC 61131-3 industry standard. The RUC's objective is to introduce CI capabilities into the automation software development process by enabling ad hoc source code reuse through collectively sharing, modifying and reviewing of code snippets within development teams.

Session #1

Date:	2013-10-15
Time , Duration:	14:00, 3 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

CI Staff Researcher #1/#2:

- Recap of CI Systems overview
- Present overview and introduction of CI Architecture Framework
- Introduce Model Kinds of Context Viewpoint

Software Architects #1/#2

- Present context and background information of industry partner.
- Goal of the company is to develop a novel CIS into their product to make software development for their customers more effective.

Session #2

Date:	2013-11-05
Time , Duration:	14:00, 2 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Discuss assumed As-Is Workflow model
 - Workflow presents a current code reuse workflow.
 - Architects are not sure if this workflow is indeed relevant for the company's clients.
- Architects organize a workshop in two weeks, to explore the As-Is-workflow with the industry partner.

Feedback

- As-Is Workflow model kind is understandable.
- Architects required some additional background information to the Stigmergic Coordination model kind, because it it felt “quite exotic” at the beginning.
 - CI Staff Reseachers provided them with hands on examples of stigmergy (e.g. in nature and robotics) and a brief overview of examples from multi-agent systems that would help them better understand the underlying mechanics.
 - CI Staff Researchers recommended them to follow a step-by-step process to construct the feedback loop in Stigmergic Coordination model.

Stakeholder Workshop #1

Date:	2013-11-14
Time , Duration:	9:00, 6,5 hours
Participants:	CEO, Company Head of Software Development, Company Project Manager, Company Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Goal of the workshop was that architects checked the As-Is Workflow model with the industry partner and to draft a Stigmergic Coordination model of a future CIS.

Observations

- First the architects presented the As-Is Workflow model to the stakeholders of the industry partner. They mostly agreed to the workflow with some minor changes to individual activities and their impact.
- Then, the architects guided a step-by-step process to draft a Stigmergic Coordination model asking the stakeholders for input for each step. The process consisted of the following steps:
 - What typical actors do we have?
 - With respect to the workflow that was discussed at the beginning, what would actors contribute into a CIS (CI Artifact)?
 - What group of users would be the main contributors?
 - What client would they use to contribute the respective content?
 - How would these artifacts be linked?
 - When you have now these network of artifacts, what information would actors get back from the system?
 - How would they receive this information (via emails?)?
 - Is this it, do actors have now all information they need?
- The process created a rough Stigmergic Coordination model, that triggered further input from stakeholders:
 - What analysis can be run on the snippet network?
 - Can we import snippets from existing libraries? How much effort would the be?
 - Who is responsible for maintaining this system.
- It was interesting to see, that when the feedback loop in the Stigmergic Coordination model was closed, and the participants perceived this, they tended to think in continuous loop interactions rather than single workflows.

Feedback

- Architects were satisfied with the results that the workshop generated.
- The incremental process to create the Stigmergic Coordination model is critical, as otherwise one would be tempted to explore multiple aspects (artifact, dissemination mechanisms, activities) at once and eventually get an inconsistent model.
- Minor refinements in the wording of model templates.

Session #3

Date:	2013-12-10
Time , Duration:	13:00, 3 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Architects created a formal Stigmergic Coordination model and the To-Be Workflow model. Also the architects performed a Comparative Process Analysis and an initial Scenario Analysis.

CI Staff Researchers #1/#2:

- Examination of the created models and analysis.
- Recap Technical Realization Viewpoint and explain concept of the CI artifact, that is necessary for the Artifact Definition model kind.

Feedback

- The To-Be Workflow model was very effective to discuss details with the stakeholders.
- The Comparative Process Analysis was useful to:
 - Cross check both workflows and their activities, also to see in nothing has been forgotten.
 - Suggestion from architects: Also add some value-based aspects to the comparison.
 - Illustrate where and how improvements in the workflows are planned to happen by using the future CI system.

Session #4

Date:	2014-01-21
Time , Duration:	14:00, 1,5 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Architects created Artifact Definition model.
- Discussion of relationship and differences between the Artifact Definition and a common data model.
- Discussion of available Linking options that could be used on the artifact.

Feedback

- Artifact Definition model was straightforward to use.

Session #5

Date:	2014-02-11
Time , Duration:	14:00, 3 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Architects created Aggregation model.
- Discussion of Aggregation model.
- Discussion of difference between Actor Record and user account.
- Architects set up a workshop stakeholder.

Feedback

- Linking artifact with activities is detail work, but provides a useful specification of the supported activities and the generated input/output.

Stakeholder Workshop #2

Date:	2014-02-27
Time , Duration:	13:00, 4 hours
Participants:	CEO, Company Project Manager, Company Project Manager, Client of Company Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- This workshop had to goal to discuss the system design with a customer (“client” in the following) of the industry partner to see if the CIS would make sense in their organization.
 - The customer is a leading builder of hydropower plants.

Observations

- Architects used the As-Is Workflow model to illustrate the perceived limitations.
 - Client agreed to the identified limitations and provided examples of the limitations in their own organization.
- Architects pitched the concept of CI systems with well-known examples from daily use (Facebook, Wikipedia).
- Architects used the To-Be Workflow model to present a solution concept for the previous process. They also used the Comparative Process Analysis to highlight certain improvements on an activity-level basis.
 - Client found the concept plausible, as it supports the developers more in the way they actually work, than in the way they ought to work.
- Question was raised how a RUC could be filled with code from available repositories?
- Architects explored candidates of useful triggers and metrics with the stakeholders.

Feedback

- Both workflow models and the Comparative Process Analysis were very useful for discussing CIS with stakeholders at a high level
 - Also they help to elicit other CIS relevant aspects like triggers, metrics and additional roles in the organization that would benefit from side-effects of CIS.

Session #6

Date:	2014-03-20
Time , Duration:	15:00, 2,5 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Discussion of usefulness of the so far created models and their utility with stakeholder communication.
- Revisiting refined To-Be Workflow, Artifact Definition and Aggregation.

Feedback

- Context View is very useful, whereby over time the workflow models are more used for external communication with the stakeholders and the Stigmergic Coordination model was more used in the internal discussion, as kind of “common mental model” of the “philosophy” of the RUC CIS.

- Once the stakeholders accepted the vocabulary as was possible to discuss aspects of the system that are more abstract and not implementation focused.

Session #7

Date:	2014-04-29
Time , Duration:	14:00, 2 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Discussion of the created Dissemination model.
- Architects created a UML component and a deployment diagram to get a better understanding of how the system is “going to look like at the end”.
- Architects organized an upcoming workshop with stakeholders.

Feedback

- CI model kinds are useful but do not cover all aspects of an IT-system. Using additional model (e.g. UML) creates a more complete and pragmatic description of the system-of-interest.
- Dissemination model was regarded as interesting. Without the dissemination model architects would have added the information about dissemination mechanisms “somewhere in the technical specification, where it would fit”.
- Architects decided to use the Operation viewpoint once the initial system is deployed.

Stakeholder Workshop #3

Date:	2014-05-08
Time , Duration:	10:00, 4 hours
Participants:	CEO, Company Head of Software Development, Company Project Manager, Company Software Developer, Company Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- The goal of the workshop was to kick-off the development of the RUC.

Observations

- The industry partner uses a Scrum-based development process. Actors activities could be grouped together to meaningful Stories.
- Artifact Definition and Aggregation model provided useful input for initial data modeling.

Session #8

Date:	2014-07-29
Time , Duration:	13:00, 2,5 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Examination of initial RUC CIS.
- Architects created Initial Content Acquisition and Analytics model and performed a Minimum Content Analysis.
- Discussion of the Operation VP and its models.

CI Staff Researchers #1/#2:

- Clarification of granularity of CI Analytics metrics.

Feedback

- Operation VP was useful as it introduced concerns that are relevant to start the system, keep the initial system running.
- Analytics model helps to think about meaningful metrics of the CIS.

Session #9

Date:	2014-09-10
Time , Duration:	14:00 , 2 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Examination of the deployed RUC CIS.
- Discussed how well the generated architecture description covers the created system.
 - Discuss if some elements are missing.

Feedback

- In general the description covers the essential elements of the system.
- A limitation is the architect herself, as she is not aware about the consequences that happen if certain aspects are neglected. e.g. “how bad is it really if I have poor dissemination mechanisms”.
 - It could help to emphasize in certain sections of the viewpoints, what are the consequences, if those elements/models are omitted / ill-structured, so that architects, who are novice in the CI domain can do better cause-effect estimates.

Session #10

Date:	2014-11-04
Time , Duration:	13:00, 3 hours
Participants:	Software Architect #1 Software Architect #2 CI Staff Researcher #1 CI Staff Researcher #2

Topics of Discussion

- Experiences from RUC CIS with some developers.
- Retrospective of CI Architecture Framework

Feedback

- Architect’s experience with the RUC CIS: Dissemination model and Operation VP models get more tangible once the CIS is in operation, as those models address aspects that yield to problems during operation.
 - The problem for architects who have no prior experience with designing CIS is that they would intuitively focus on these concerns once the system is running. Then however, implementing dissemination mechanisms and analytics, as well as to explore initial data sources may be associated with additional effort and time.
- The CI AF is very useful for designing CIS architectures, but it has some minor limitations:

Session / Workshop Protocols – Industrial Cases

- Initial effort to understand CI domain and underlying CI AF principles.
- Probably tool support could be useful to assist in model generation and enforcing of correspondences.
- CI AF is not complete and requires additional viewpoints to create a “whole” architecture description.
- Probably there some additional CI concerns:
 - Privacy of users
 - Motivation of users
 - Using data from the CI system within other systems