



View Harmonization in Software Processes: From the Idea to QuASE

Workshop: Software-Prozesse und -Produkte im Licht
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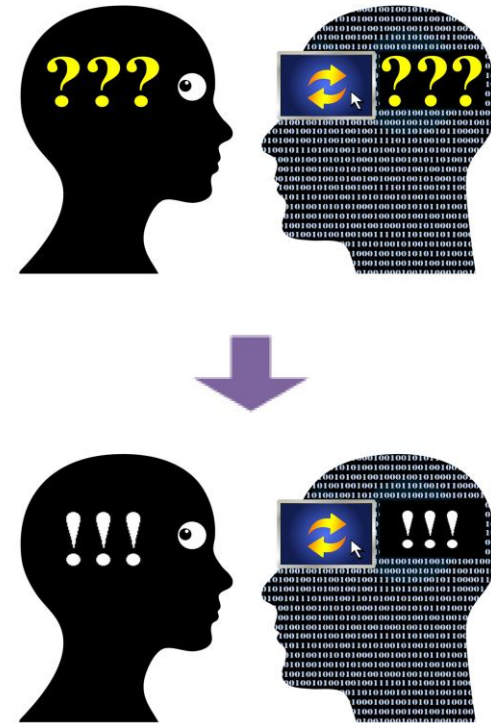
Initial motivation

Motivational problem

- To succeed, software development processes require a smooth communication between the different parties involved, especially developers and business stakeholders
 - In particular, they need to have a common understanding of the quality to be possessed by the software under development
- **Problem:** people often cannot communicate effectively because of having **different cultural, professional and educational background**

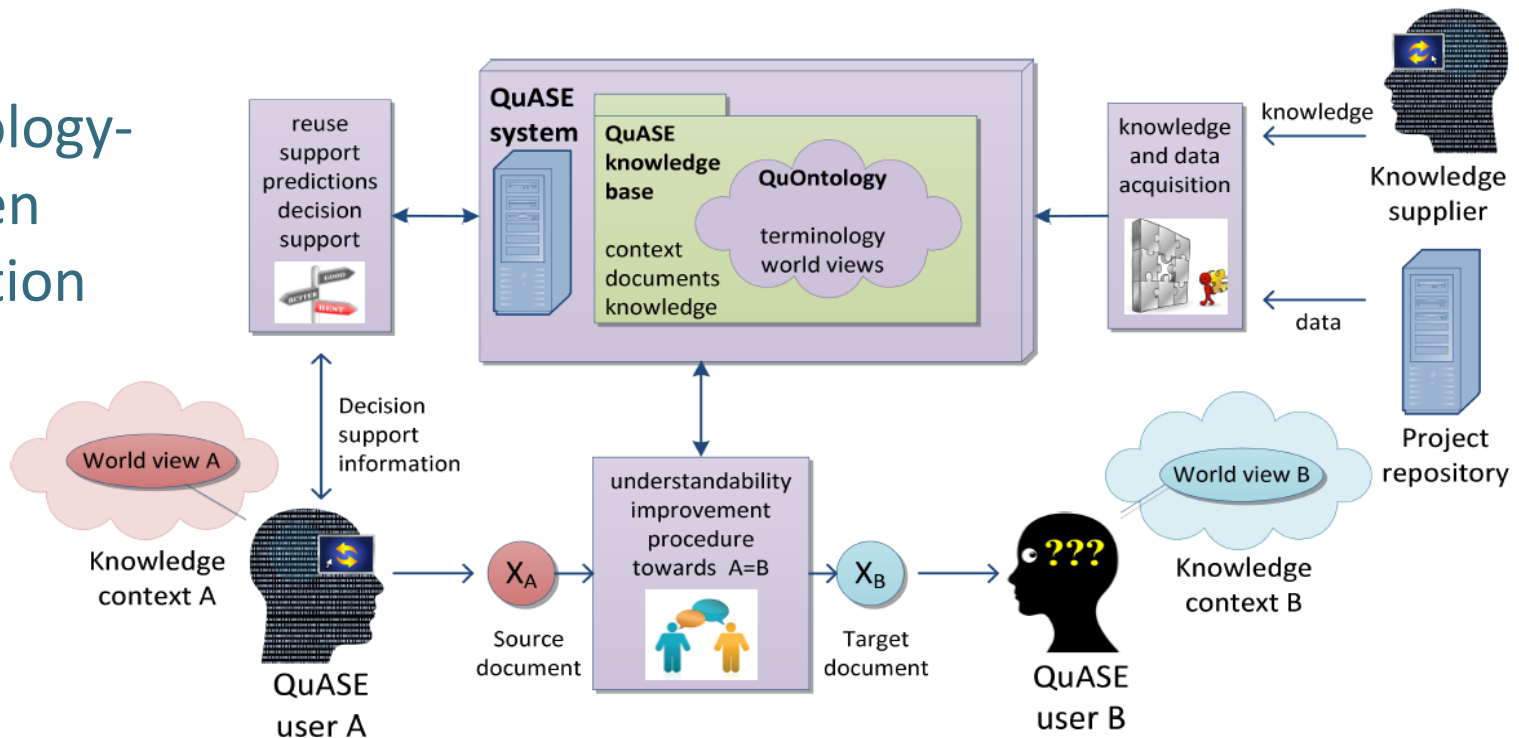
Addressing the motivational problem

- Enable effective communication between parties by harmonizing their quality views
- Manage communicated quality-related information in a way that allows for easy access and analysis



2012: initial QuASE proposal

Ontology-driven solution



The ontology

- incorporates the knowledge about quality conceptualization domain (**the approach only deals with quality-related information**)
- is a sole source for harmonization and analytical activities
 - understandability management, knowledge reuse, prediction, decision support
- is built by means of ontology engineering methods

2014-2015: evolving the concepts

Limitations of the special-purpose ontology

- Communicated information varies from company to company
 - has to be separately configurable for the particular deployment site
- Communicated information to be converted into knowledge is stored in project repositories (e.g. Jira databases)
 - No instructions for conversion in the quality communication domain ontology
- Direct ontology modification is a problem (too technical)

Scope limitations (for small-to-medium size IT companies)

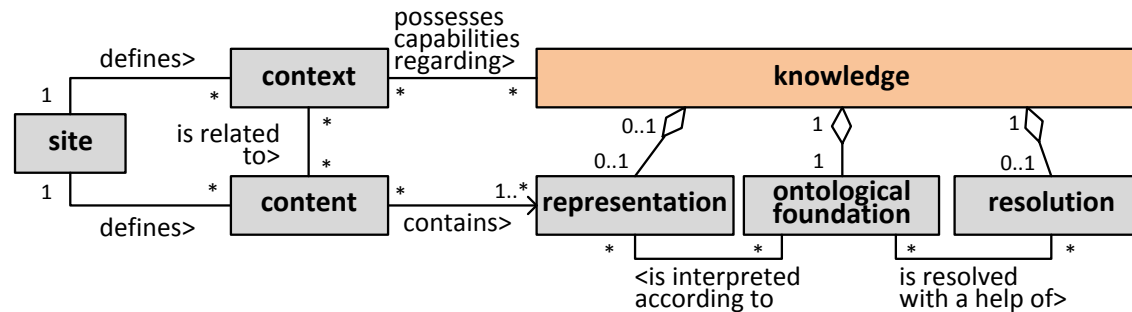
- Not productive to limit the scope to harmonizing quality-related communications
 - the subset of the quality-related information in the project repository is limited
 - stakeholders prefer to delegate quality-related communications to the IT people

Solution redesign

- Based on a **knowledge-oriented representation of the communicated information** collected in project repositories
- Targeting **the whole volume of communicated information**
 - Making possible to **filter it by topic** (e.g. by quality characteristic)

QuASE implementation concepts (evolved)

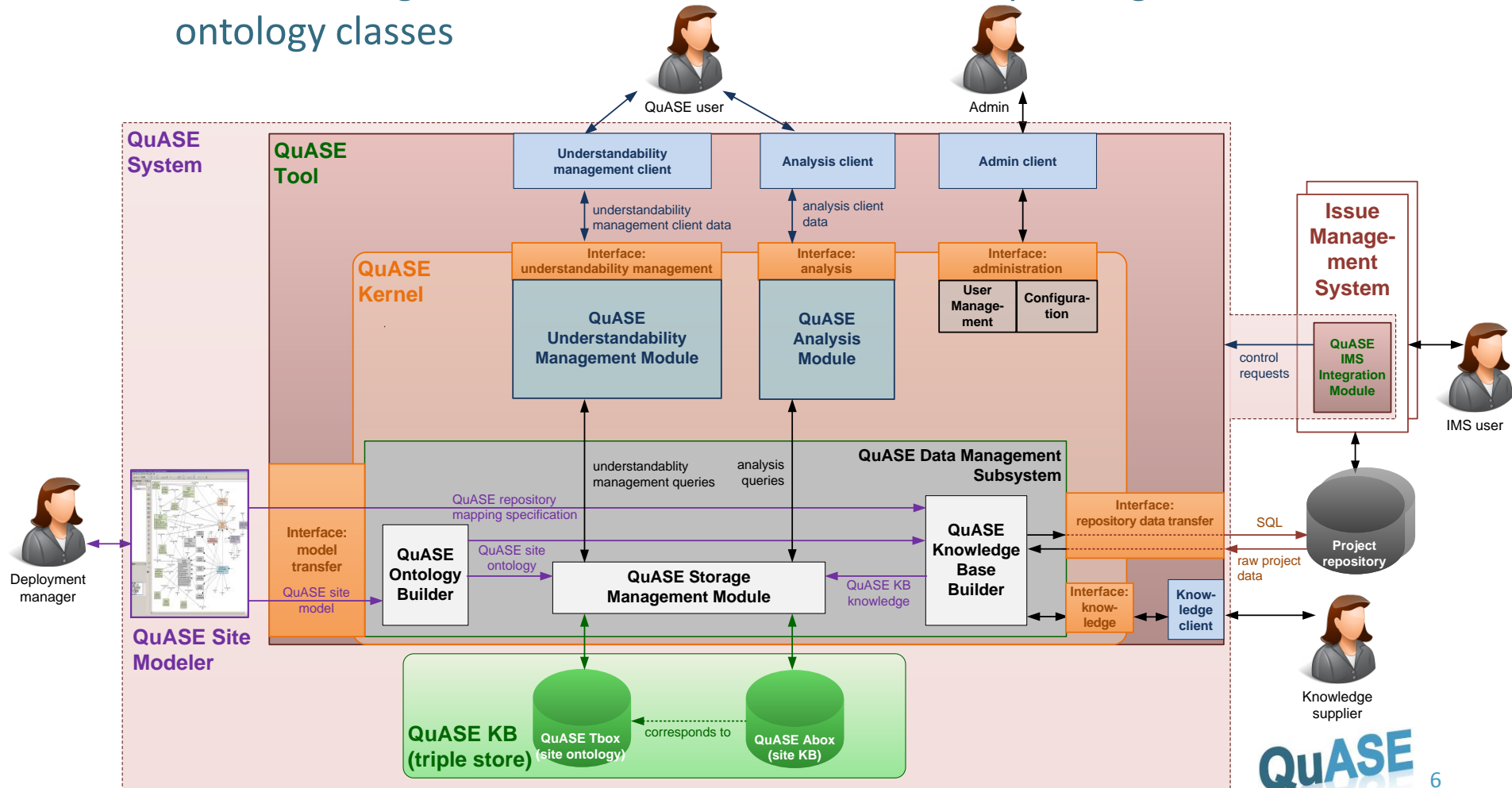
- **Generic:** covering different categories of communicated information



- **Site:** the deployment configuration for QuASE
- **Context units:** projects, organizations, involved people (stakeholders) etc.
- **Content units:** issues, requirement specifications etc.
- **Knowledge units:** related to the sources of understandability conflicts and ways of their resolution
 - **Representation units:** plain text fragments, diagram elements
 - **Resolution units:** explanations, external references etc.
 - **Ontological foundation units:** (domain-related) concepts and facts
- Content units possess **capabilities** regarding knowledge units

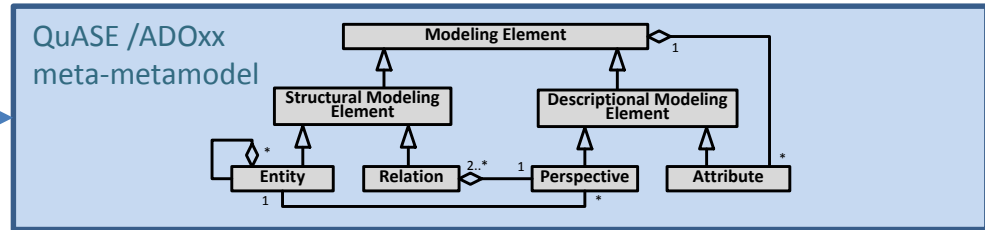
QuASE system architecture

- The ontology is generated based on the **site model**
 - defined in the modeling tool (based on ADOxx metamodeling framework)
- The knowledge base is a set of individuals corresponding to the ontology classes



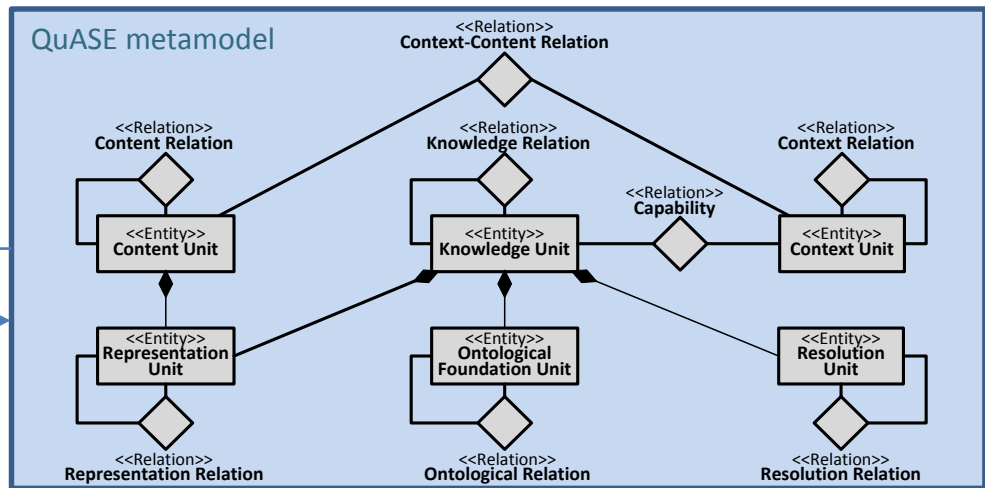
QuASE DSL: metamodeling hierarchy

Meta-metamodel level:
M3



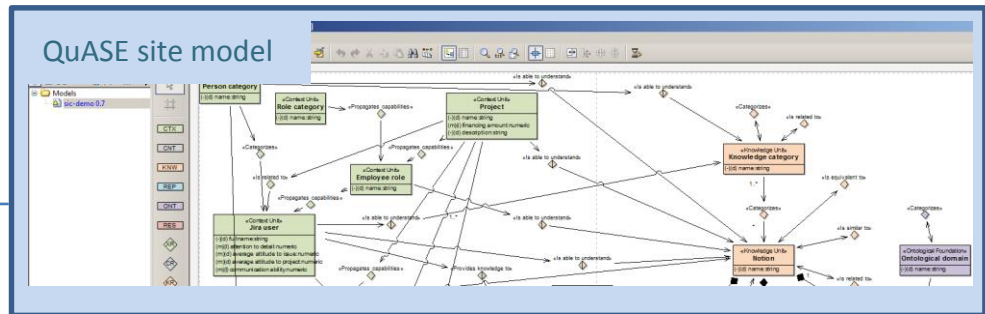
Metamodel level:
M2

instantiates

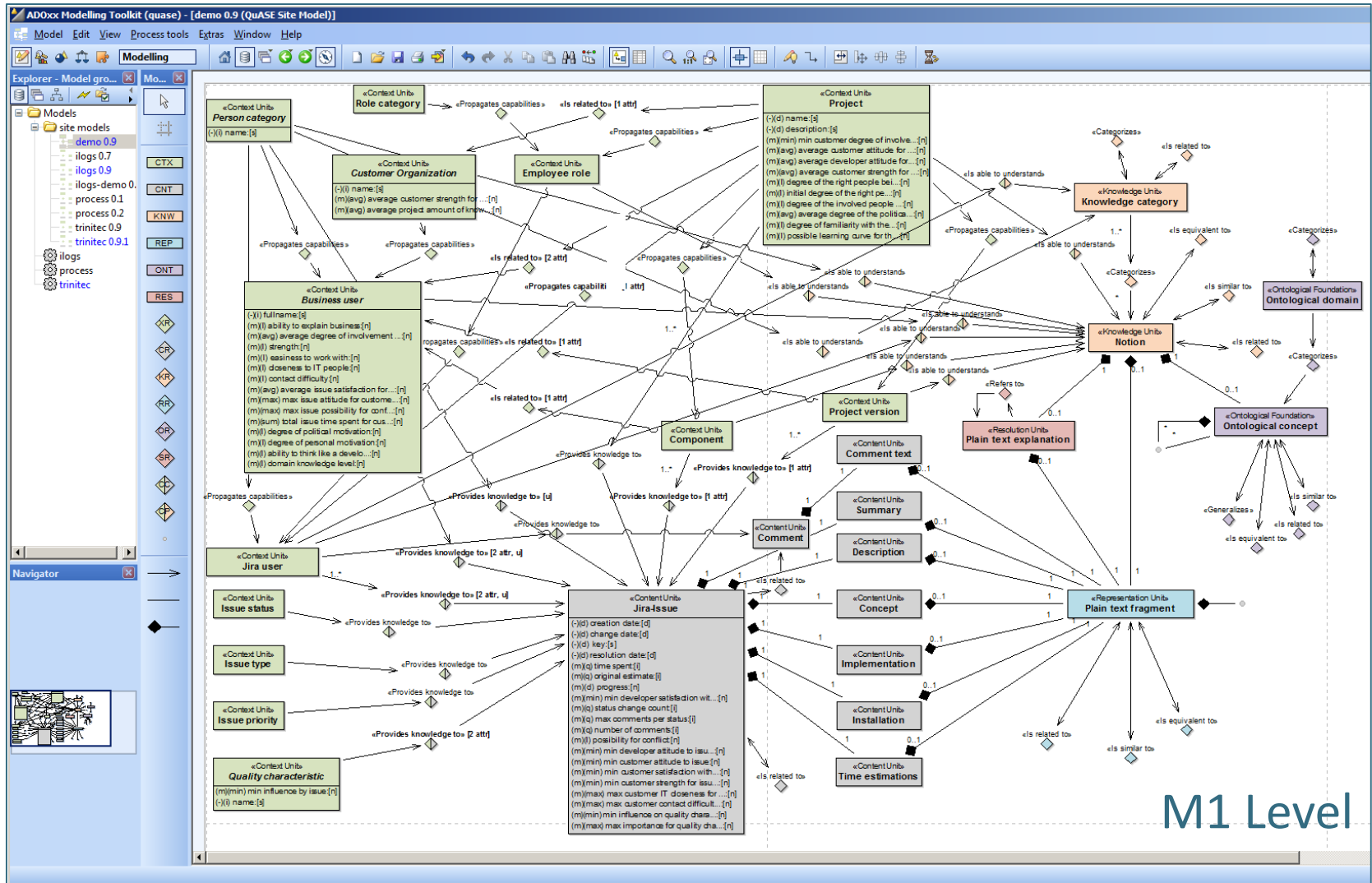


Model level:
M1

instantiates



QuASE Site Modeler: using QuASE DSL



QuASE Site Modeler: mapping repositories

The screenshot displays the QuASE Site Modeler interface, which is used for mapping repositories. The main window is titled "ADOxx Modelling Toolkit (quase) - [demo 0.9 (QuASE Site Model)]".

Modeling View: The central area shows a UML-like class diagram with several classes representing context units:

- Person category**: {() name:[s]}
- Role category**: {() name:[s]}
- Customer Organiz**: {() name:[s], (m)avg average customer, (m)avg average project a}
- Business user**: {() fullname:[s], (m)() ability to explain business:[n], (m)avg average degree of involvement ...:[n], (m)() strength:[n], (m)() easiness to work with:[n], (m)() closeness to IT people:[n], (m)() contact difficulty:[n], (m)avg average issue satisfaction for ...:[n], (m)max max issue attitude for customer ...:[n], (m)max max issue possibility for conf ...:[n], (m)sum total issue time spent for cus ...:[n], (m)() degree of political motivation:[n], (m)() degree of personal motivation:[n], (m)() ability to think like a develo ...:[n], (m)() domain knowledge level:[n]}
- Jira user**: {() name:[s]}
- Issue status**: {() name:[s]}
- Issue type**: {() name:[s]}
- Issue priority**: {() name:[s]}
- Quality characteristic**: {() name:[s], (m)min min influence by issue:[n], (m)max max importance for quality cha ...:[n]}

 Relationships include "Propagates capabilities", "Propagates", "Provides knowledge", and "Provides know".

Jira-Issue (Content Unit) Properties:

- Repository Table:** jiraissue
- SQL Query:**

```
SELECT
jiraissue.id,
jiraissue.pkey,
jiraissue.issue,
jiraissue.project,
```
- ID Column:** id
- Last Upc:** jiraissue
- Last Upc:** update
- Data Sources:**

```
SELECT
jiraissue.id,
jiraissue.pkey,
jiraissue.issue,
jiraissue.project,
jiraissue.reporter,
jiraissue.assignee,
jiraissue.creator,
jiraissue.summary,
jiraissue.description,
jiraissue.environment,
jiraissue.priority,
jiraissue.resolution,
jiraissue.status,
jiraissue.created,
jiraissue.updated,
jiraissue.duedate,
jiraissue.resolutiondate,
jiraissue.votes,
jiraissue.watches,
jiraissue.timeestimate,
jiraissue.workflow_id,
jiraissue.security,
jiraissue.fixfor,
jiraissue.component,
```

Ontology Diagram: On the right, an ontology diagram shows relationships between concepts:

- «Ontological Foundations» Ontological domain** is related to **«Categories»**.
- «Ontological Foundations» Ontological concept** is related to **«Categories»**.
- «Ontological Foundations» Ontological concept** is related to **«Generalizes»**, **«Is similar to»**, **«Is related to»**, and **«Is equivalent to»**.

QuASE Site Modeler: specifying metrics

ADOxx Modelling Toolkit (quase) - [demo 0.9 (QuASE Site Model)]

Model Edit View Process tools Extras Window Help

Modelling

Explorer - Model gro... Mo...

Models

- site models
 - demo 0.9
 - ilogs 0.7
 - ilogs 0.9
 - ilogs-demo 0.1
 - process 0.1
 - process 0.2
 - trintec 0.9
 - trintec

CTX CNT KNW REP ONT RES

«Context Unit» Person category
 «Context Unit» Role category
 «Context Unit» Customer Organiz.
 «Context Unit» Jira user
 «Context Unit» Issue status
 «Context Unit» Issue type
 «Context Unit» Issue priority
 «Context Unit» Quality characteristic

Jira-Issue (Content Unit)

Properties:

SQL query column	SQL query
10 max_comment_count	select jiraissue.id issueid, case when max(comment_count) is null then 0 else max(comment_count) end as max_coi jiraissue left join (select t1.issueid as issueid,startnew as status,t1.status_change as start_change, t2.status_change as end_change, (select count(*) from jiraaction where actiontype='comment' and created between t1.status_change and t2.status_change

Jira-Issue (Content Unit) - Properties

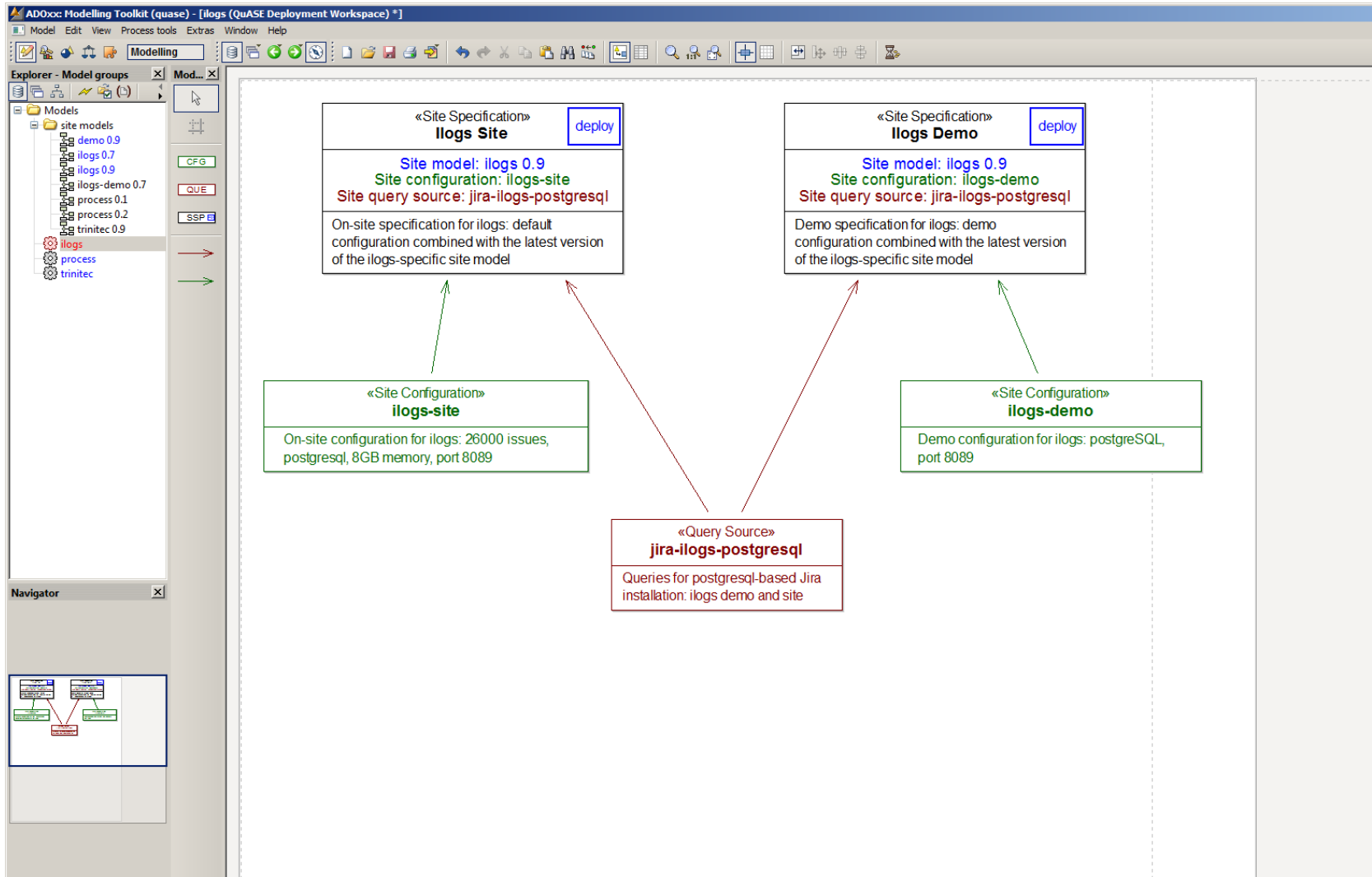
AttrName	Type	Metric	Mapping mode	Aggregation target	Aggregated property	SQL query column
1 creation date	datetime	no	direct			
2 change date	datetime	no	direct			
3 key	string	no	direct			issuekey
4 resolution date	datetime	no	direct			
5 time spent	integer	yes	query			timespent select id,timespent from jiraissue
6 original estimate	integer	yes	query			timeoriginalestimate select id,timeoriginalestimate from
7 progress	numeric	yes	direct			
8 min developer satisfaction with issue	numeric	yes	min	Jira user.Provides knowledge to Jira-Issue	developer satisfaction	
9 status change count	integer	yes	query			change_count select jiraissue.id, count(dl.issueid)
10 max comments per status	integer	yes	query			max_comment_count select jiraissue.id issueid, case when
11 number of comments	integer	yes	query			comments_count select jiraissue.id, count(jiraaction.is
12 possibility for conflict	numeric	yes	level			
13 min developer attitude to issue	numeric	yes	min	Jira user.Provides knowledge to Jira-Issue	developer attitude	
14 min customer attitude to issue	numeric	yes	min	Business user.Provides knowledge to Jira-Issue	customer attitude	
15 min customer satisfaction with issue	numeric	yes	min	Business user.Provides knowledge to Jira-Issue	customer satisfaction	
16 min customer strength for issue	numeric	yes	min	Business user	strength	
17 max customer IT closeness for issue	numeric	yes	max	Business user	closeness to IT people	
18 max customer contact difficulty for issue	numeric	yes	max	Business user	contact difficulty	

Save... Print... Search... Close Help

Close Reset

«Context Unit» min importance for quality cha... [n]
 «Context Unit» max importance for quality cha... [n]

QuASE Site Modeler: site specifications



QuASE Tool: understandability management

The screenshot displays the QuASE web application interface. The browser title is "The QuASE - demo / demo 0.9 - Mozilla Firefox". The address bar shows "quase-ainf.fau.at:8080/#/understandability". The page header includes the QuASE logo and "Hello, admin (logout)".

The main content area is divided into two columns:

- Adapt from (current context):**
 - Context: #Example User 36
 - Document: Text
 - Adapt what (current document): Project3-11: RSK Erweiterung - XSL Stylesheet Erweiterungen
 - Assessment: 17 (1/17, 13/17, 3/17)
 - Table:

Property	Value
Description	[XSL] [Stylesheet] Erweiterungen in [ELAKBVCOM] für [RSK] Erweiterung
Implementation	<ul style="list-style-type: none"> * Erweiterung von elakbvcom_officialLetterGenericResult.[XSL] ** Erstellung eines [Templates] für das [Rendering] von spezifischen [Zusatzfeldern] in Bescheidsuchen * Erstellung eines [Templates] createCustomBooleanSearchField in elakbvcom_searchFormHelpers.[XSL] für das [Rendering] eines Suchfelds mit Spezialtokens für 'Ja' und 'Nein' * Erweitern von elakbvcom_searchFormHelpers.[XSL] um zusätzliches [Template] showCustomSimpleSearchFields für das [Rendern] von Spezialfeldern in Suchen
Summary	[RSK] Erweiterung - [XSL] [Stylesheet] Erweiterungen
- Adapt to (target context):**
 - Context: Business person
 - Knowledge domain (optional): select
 - Table:

Property	Value
Description	[XSL] [Stylesheet] Erweiterungen in [ELAKBVCOM] für [RSK] Erweiterung
Implementation	<ul style="list-style-type: none"> * Erweiterung von elakbvcom_officialLetterGenericResult.[XSL] ** Erstellung eines [(Muster)vorlage] für das [Darstellung] von spezifischen [Zusatzfeldern] in Bescheidsuchen * Erstellung eines [(Muster)vorlage] createCustomBooleanSearchField in elakbvcom_searchFormHelpers.[XSL] für das [Darstellung] eines Suchfelds mit Spezialtokens für 'Ja' und 'Nein' * Erweitern von elakbvcom_searchFormHelpers.[XSL] um zusätzliches [(Muster)vorlage] showCustomSimpleSearchFields für das [Darstellung] von Spezialfeldern in Suchen

A tooltip for "RSK" is visible, showing "RSK explanation for business people".

QuASE Tool: analysis (reuse support)

QuASE Hello, shekvl (logout)

Similarity Search Target (Jira-Issue) Save to New bookmark

Project3-11: RSK Erweiterung - XSL Stylesheet Erweiterungen

Metrics

Max comments per status, Min developer attitude to issue, Min developer satisfaction with issue

Select All Select None Reset

Search...

- Max comments per status ✓
- Min developer attitude to issue ✓
- Min developer satisfaction with issue ✓
- Number of comments
- Original estimate
- Possibility for conflict
- Status change count
- Time spent

QuASE Hello, shekvl (logout)

Similarity Search Target (Jira-Issue) Save to New bookmark

Project3-11: RSK Erweiterung - XSL Stylesheet Erweiterungen

Metrics

Max comments per status, Min developer attitude to issue, Min developer satisfaction with issue

Get similar entities

Output:

#	Name	Metrics	Similarity
Input entity			
0	Project3-11: RSK Erweiterung - XSL Stylesheet Erweiterungen	Max comments per status: 1 Min developer attitude to issue: 0.5 Min developer satisfaction with issue: 0.5	1
Similar entities			
1	Project5-153: RSK Erweiterung - Bescheld	Max comments per status: 3 Min developer attitude to issue: 0.5 Min developer satisfaction with issue: 0.75	0.879576

QuASE Tool: Jira integration

The screenshot shows a Mozilla Firefox browser window with the URL `http://localhost:8085/browse/P3-11`. The page displays a Jira issue titled "RSK Erweiterung - XSL Stylesheet Erweiterungen" under "Project3 / P3-11". The Jira UI includes a header with "Project3 / P3-11" and "RSK Erweiterung - XSL Stylesheet Erweiterungen", and a sidebar with "Activity" and "Comments" tabs. The QuASE UI is overlaid on the Jira UI, featuring a "QuASE" logo, a "Hello, admin (logout)" message, and a "Selected document" field containing "P3-11: RSK Erweiterung - XSL Stylesheet Erweiterungen". A blue double-headed arrow points between the Jira UI and the QuASE UI, indicating their integration.

Embedding “mini-QuASE” into Jira artifact handling pages

QuASE Tool: harmonizing quality views

The screenshot shows the QuASE tool interface. On the left is an ontology diagram with nodes like «Ontological Foundations» and «Ontological concept». In the center is a 'Select item' dialog box with three columns of ontological domains. The first column lists 'Customer Business', 'Project Management', and 'Software Development'. The second column lists 'Software Functionality', 'Software Quality', 'Software Support', and 'Software Testing'. The third column lists 'Maintainability', 'Performance', 'Portability', 'Quality Management', 'Reliability', 'Security', 'Software Correctness', and 'Usability'. A red dashed box highlights 'Reliability' in the third column. The dialog box has 'Cancel' and 'OK' buttons at the bottom right. The background shows a Firefox browser window with a 'Hello, admin (logout)' message and a 'New bookmark' field.

2015-2016: QuASE experiences

QuASE current status

- QuASE Tool 1.0 released; demo at <http://quase-ainf.aau.at:8080>
- Installed at the sites of two consortium partners
- Jira interface is preferred as more convenient

QuASE experiences: scalability

Partner	Total # of projects	Total # of Jira issues	Collecting period	Knowledge base size	Minimal response time
Partner 1	50	9300	7 years	1,7*10 ⁶ axioms	0,2 sec (very good)
Partner 2	30	26000	5 years	1,9*10 ⁶ axioms	0,5 sec (good)

QuASE experiences: coverage of project artifacts

Partner	# of Jira-based artifacts	# of user-supplied artifacts	Extension ratio for artifacts	Number of Jira-based metrics	Number of user-supplied metrics	Extension ratio for metrics
Partner 1	18	4	0,22	16	67	4,18
Partner 2	14	3	0,21	10	61	6,1

QuASE: knowledge-based integrated solution

- The data from a project repository is immediately converted into knowledge available for understandability management and analysis
- The conversion is controlled by a flexible mapping (based on DSL)
 - it allows large amounts of existing data to be the subject of applying these techniques
- The QuASE system can be seen as a bridge which connects
 - end users
 - the data in project repositories
 - the (extendable) set of machine learning and NLP techniques

QuASE: benefits

The business stakeholders

- are able to express their wishes and complaints in a way that could be understood by developers without the need to learn the „tech-talk“

The IT people

- are able to express their view of the prospective system in a way that is accessible for the particular business stakeholder without the need to „unlearn“ their „tech-talk“

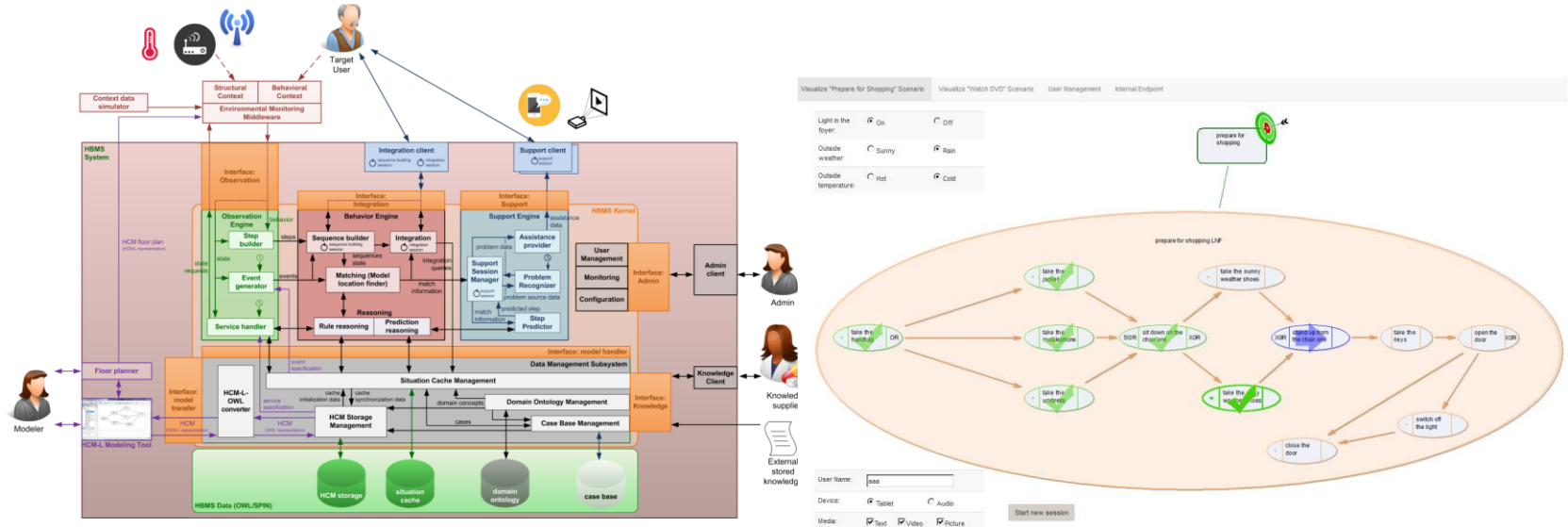
The developers together with project managers

- are able to learn how to deal with the particular customer from the past communication experience with this or similar customers



Current continuation and future work

- Architectural solution: adapting to other projects (e.g. HBMS)
 - saving development efforts



- View harmonization problems in other domains
 - not limited to software development
- Enhancing the understandability management support
 - more advanced terminology specification and translation techniques

Thank you for your attention!

