



# Implementing Tool Support for Analyzing Stakeholder Communications in Software Development

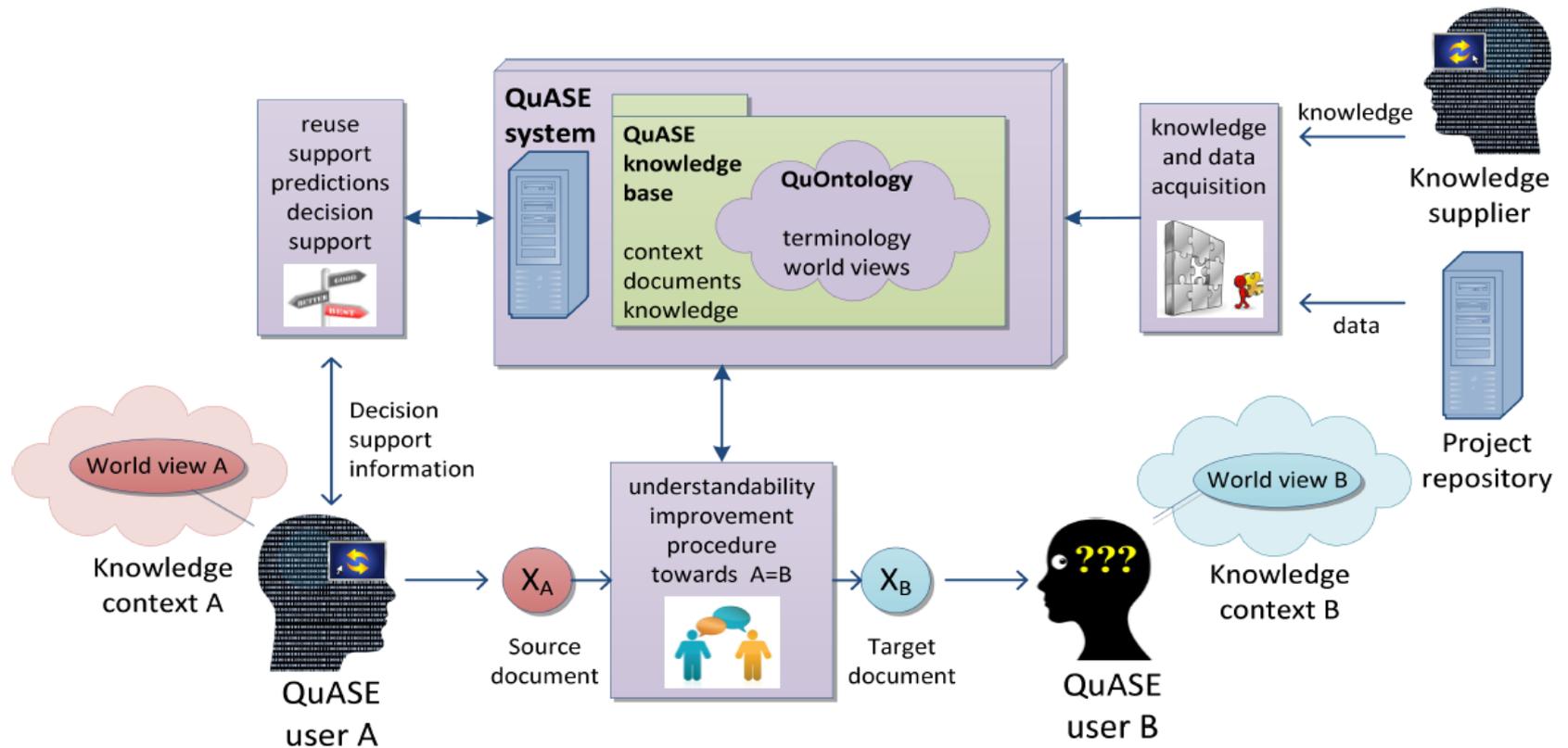
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# QuASE Project Overview

- Duration: 01/03/2013-28/02/2015, supported by FFG
- 2 researchers, 4 developers
- 4 partner companies (CICERO, ilogs, Lanner GmbH, trinitec)



# QuASE Project Goals

Theoretical foundation, implementation procedures and a proof-of-concept tool support for

(G-1) acquiring and formalizing domain knowledge related to communicated information in the software process

(G-2) collecting communicated information from different parties and converting it into knowledge

(G-3) supporting

a) **reuse** of communication-related experience

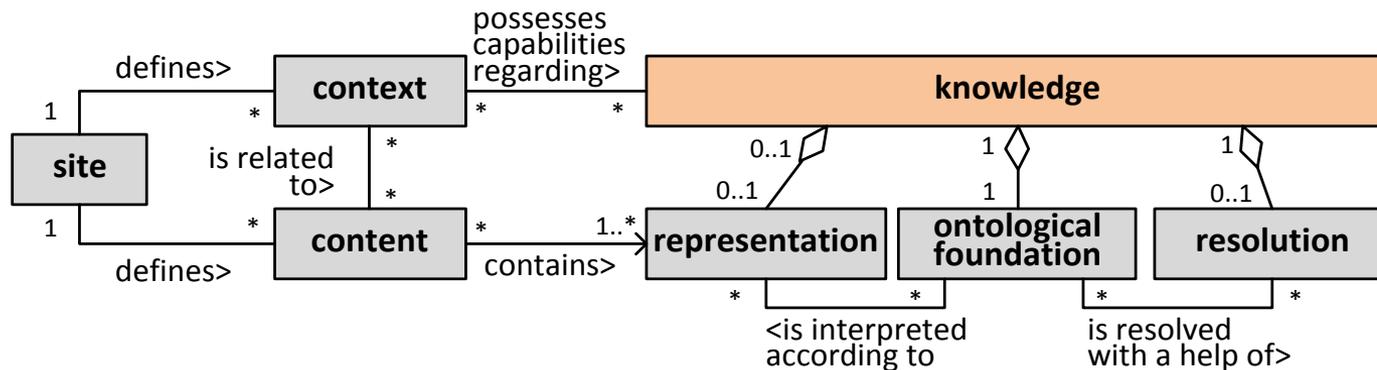
b) **decision making** in the software process

c) **prediction** of future communication-related behavior of the involved parties

(G-4) establishing a **common communication basis** for different parties

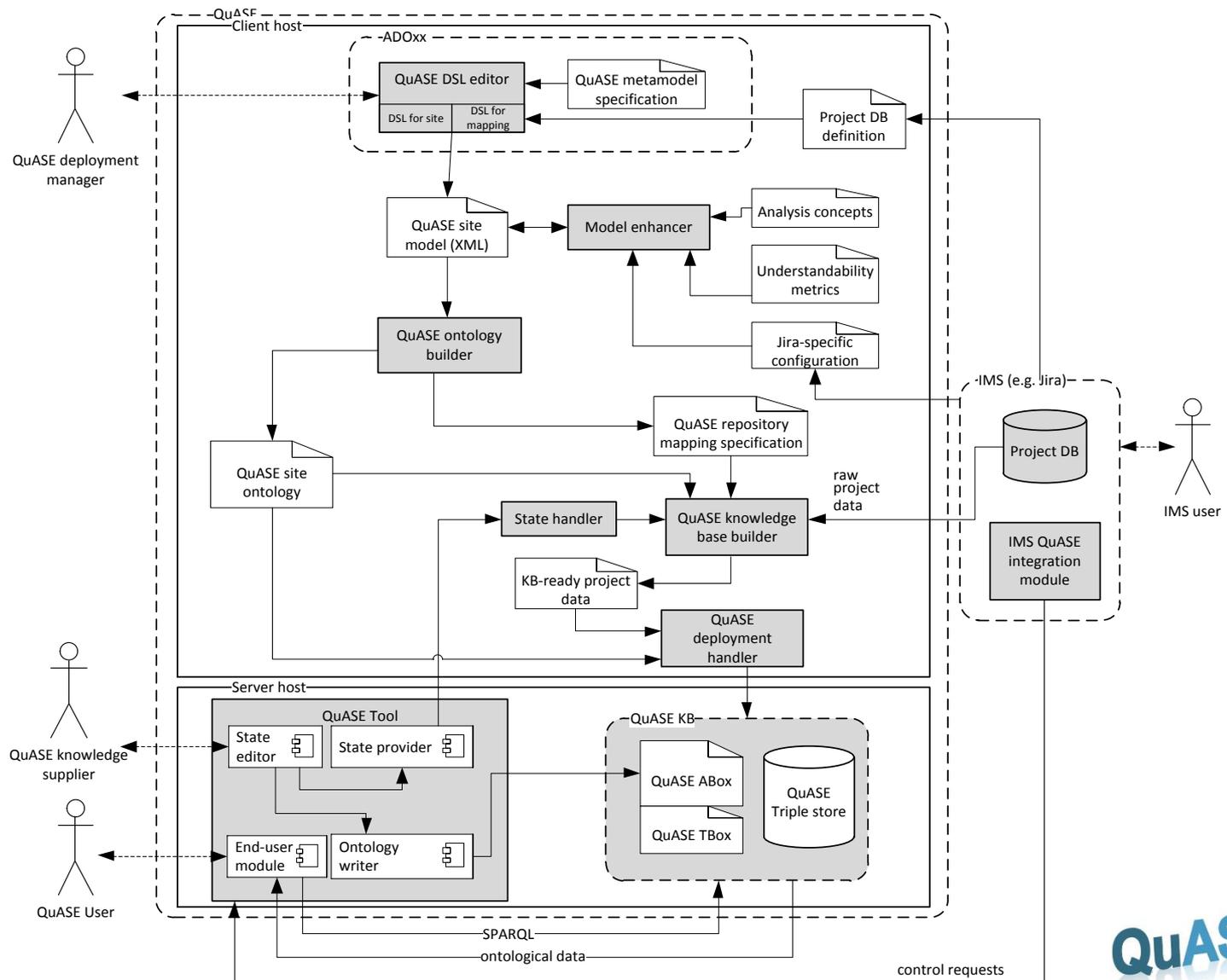
The main case of communicated information we considered was **quality-related information**

# QuASE Implementation Concepts



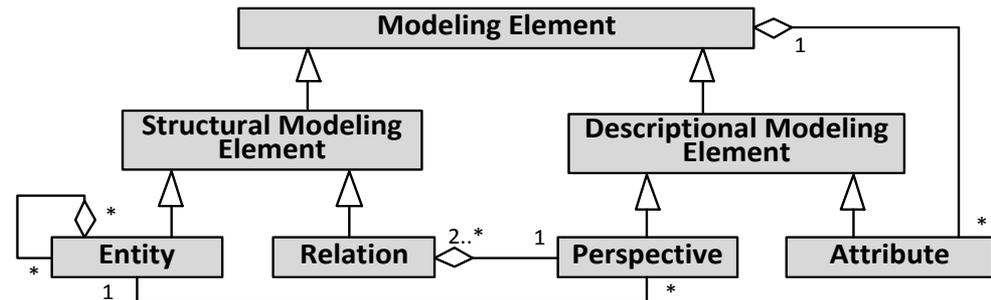
- **Site:** the deployment configuration for QuASE
- **Context units:** projects, organizations, involved people (stakeholders) etc.
- **Content units:** issues, requirement specifications etc.
- **Knowledge units:** related to the sources of understandability conflicts and ways of their resolution
-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

# QuASE Runtime Architecture

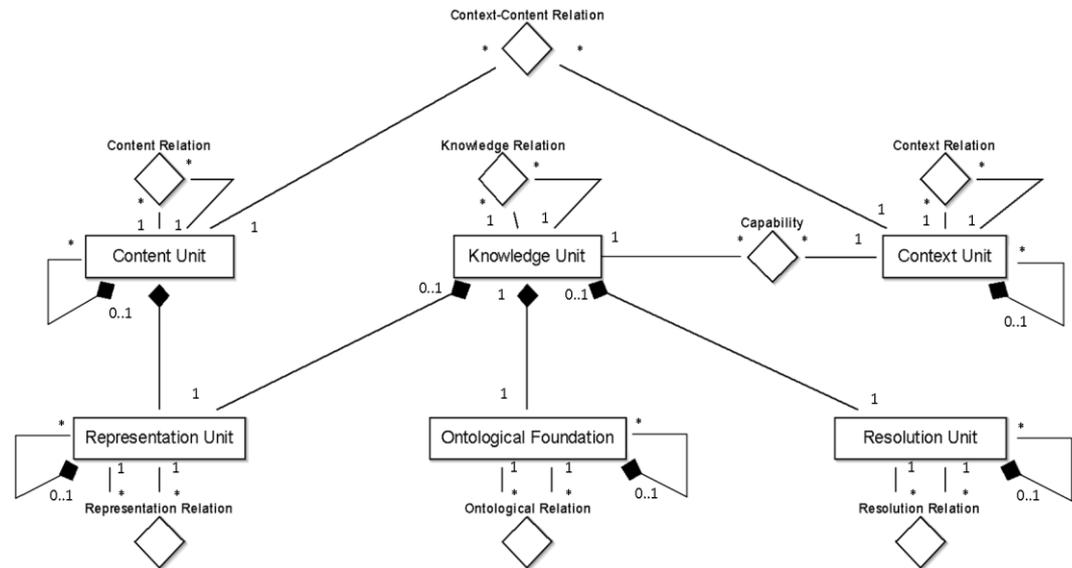


# QuASE DSL: A Metamodel

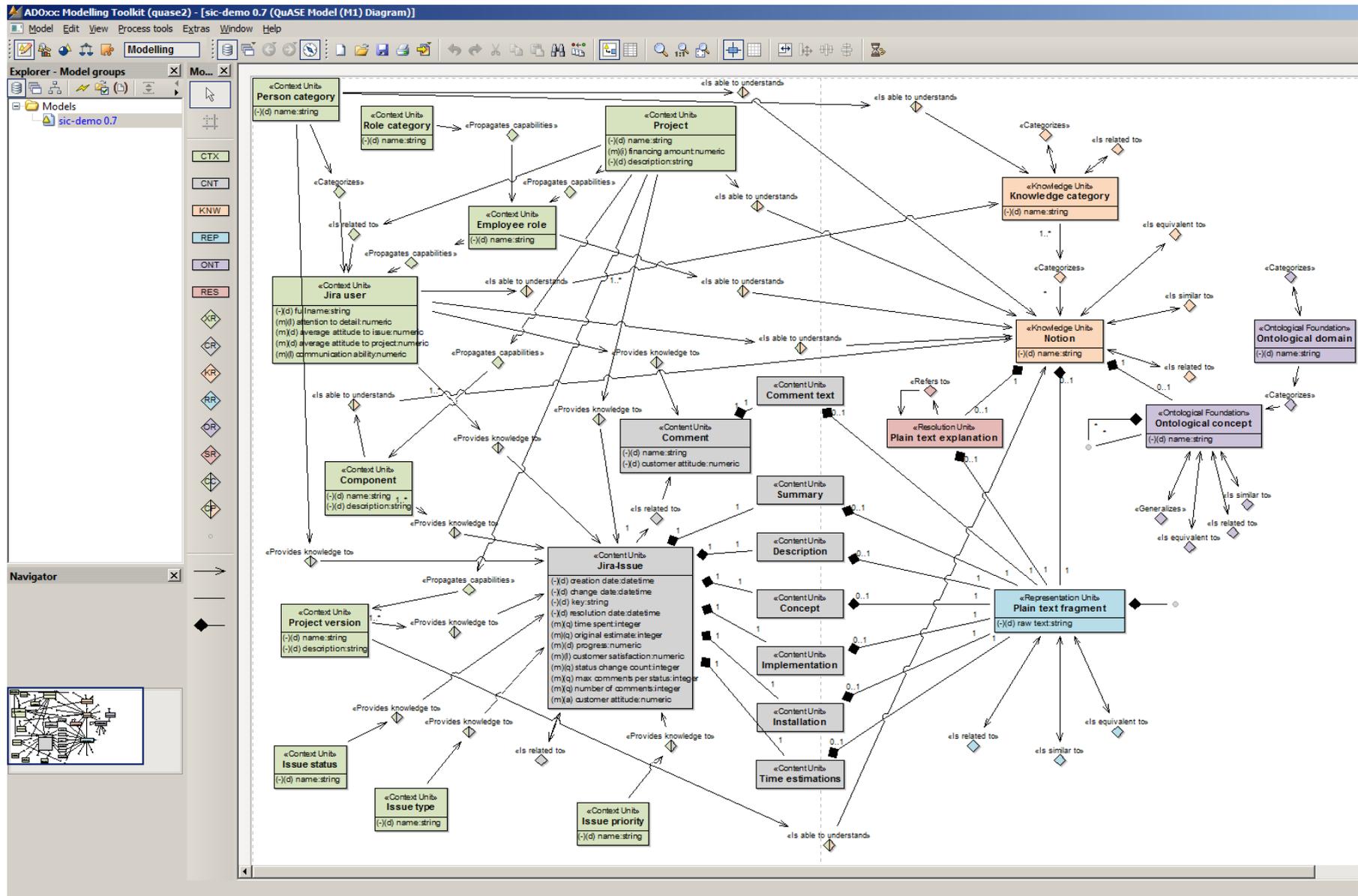

**M2-1 Level:**  
 basic concepts




**M2-2 Level:**  
 QuASE concepts



# QuASE DSL: Creating Site Models



# QuASE DSL: Mapping Repositories

ADOxx Modelling Toolkit (quase2) - [sic-demo 0.7 (QuASE Model (M1) Diagram)]

Model Edit View Process tools Extras Window Help

Modelling

Explorer - Model groups

Models

sic-demo 0.7

«Context Unit»  
Person category  
(-) name:string

«Context Unit»  
Role category  
(-) name:string

«Context Unit»  
Jira user  
(-) full name:string  
(m) attention to detail:numeric  
(m) average attitude to issue:numeric  
(m) average attitude to project:numeric  
(m) communication ability:numeric

«Context Unit»  
Component  
(-) name:string 1..\*  
(-) description:string

«Context Unit»  
Project version  
(-) name:string  
(-) description:string

«Context Unit»  
Issue status  
(-) name:string

«Context Unit»  
Issue type  
(-) name:string

Jira-Issue (Content Unit)

Repository Table:

SQL Query:  
SELECT  
jiraissue.id,  
jiraissue.pkey,  
issuenum,  
project,

ID Column:  
id

Last Update Time:  
jiraissue

Last Update Time:  
updated

Data Source:

Jira-Issue (Content Unit) - SQL Query

```
SELECT  
jiraissue.id,  
jiraissue.pkey,  
issuenum,  
project, |  
reporter,  
assignee,  
creator,  
issue type,  
summary,  
jiraissue.description,  
environment,  
priority,  
resolution,  
issuestatus,  
created,  
updated,  
duedate,  
resolutiondate,  
votes,  
watches,  
timeestimate,  
workflow_id,  
security,  
fixfor,  
component,  
case when concept_issue is null then null else _char(concept) end concept,  
case when implementation_issue is null then null else _char(implementation) end implementation,  
case when installation_issue is null then null else _char(installation) end installation,  
case when time_estimations_issue is null then null else _char(time_estimations) end
```

2312 characters Ln 5 Col 10

Close Reset

«Ontological Foundations»  
Ontological domain  
(-) name:string

«Concept»  
concept

«Is able to understand»

«Propagates capability»

«Is related to»

«Provides knowledge to»

«Prop»

«Provide»

«Is similar to»

«Related to»

Selected modelling objects: 1

# QuASE DSL: Specifying Metrics

The screenshot displays the ADOxx Modelling Toolkit interface for a QuASE model. The main workspace shows a UML class diagram with several classes: Person category, Role category, Jira user, Component, Project version, Issue status, and Issue type. The 'Jira-Issue' class is selected, and its properties are listed in a table. A dialog box titled '5 - Mapping mode' is open over the table, showing a list of values for the 'Mapping mode' property.

AttrName	Type	Metric	Mapping mode	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	timeoriginaestimate select id,timeoriginaestimate from jiraissue
7 progress	numeric	yes	direct	
8 customer satisfaction	numeric	yes	level	
9 status change count	integer	yes	query	change_count select jiraissue.id, count(dl.issueid) as change_count from jiraissue

The '5 - Mapping mode' dialog shows the following values:

- direct
- query
- calculated
- input
- level
- attitude

Selected modelling objects: 1

# QuASE DSL: Decision Support

The screenshot displays the ADOxx Modelling Toolkit interface for a QuASE model. The main workspace shows a diagram of Content Units (Context Units) and their relationships. The selected element, 'Jira-Issue (Content Unit)', is shown in a detailed view with the following structure:

**«Context Unit» Jira-Issue (Content Unit)**

- Enable Understandability Assessment
- Enable Recommendations
- Enable Predictions
- Enable Decision Support

**Decision Structure:**

Decision Name	Description	Alternative 1	Alternative 2	Alternative
1 Selection of the communication channel		Direct contact with the customer	Contact through the key user	Contact through the...
2 Further contact with the stakeholder		Immediate contact	Scheduled contact	No further contact
3 Selection of the "safe strategy"		Safe strategy selected	Safe strategy not selected	
4 Additional organizational activities		Full-scale activities	Limited activities	No additional activit

**Recommendation Structure:**

Recommendation Name	Description	Recommendation 1	Recommendation 2
1 IT level necessary for dealing with the issue		High IT level	Medium IT level
2 Level of understanding the business necessary for dealing with the issue		Deep understanding	Almost complete understa
3 Amount of effort necessary to explain the issue to others		High amount of effort	Medium amount of effort
4 Expected level of customer involvement		High level of involvement	Medium level of involvem

The diagram also shows other Context Units like 'Person category', 'Role category', 'Jira user', 'Component', 'Project version', 'Issue status', and 'Issue type', along with relationships such as '«Categorizes»', '«is related to»', and '«Provides knowledge to»'.

Selected modelling objects: 1

# QuASE Site Ontology

The screenshot displays the QuOntology web interface. The top navigation bar includes tabs for Class hierarchy, Entitles, Classes, Object Properties, Data Properties, Class matrix, Annotation Properties, Individuals, OVL Viz, DL Query, ontop Mappings, ontop SPARQL, OntoGraf, Ontology Differences, and SPARQL Query. The main content area is divided into several panels:

- Class hierarchy (Issue\_Version):** A tree view showing the ontology structure. The 'Issue\_Version' class is highlighted under the 'Entity' class.
- Class Annotations / Class Usage:** Shows 19 uses of the 'Issue\_Version' class. It lists various properties and relationships, such as 'EquivalentTo', 'SubClassOf', and 'DisjointClasses'.
- Description: Issue\_Version:** A detailed view of the 'Issue\_Version' class. It lists several properties and their values:
  - Equivalent To:
    - hasComposition some Solution
    - hasComposition some Description
    - hasComposition some Subject
  - SubClass Of:
    - Content\_Unit
    - hasAttribute some Issue\_Version\_IT\_Level
    - hasAttribute some Issue\_Version\_version\_number
    - isHolder value false
    - isSourcePerspectiveFor some Issue\_Version\_Is\_version\_of\_Issue
  - SubClass Of (Anonymous Ancestor):
    - isTargetPerspectiveFor some Context-Content\_Relation
    - isSourcePerspectiveFor some Content\_Relation
    - isTargetPerspectiveFor some Content\_Relation
    - hasComposition some Content\_Unit
    - isPartOf some Content\_Unit
    - hasComposition some Representation\_Unit
- Object property hierarchy (isSourcePerspectiveFor):** A tree view showing the hierarchy of object properties. The 'isSourcePerspectiveFor' property is highlighted.

To use the reasoner click Reasoner->Start reasoner  Show Inferences

# QuASE Tool: Knowledge Base Management

The screenshot shows the QuASE web application interface in a Mozilla Firefox browser window. The page title is "The QuASE - Mozilla Firefox (Build 20150122214805)". The browser tab is labeled "The QuASE". The application header features the QuASE logo and a user greeting: "Hello, admin (logout)".

The main content area is titled "QuASE status information" and contains a table with the following data:

QuASE site model	sic-demo
Version	0.7
Last knowledge base synchronization	Fr, 17 Apr 2015 04:00:08 MESZ <a href="#">Synchronize knowledge base</a>

Below the table, there are two sections for file uploads:

- Upload new site model XML file**: A message states "The ontology will be generated automatically and the knowledge base will be synchronized." Below this is a "Browse..." button and the text "No file selected."
- Reload knowledge base from OWL file**: A message states "Please make sure that the current version of the site model in the system corresponds to the KB version you are going to upload!" Below this is a "Browse..." button and the text "No file selected."

The "Other QuASE components" section includes a link for "Terminological Knowledge Editor".

A sidebar on the left contains a list of navigation links: Understandability Management, Understandability Assessment, Similarity Search, Recommendations, Value Predictions, Decision Support, Decision Collecting, Recommendation Assessment, External Values Collecting, Bookmark Management, User Management (admin only), and Internal Endpoint (admin only).

# QuASE Tool: Understandability Management

The QuASE - Mozilla Firefox (Build 20150122214805)

The QuASE

Hello, admin (logout)

Understandability Management

Understandability Assessment

Similarity Search

Recommendations

Value Predictions

Decision Support

Decision Collecting

Recommendation Assessment

External Values Collecting

Bookmark Management

User Management (admin only)

Internal Endpoint (admin only)

Adapt from (current context):

IT person

Document Text

Adapt what (current document):

TPP-5: The C01 failure of Component\_Y

Assessment: 5 0/5 2/5 3/5

Property	Value
Description	The [MTBF] of the Component_Y, as measured for the data of the [C01] benchmark is 70 hours which fails the [reliability] criteria established by the specification [S01].  This could be caused by the improper handling of the errors in the CY_core, please check.
Summary	The [C01] failure of Component_Y

Adapt to (target context):

Business person

Knowledge domain (optional):

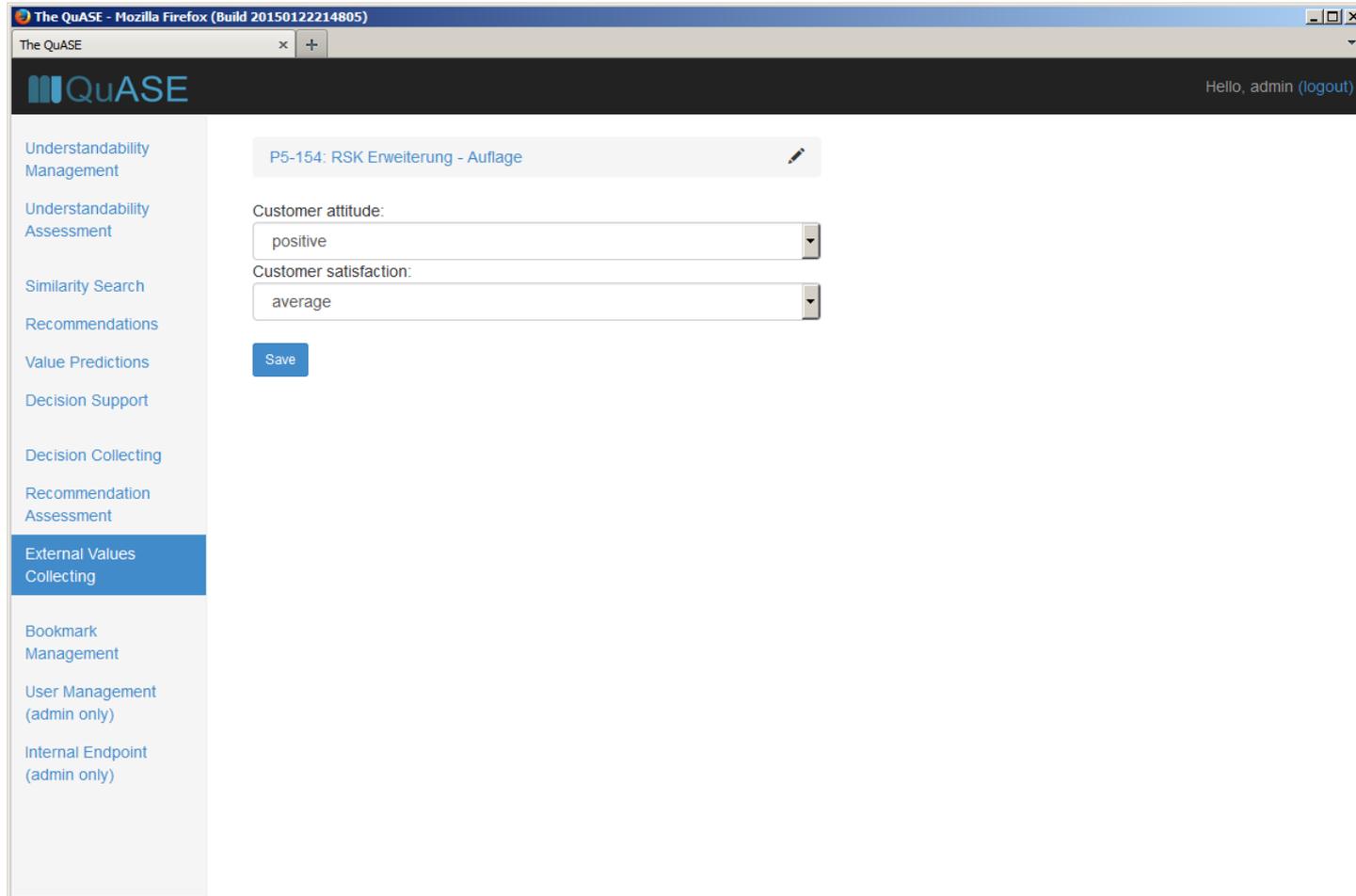
Software Development / Software Quality / Reliability

MTBF

Business-specific explanation of MTBF

Property	Value
Description	The [mean time between failures] of the Component_Y, as measured for the data of the [C01] benchmark is 70 hours which fails the [reliability] criteria established by the specification [reliability specification (see X)].  This could be caused by the improper handling of the errors in the CY_core, please check.
Summary	The [C01] failure of Component_Y

# QuASE Tool: Specifying Interactive Attributes



# QuASE Tool: Knowledge Reuse Support

The screenshot shows the QuASE web application interface. The browser title is 'The QuASE - Mozilla Firefox (Build 20150122214805)'. The page header includes the QuASE logo and a user greeting 'Hello, admin (logout)'. A navigation sidebar on the left lists various features: Understandability Management, Understandability Assessment, Similarity Search (highlighted), Recommendations, Value Predictions, Decision Support, Decision Collecting, Recommendation Assessment, External Values Collecting, Bookmark Management, User Management (admin only), and Internal Endpoint (admin only). The main content area is titled 'Similarity Search Target:' and shows the target entity 'P1-1075: Overhead Branche-Entwicklung'. Below this, the 'Metrics' section is set to 'Jira-Issue.original estimate, Jira-Issue.time spent'. A 'Get similar entities' button is visible. The 'Output' section displays a table with the following data:

#	Name	Metrics	Similarity
<b>Input entity</b>			
0	P1-1075: Overhead Branche-Entwicklung	Jira-Issue.original estimate: 7200 Jira-Issue.time spent: 5400	1
<b>Similar entities</b>			
1	P1-1076: Packaging und Pakettests	Jira-Issue.original estimate: 7200 Jira-Issue.time spent: 3600	0.993209
2	P5-155: RSK Erweiterung - Sichtbarkeit	Jira-Issue.original estimate: 10800 Jira-Issue.time spent: 4500	0.987599
3	P3-11: RSK Erweiterung - XSL Stylesheet Erweiterungen	Jira-Issue.original estimate: 0 Jira-Issue.time spent: 0	0.970492

# QuASE Tool: Value Prediction Support

The screenshot shows the QuASE web application interface. The browser title is "The QuASE - Mozilla Firefox (Build 20150122214805)". The page header includes the QuASE logo and a user greeting "Hello, admin (logout)". A sidebar on the left contains navigation links: "Understandability Management", "Understandability Assessment", "Similarity Search", "Recommendations", "Value Predictions" (highlighted), "Decision Support", "Decision Collecting", "Recommendation Assessment", "External Values Collecting", "Bookmark Management", "User Management (admin only)", and "Internal Endpoint (admin only)".

The main content area displays the "Prediction Target" as "P1-1076: Packaging und Pakettests". Below this, the "Predicted Metrics" are listed in a dropdown menu: "Jira-Issue.customer attitude, Jira-Issue.time spent, Jira-Issue.original estimate, Jira-Issue.status change count". A "Get predictions" button is visible.

The "Output" section contains a table with the following data:

#	Metric	Predicted Value
1	Jira-Issue.customer attitude	positive
2	Jira-Issue.time spent	3600.00
3	Jira-Issue.original estimate	7200.00
4	Jira-Issue.status change count	2.00

# QuASE Tool: Decision Recommendations /1

The screenshot shows the QuASE web application interface. The browser title is "The QuASE - Mozilla Firefox (Build 20150122214805)". The page header includes the QuASE logo and a user greeting "Hello, admin (logout)".

**Left Sidebar (Navigation):**

- Understandability Management
- Understandability Assessment
- Similarity Search
- Recommendations
- Value Predictions
- Decision Support
- Decision Collecting** (highlighted)
- Recommendation Assessment
- External Values Collecting
- Bookmark Management
- User Management (admin only)
- Internal Endpoint (admin only)

**Main Content Area:**

- Select unit:** P5-155: RSK Erweiterung - Sichtbarkeit
- Select assessor:** #Example User 36 (with a "Save" button)
- Record a decision:**
  - Selection of the communication channel
    - Direct contact with the customer
    - Contact through the key user
    - Contact through the top-level manager
  - Further contact with the stakeholder
    - Immediate contact
    - Scheduled contact
    - No further contact
  - Selection of the "safe strategy"
    - Safe strategy selected
    - Safe strategy not selected

**History of the "P5-155: RSK Erweiterung - Sichtbarkeit"**

Selection of the communication channel

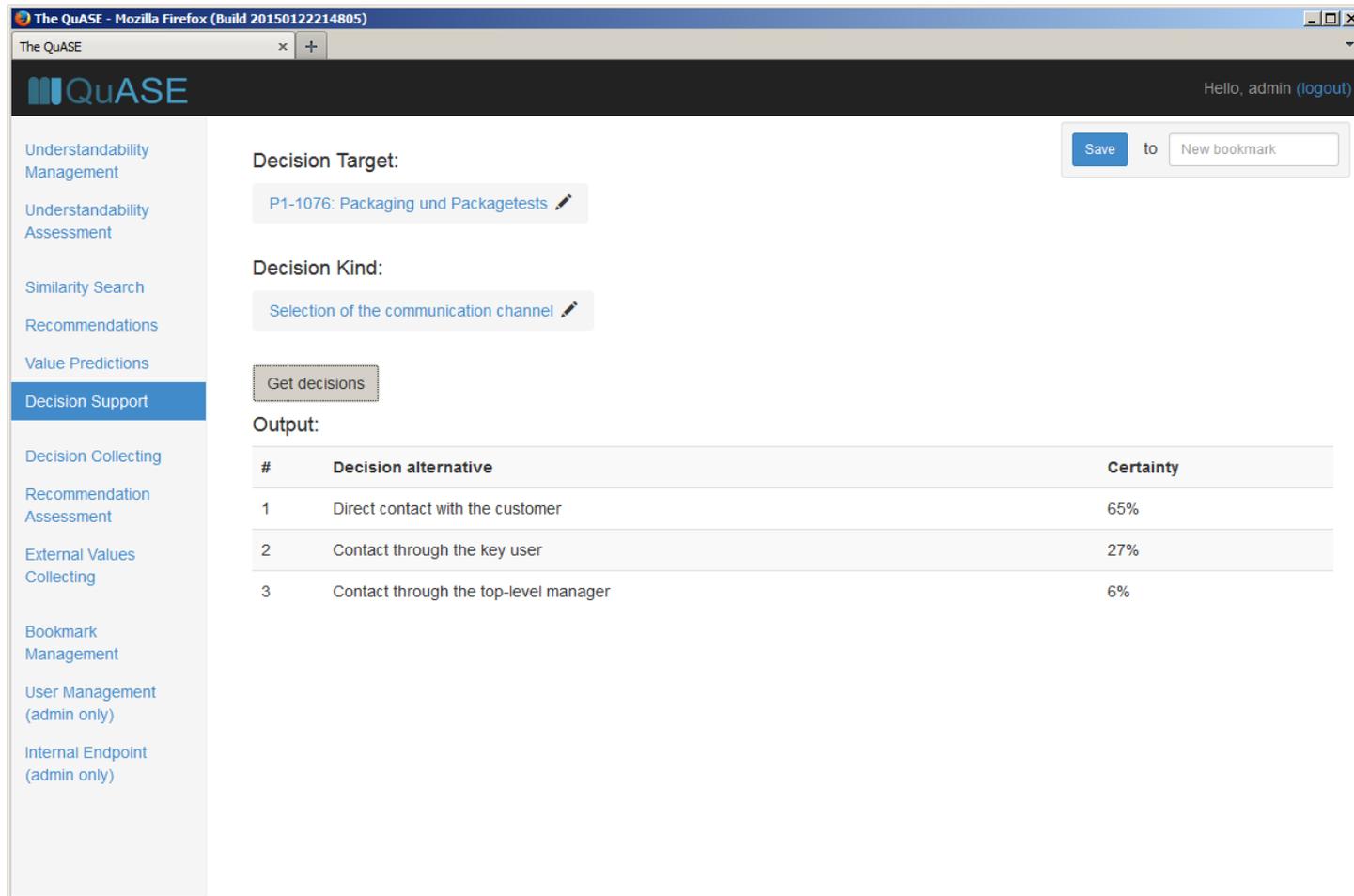
#	User	Decision made
1	#Example User 36	Direct contact with the customer

Further contact with the stakeholder

#	User	Decision made
1	#Example User 36	Immediate contact

# QuASE Tool:

## Decision Recommendations /2



The screenshot shows the QuASE web application interface. The browser title is "The QuASE - Mozilla Firefox (Build 20150122214805)". The page header includes the QuASE logo and the user "Hello, admin (logout)". A sidebar on the left contains navigation links: Understandability Management, Understandability Assessment, Similarity Search, Recommendations, Value Predictions, Decision Support (highlighted), Decision Collecting, Recommendation Assessment, External Values Collecting, Bookmark Management, User Management (admin only), and Internal Endpoint (admin only). The main content area is titled "Decision Target:" and shows "P1-1076: Packaging und Paketgetests" with an edit icon. Below it, "Decision Kind:" is "Selection of the communication channel" with an edit icon. A "Get decisions" button is present. An "Output:" table displays three decision alternatives with their respective certainties.

#	Decision alternative	Certainty
1	Direct contact with the customer	65%
2	Contact through the key user	27%
3	Contact through the top-level manager	6%

# QuASE Tool: Jira Integration /1

The screenshot shows a Jira issue page for 'The C01 failure of Component\_Y' in the 'Test Project (performance) / TPP-5' project. The issue is a 'Task' with 'Major' priority and 'TO DO' status. The description states: 'The MTBF of the Component\_Y, as measured for the data of the C01 benchmark is 70 hours which fails the reliability criteria established by the specification S01. This could be caused by the improper handling of the errors in the CY\_core, please check.'

The QuASE tool is embedded at the bottom of the page, displaying 'QuASE status information' for the current document 'TPP-5: The C01 failure of Component\_Y'. The status information includes:

QuASE site model	sic-demo
Version	0.7
Current document	TPP-5: The C01 failure of Component_Y
Last knowledge base synchronization	Fr, 17 Apr 2015 04:00:08 MESZ

A 'Synchronize knowledge base' button is visible below the last synchronization timestamp.

 Embedding “mini-QuASE” into Jira issue handling pages  19

# QuASE Tool: Jira Integration /2

Project2 / P2-82  
RSK Erweiterung - XSL Stylesheet Erweiterungen

Comment Watch Issue More Reopen Issue Export

Issue Links  
Dependent issue P2-167 RSK Erweiterung - RSK Aufgagensuche CLOSED

Activity  
All Comments Work Log History Activity QuASE

QuASE Hello, admin (logout)

Understandability Management  
Similarity Search  
Recommendations  
Value Predictions  
Decision Support  
Decision Collecting  
Recommendation Assessment  
External Values Collecting

Decision Target:  
P2-82: RSK Erweiterung - XSL Stylesheet Erweiterungen

Decision Kind:  
Selection of the communication channel

Get decisions

Output:

#	Decision alternative	Certainty
1	Direct contact with the customer	60%
2	Contact through the key user	30%
3	Contact through the top-level manager	8%

 Jira works with a filter based on the selected issue

# Future Work

- Establish QuASE process support: integration into different software development process models (QuASE for agile etc.)
- Generalize QuASE as a means of implementing generic understandability management and issue-based analysis support
  - handling different representation formats (not only plain text): understandability of conceptual schemas etc.
  - different processes to be supported: beyond software development
- Case study: adapting QuASE for managing understandability and analyzing communicated information in the AAL domain

# Experiences and Advantages

## ■ ■ ■ QuASE experiences

- Installed at the sites of two consortium partners
- Scales adequately for the Jira repository of 50 projects including 9300 issues collected in the period of up to 7 years

## ■ ■ ■ QuASE advantages

- integrated solution: targets understandability and reusability of communicated information, prediction of the communication behavior, and decision quality,
- handles the analysis based on the attributes of the pieces of communicated information obtained from project repositories, or provided by knowledge suppliers
- integrated with Jira, can be integrated with other systems of this type (e.g. MantisBT, Bugzilla etc.)

**Thank you for your attention!**

