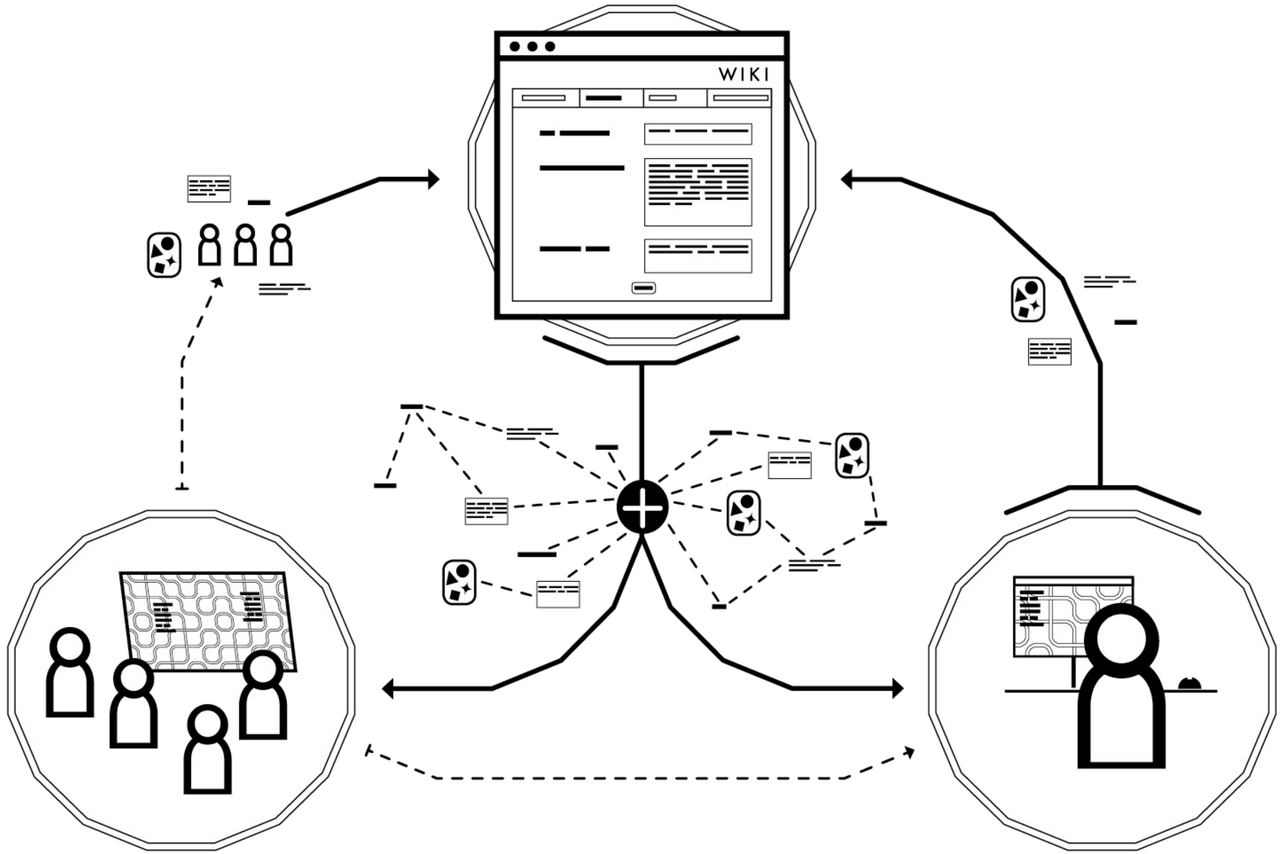


Project IKON

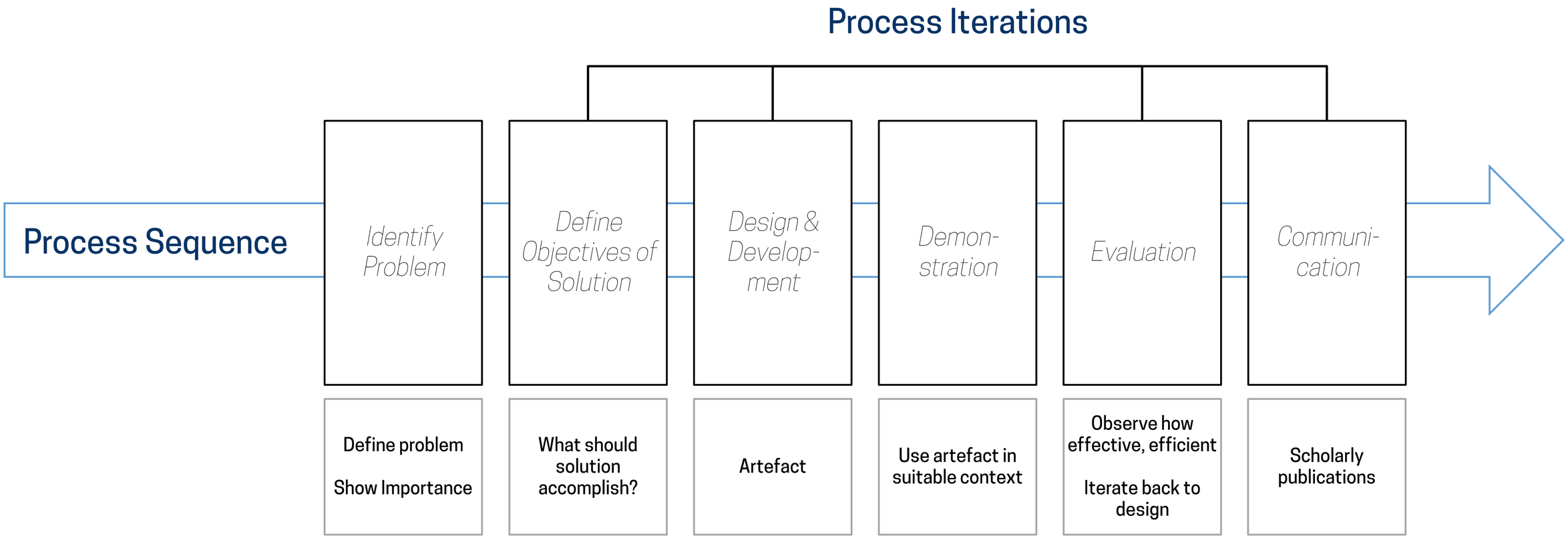
Visualizing potential for knowledge transfer in research museums

Jesse Benjamin, Jonas Oppenländer

AG Human-Centered Computing
Institute of Computer Science

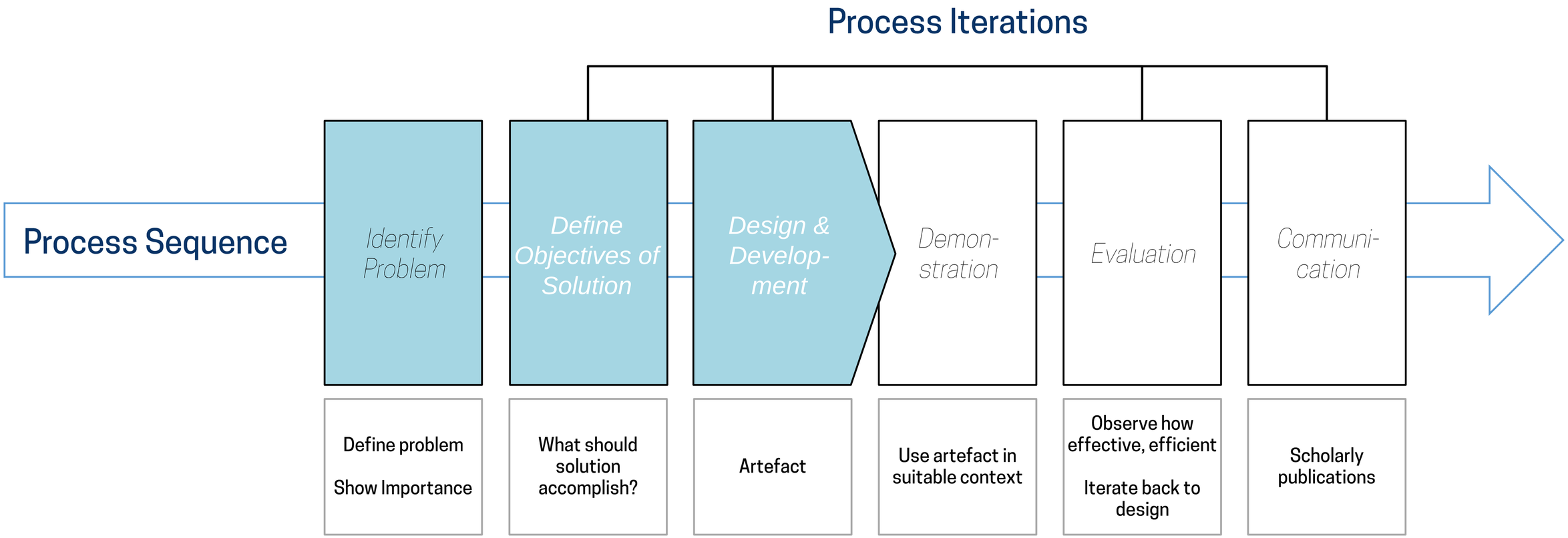
Freie Universität Berlin

Design Science Research Methodology



Adapted from: Peffers, K., Tuunanen, T., Rothenberger, M. A., Chatterjee, S., A Design Science Research Methodology for Information Systems Research, JMIS, 24(3), 45–78, 2007.

Design Science Research Methodology



Adapted from: Peffers, K., Tuunanen, T., Rothenberger, M. A., Chatterjee, S., A Design Science Research Methodology for Information Systems Research, JMIS, 24(3), 45–78, 2007.

Design Problem

Context

Artefact

Requirements

Stakeholder Goals

Accelerate knowledge exchange in a research organisation

by designing a sociotechnical system

that satisfies the requirements of the knowledge transfer manager and researchers

to support the knowledge transfer manager in matching researchers who have mutual interests and complementary expertise.

Goals

1) Identify and 2) Visualize Knowledge Transfer Potentials

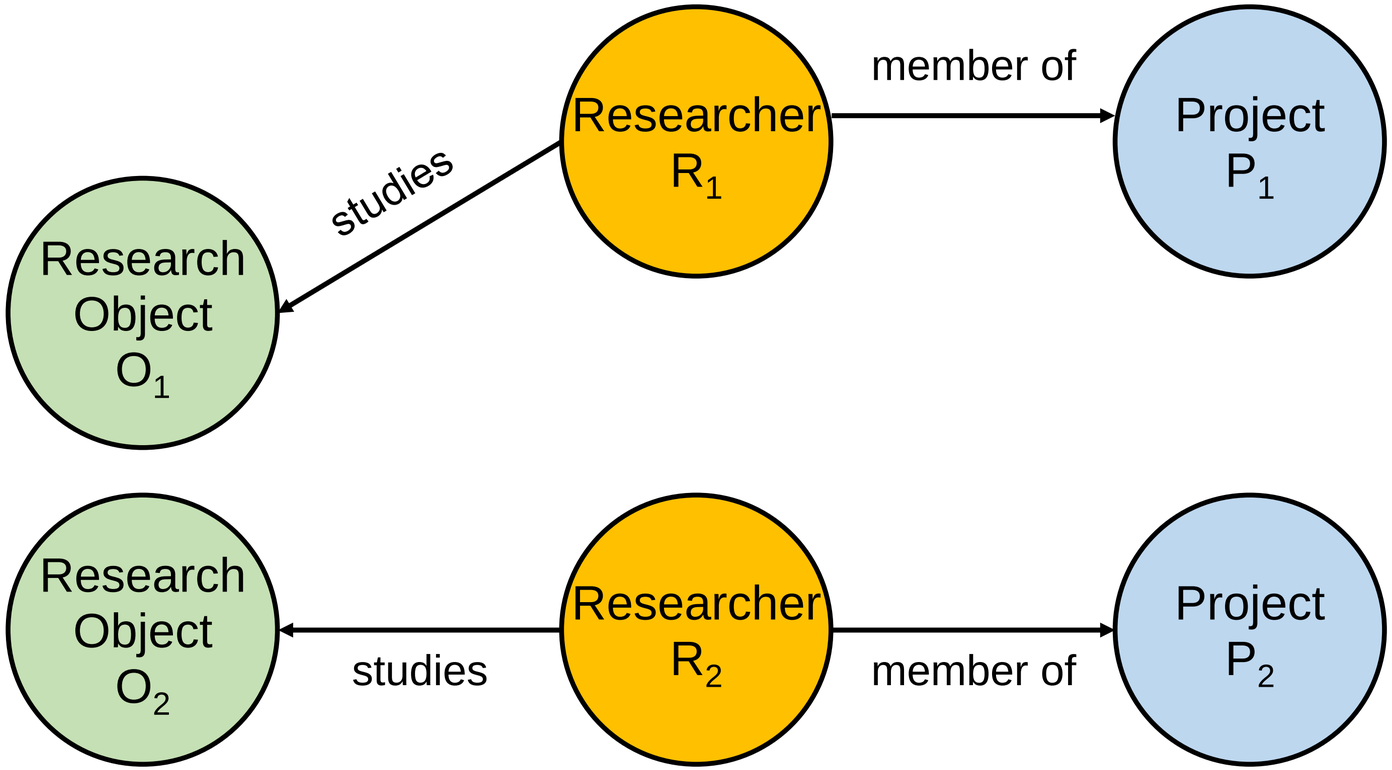
(1) Data Integration

- What are the **data sources** available in research organisations that can be integrated?
- What **relationships** can be inferred between the members of the organisation, based on these data sources?

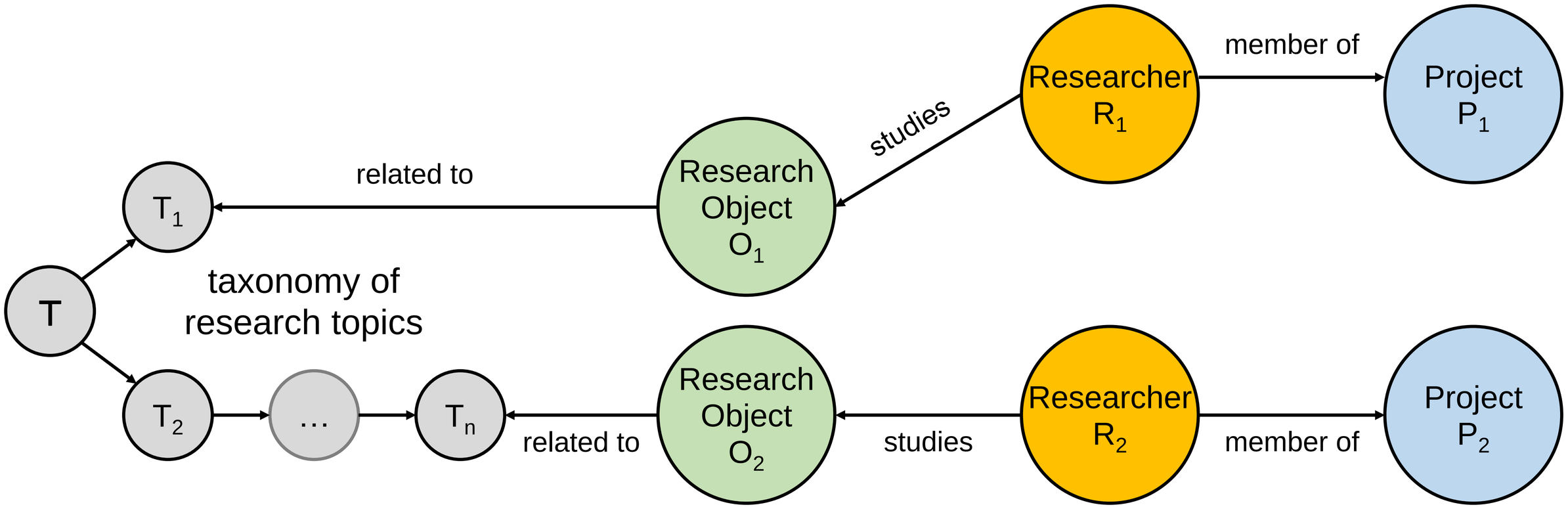
(2) Visualization

- How can we **present** the inferred relationships to produce insights that are useful and actionable for both knowledge managers and researchers?

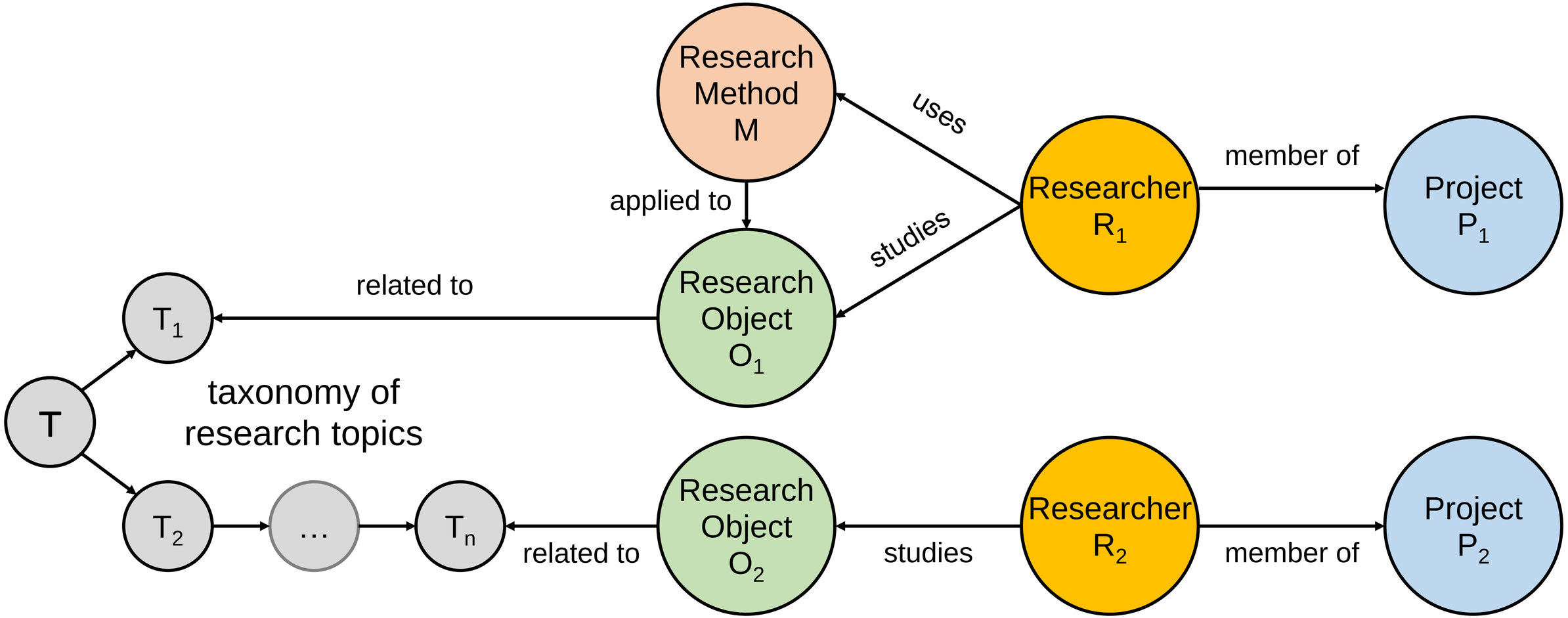
Example for a Potential for Knowledge Transfer



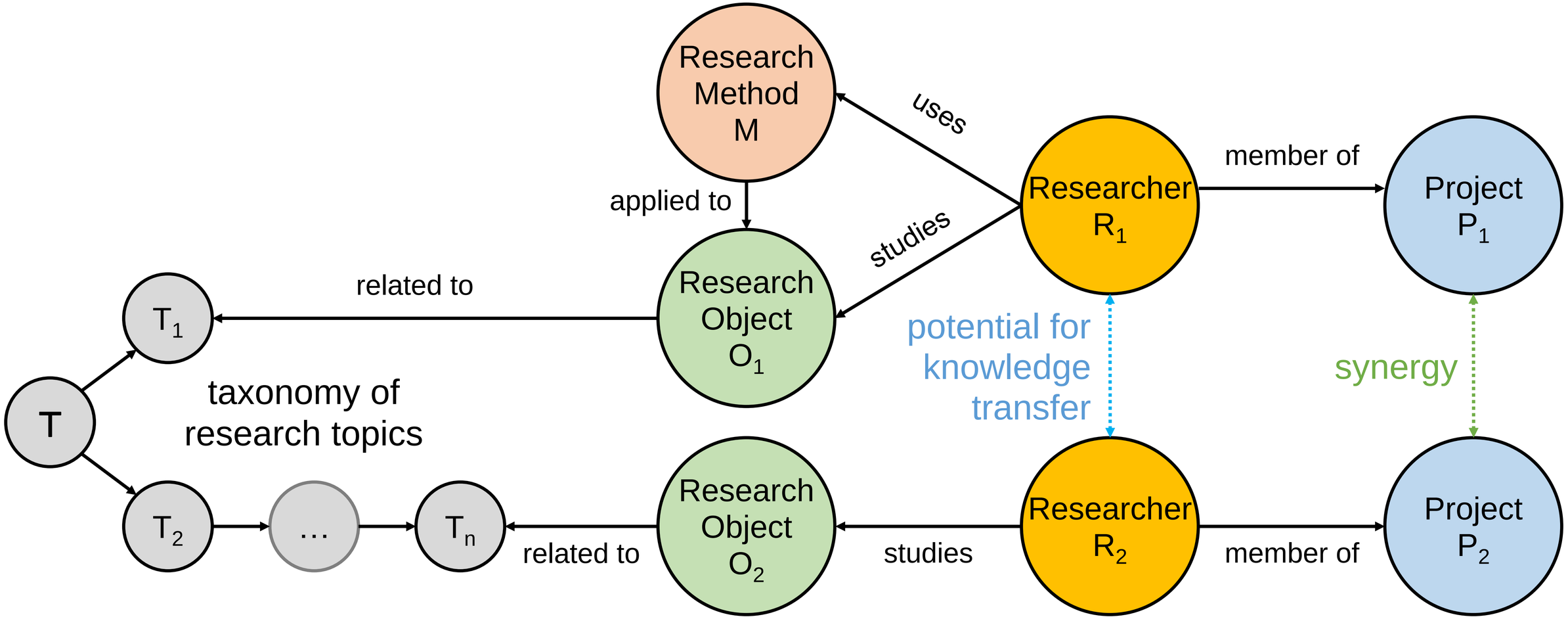
Example for a Potential for Knowledge Transfer



Example for a Potential for Knowledge Transfer

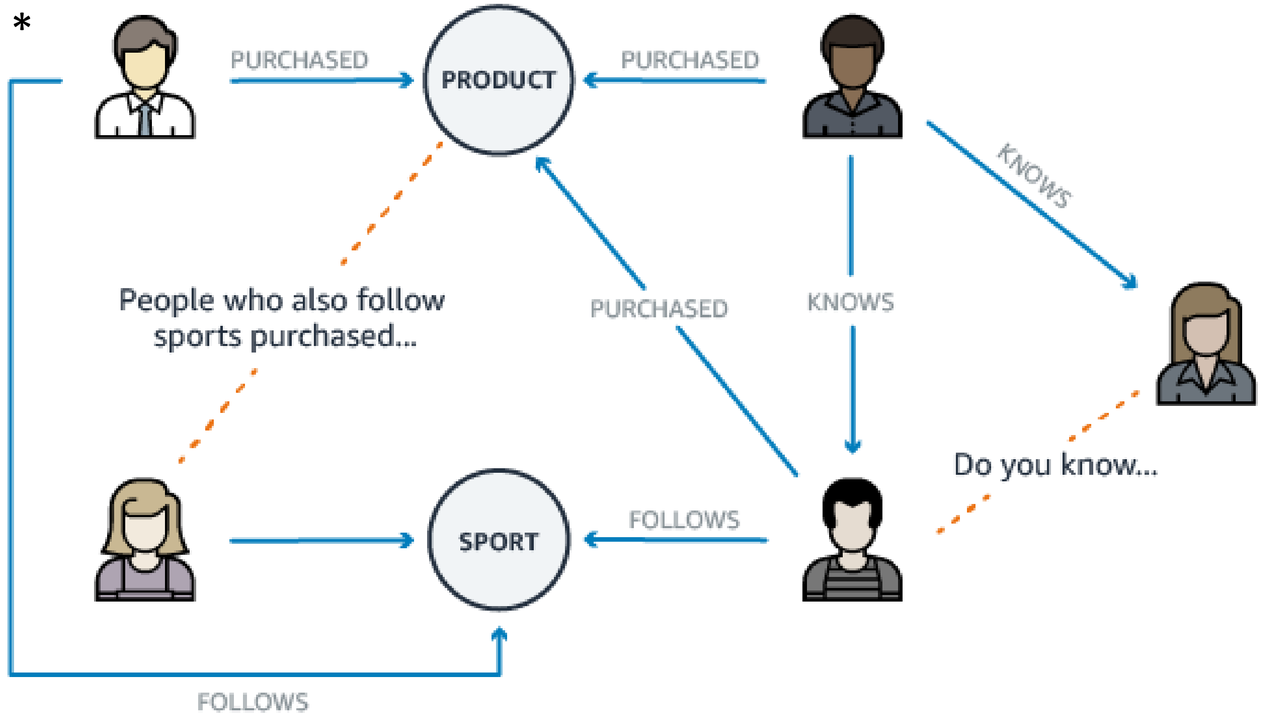


Example for a Potential for Knowledge Transfer



Related Work

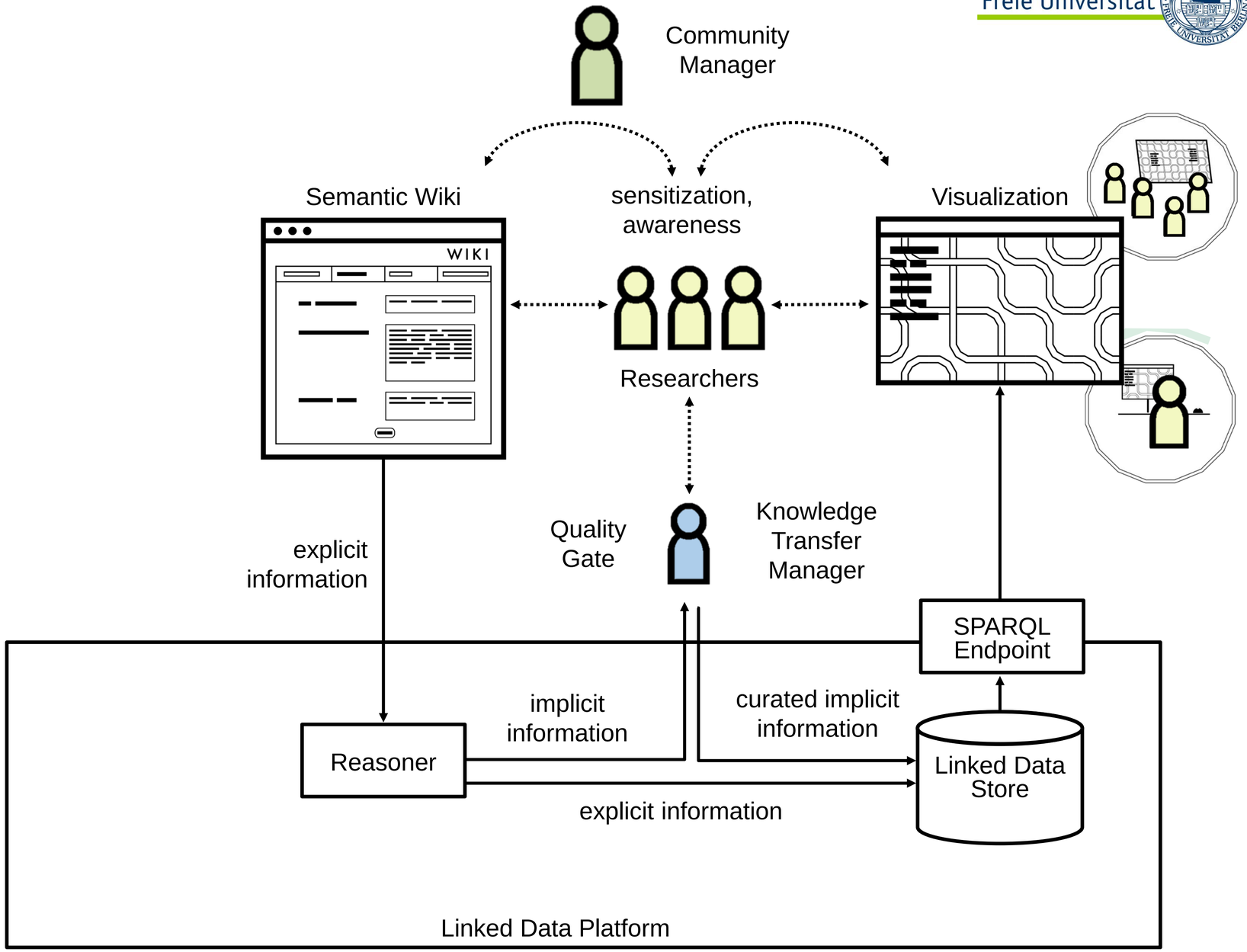
- Recommender systems
- Link prediction in networks
- Semantic search
- Expert search
- Information retrieval



* https://aws.amazon.com/neptune/

Sociotechnical System

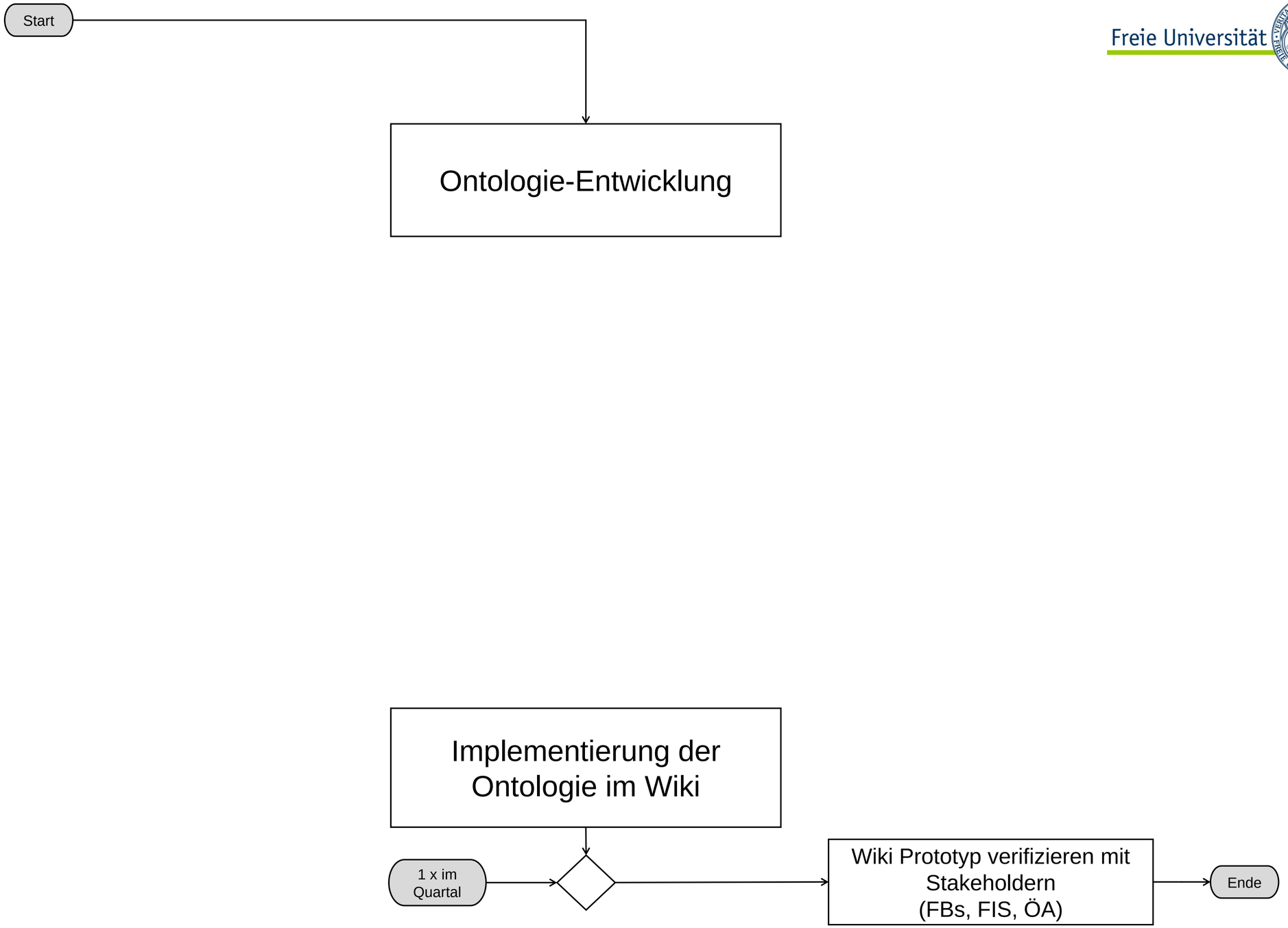
System Architecture

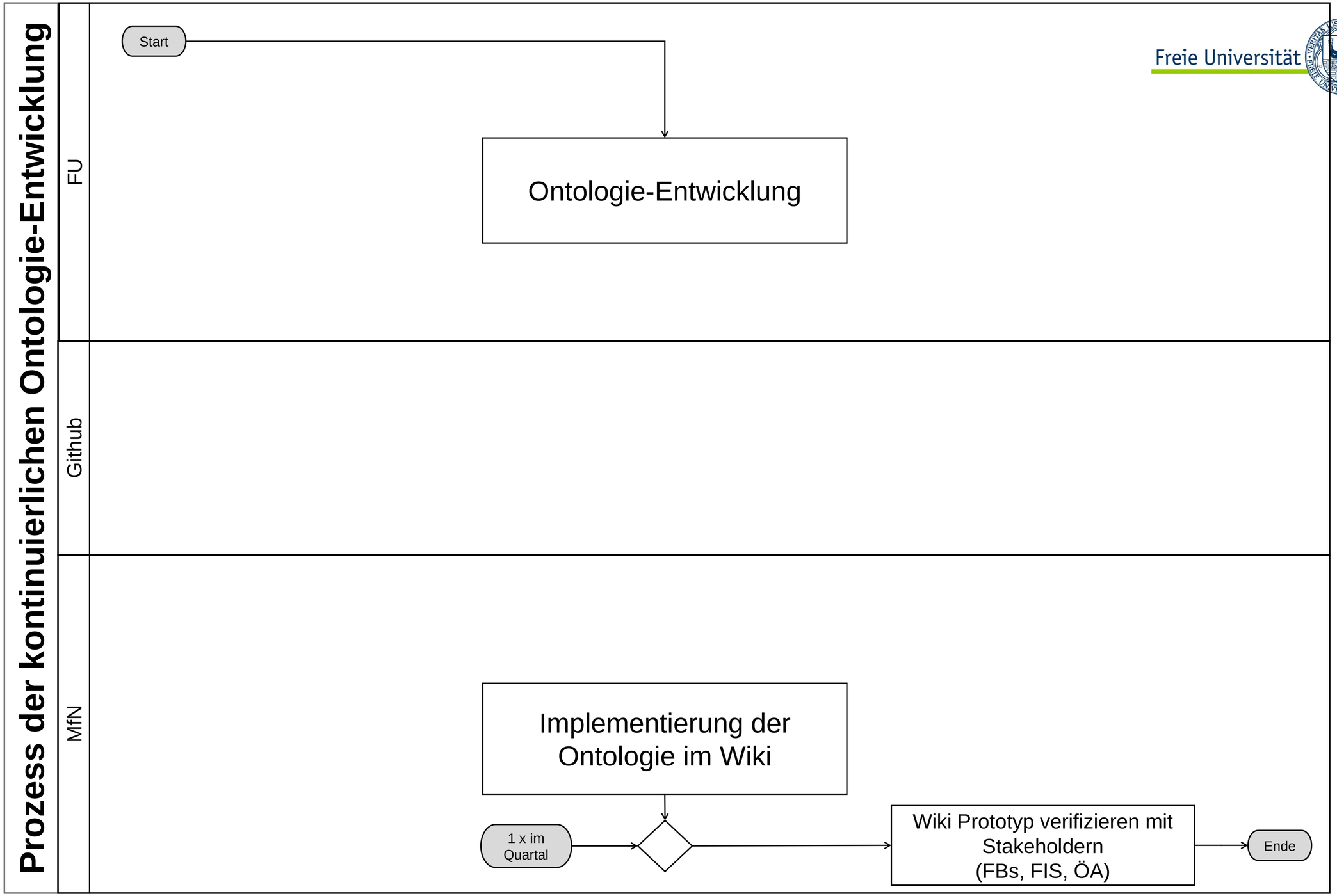

Community Manager
Semantic Wiki
sensitization, awareness
Visualization
WIKI
Researchers
explicit information
Quality Gate
Knowledge Transfer Manager
SPARQL Endpoint
implicit information
curated implicit information
Reasoner
Linked Data Store
explicit information
Linked Data Platform

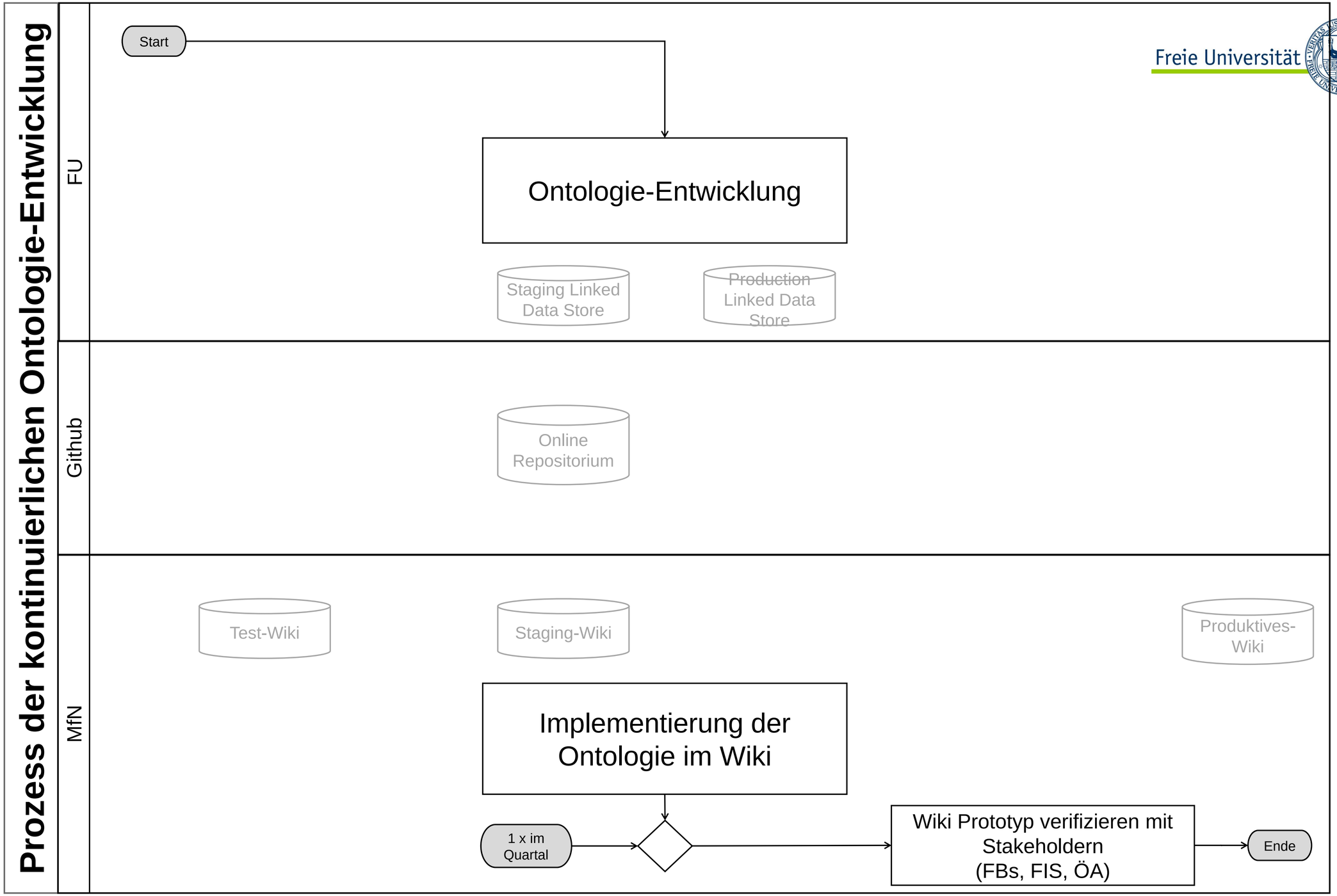
Ontology Development Process

Iterative and Incremental Development of the Ontology

Prozess der kontinuierlichen Ontologie-Entwicklung




Prozess der kontinuierlichen Ontologie-Entwicklung
FU
Github
MfN
Start
Ontologie-Entwicklung
Implementierung der Ontologie im Wiki
1 x im Quartal
Wiki Prototyp verifizieren mit Stakeholdern (FBs, FIS, ÖA)
Ende


Prozess der kontinuierlichen Ontologie-Entwicklung
FU
Github
MfN
Start
Ontologie-Entwicklung
Staging Linked Data Store
Production Linked Data Store
Online Repositorium
Test-Wiki
Staging-Wiki
Produktives-Wiki
Implementierung der Ontologie im Wiki
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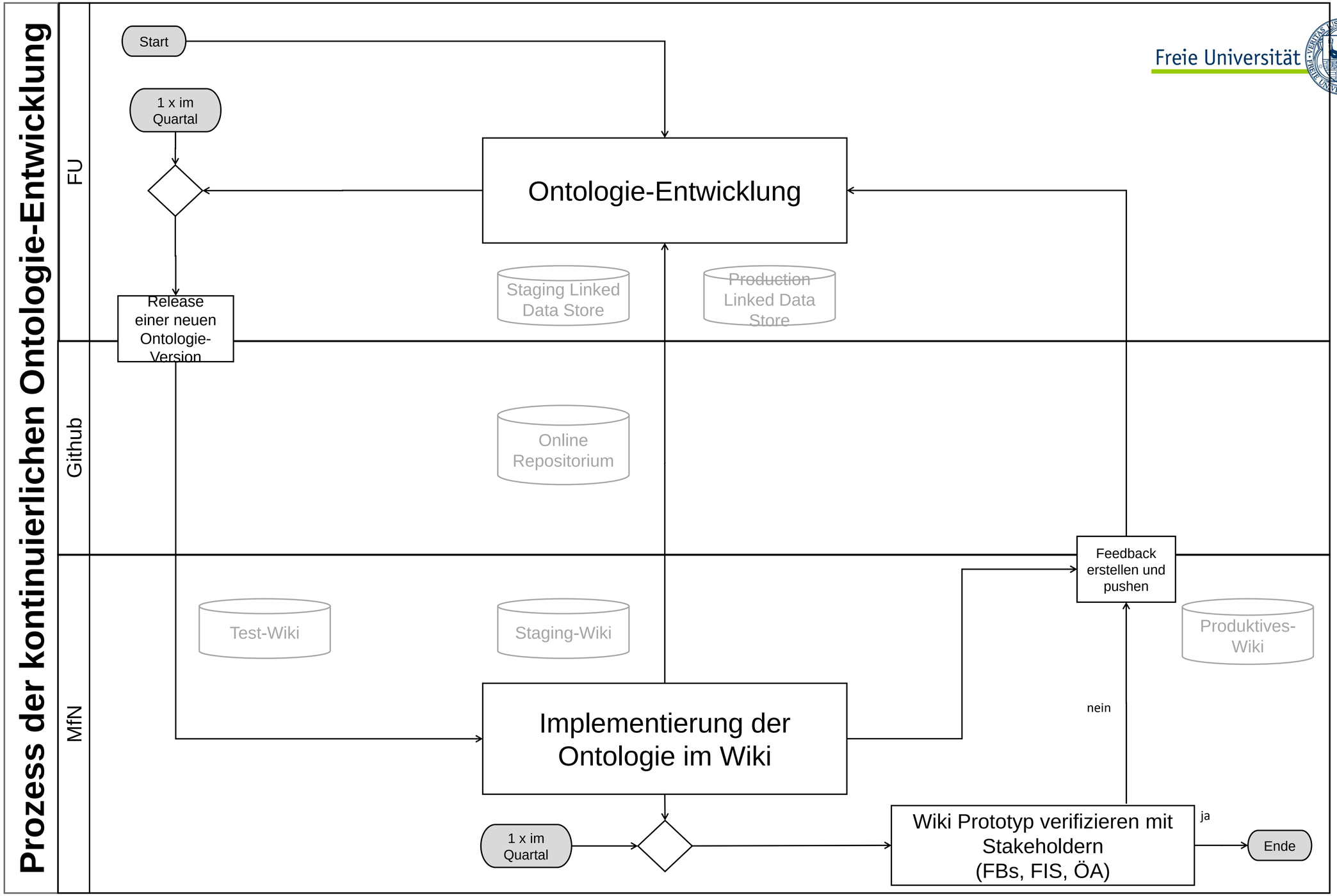
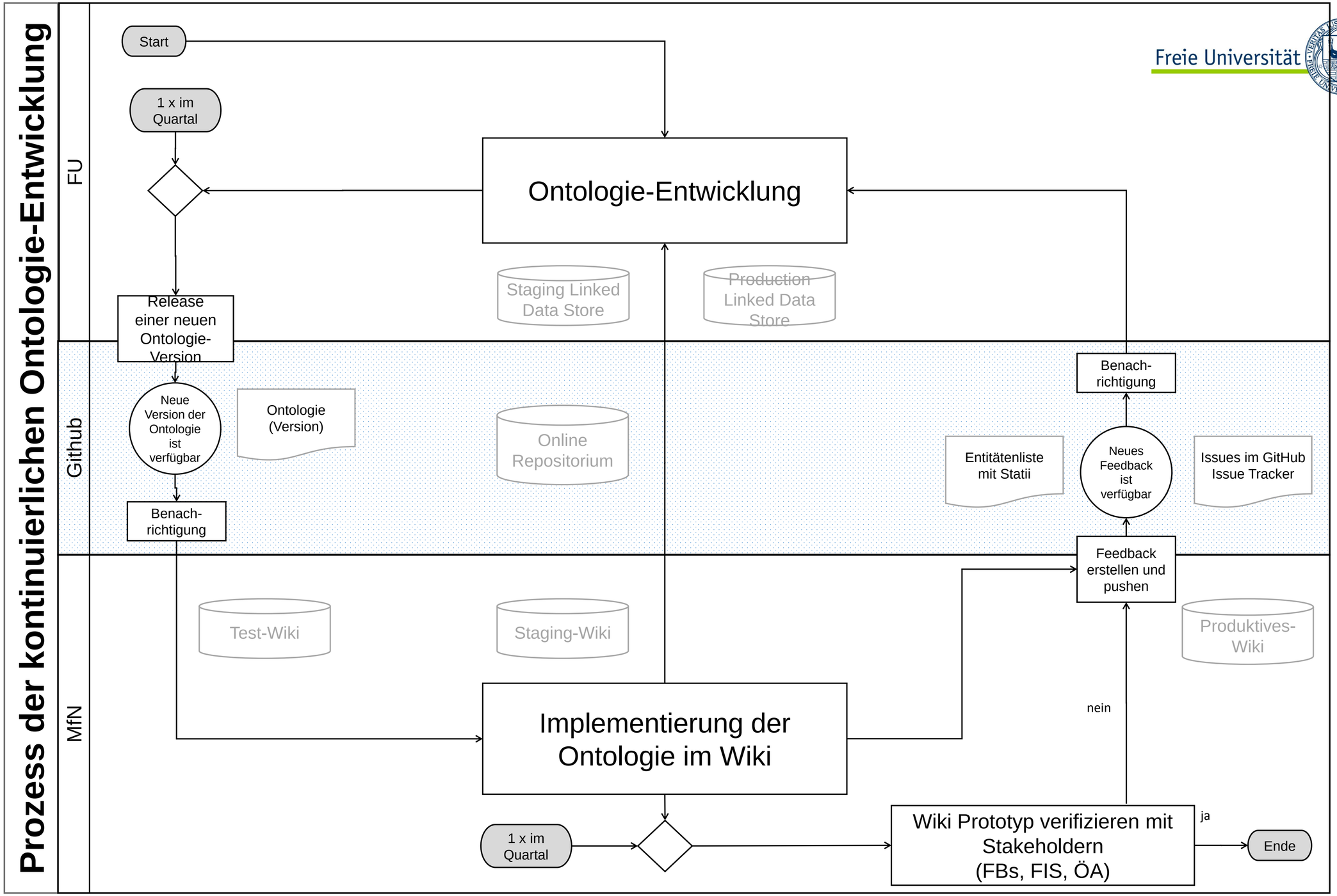
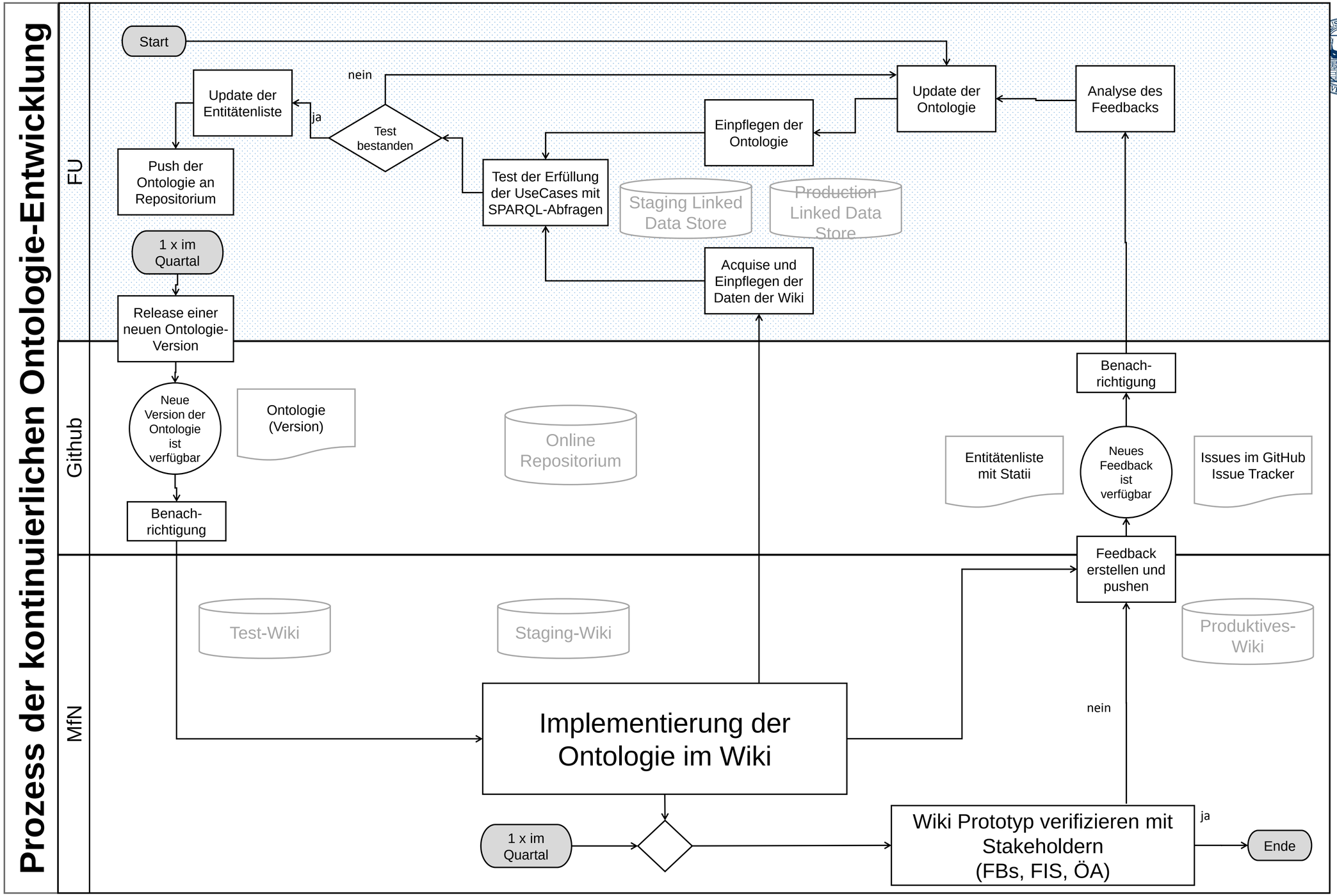
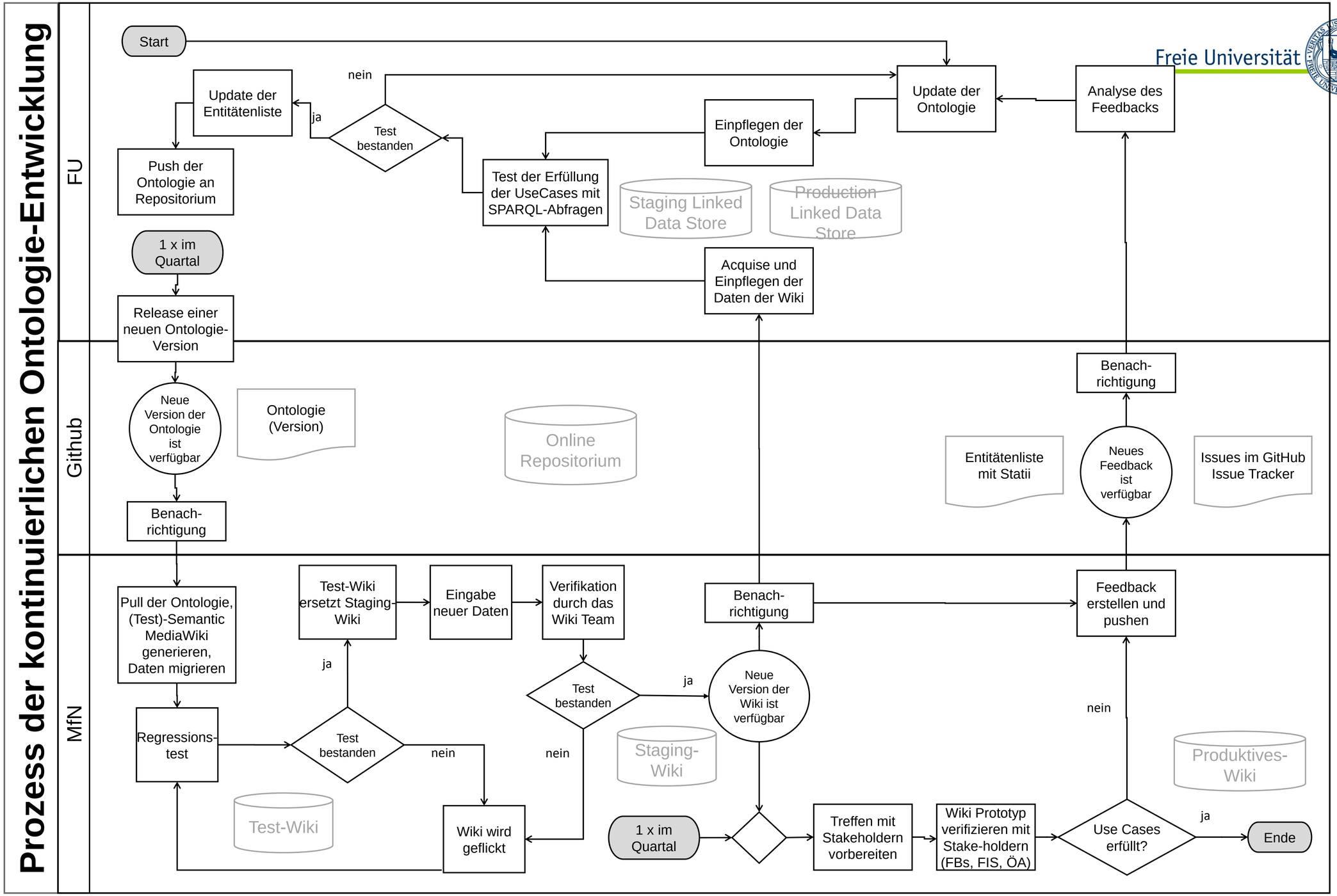

Prozess der kontinuierlichen Ontologie-Entwicklung
FU
Github
MfN
Start
1 x im Quartal
Release einer neuen Ontologie-Version
Ontologie-Entwicklung
Staging Linked Data Store
Production Linked Data Store
Online Repositorium
Test-Wiki
Staging-Wiki
Produktives-Wiki
Feedback erstellen und pushen
Implementierung der Ontologie im Wiki
1 x im Quartal
Wiki Prototyp verifizieren mit Stakeholdern (FBs, FIS, ÖA)
nein
ja
Ende


Prozess der kontinuierlichen Ontologie-Entwicklung
FU
Github
MfN
Start
1 x im Quartal
Release einer neuen Ontologie-Version
Neue Version der Ontologie ist verfügbar
Benach-richtigung
Ontologie (Version)
Ontologie-Entwicklung
Staging Linked Data Store
Production Linked Data Store
Online Repositorium
Benach-richtigung
Entitätenliste mit Statii
Neues Feedback ist verfügbar
Issues im GitHub Issue Tracker
Feedback erstellen und pushen
Test-Wiki
Staging-Wiki
Produktives-Wiki
nein
Implementierung der Ontologie im Wiki
1 x im Quartal
Wiki Prototyp verifizieren mit Stakeholdern (FBs, FIS, ÖA)
ja
Ende


Prozess der kontinuierlichen Ontologie-Entwicklung
FU
Github
MfN
Start
Update der Entitätenliste
nein
ja
Test bestanden
Update der Ontologie
Analyse des Feedbacks
Einpflegen der Ontologie
Push der Ontologie an Repositorium
Test der Erfüllung der UseCases mit SPARQL-Abfragen
Staging Linked Data Store
Production Linked Data Store
1 x im Quartal
Acquise und Einpflegen der Daten der Wiki
Release einer neuen Ontologie-Version
Benach-richtigung
Neue Version der Ontologie ist verfügbar
Ontologie (Version)
Online Repositorium
Entitätenliste mit Statii
Neues Feedback ist verfügbar
Issues im GitHub Issue Tracker
Benach-richtigung
Feedback erstellen und pushen
Test-Wiki
Staging-Wiki
Produktives-Wiki
Implementierung der Ontologie im Wiki
nein
1 x im Quartal
Wiki Prototyp verifizieren mit Stakeholdern (FBs, FIS, ÖA)
ja
Ende


Prozess der kontinuierlichen Ontologie-Entwicklung
FU
Github
MfN
Start
Update der Entitätenliste
nein
ja
Test bestanden
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Production Linked Data Store
Einpflegen der Ontologie
Update der Ontologie
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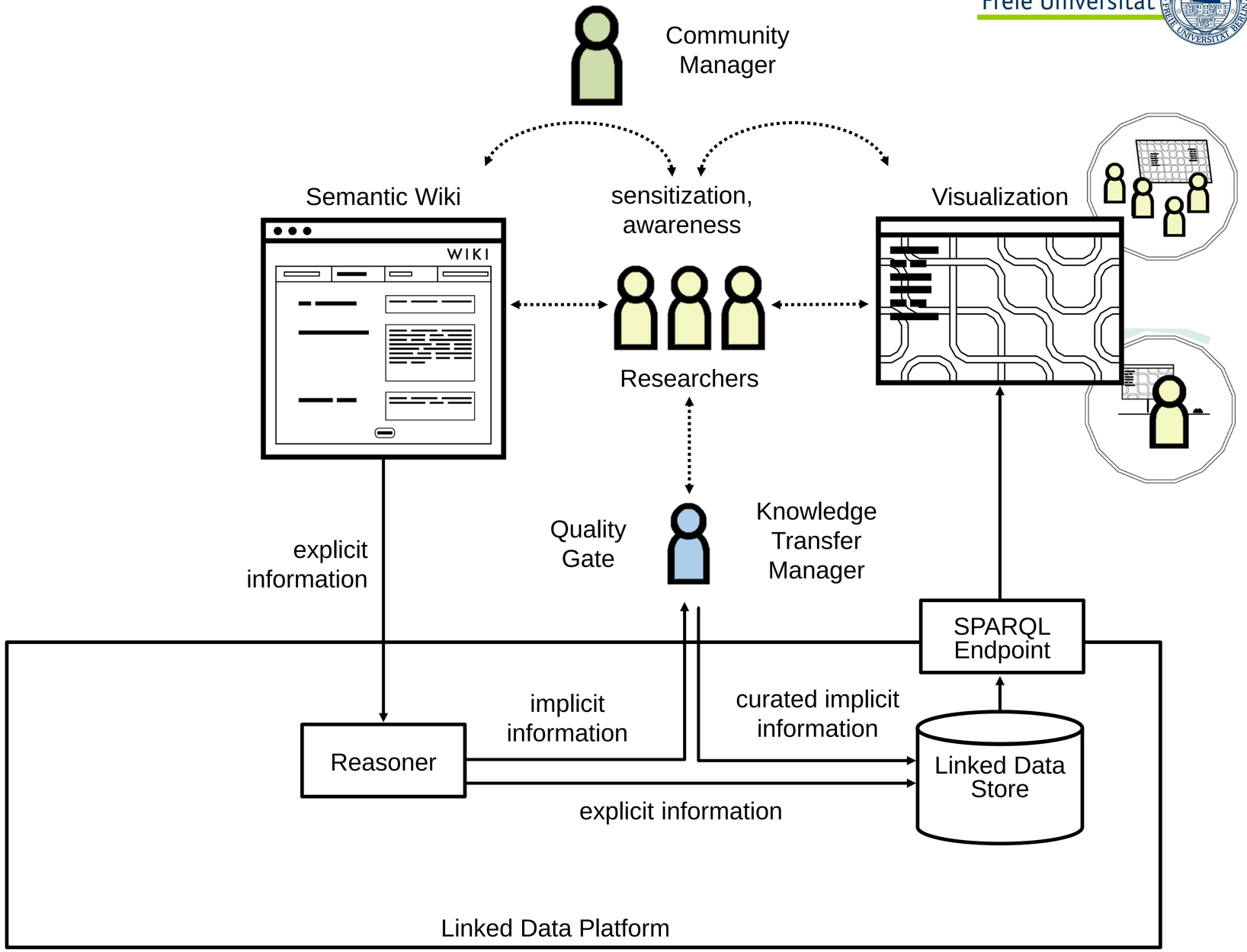
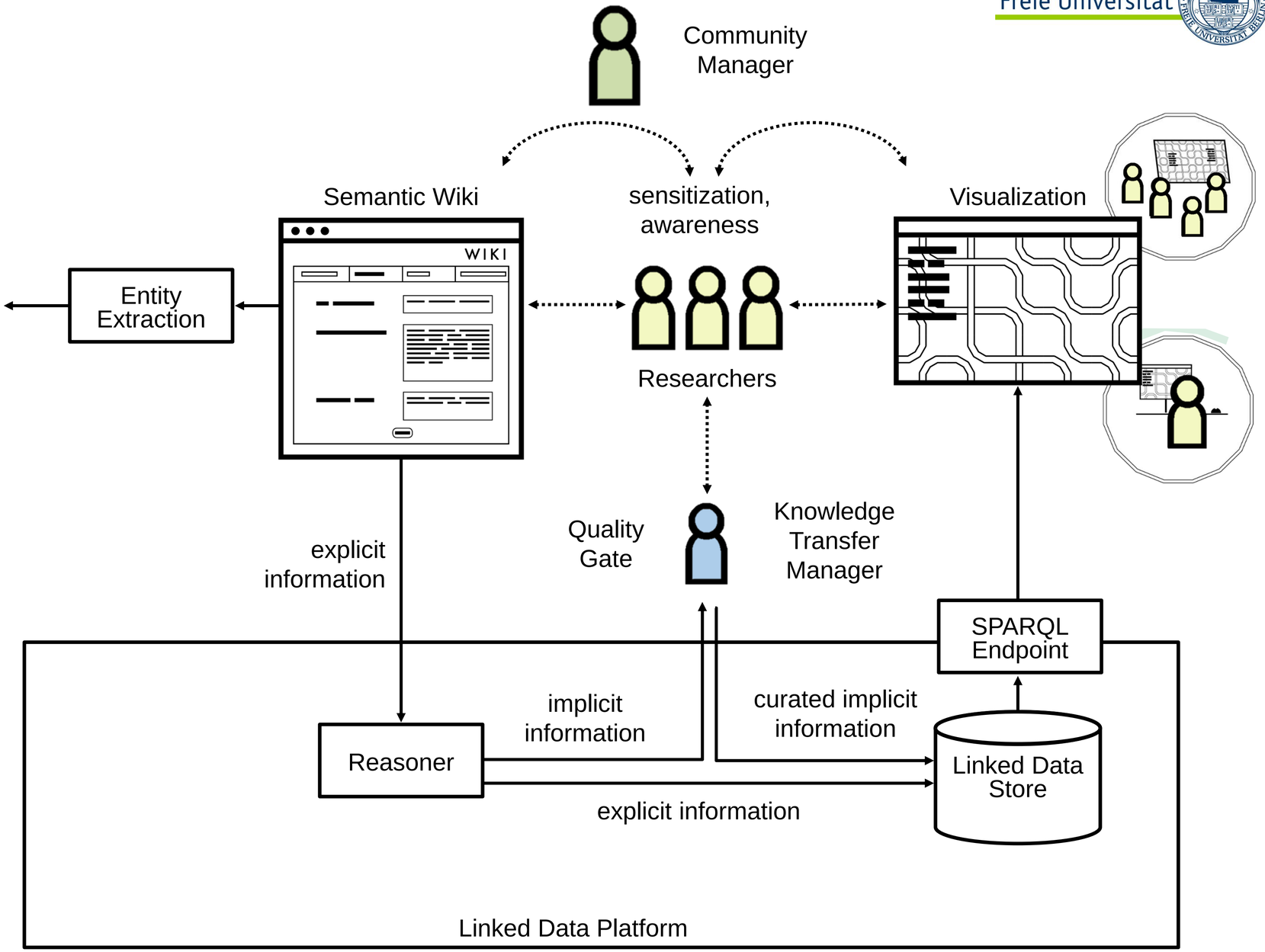
Neue Version der Ontologie ist verfügbar
Ontologie (Version)
Online Repositorium
Benach-richtigung
Entitätenliste mit Statii
Neues Feedback ist verfügbar
Issues im GitHub Issue Tracker
Benach-richtigung
Pull der Ontologie, (Test)-Semantic MediaWiki generieren, Daten migrieren
Test-Wiki ersetzt Staging-Wiki
Eingabe neuer Daten
Verifikation durch das Wiki Team
Benach-richtigung
Feedback erstellen und pushen
ja
Test bestanden
ja
Neue Version der Wiki ist verfügbar
nein
Regressions-test
Test bestanden
nein
nein
Staging-Wiki
Produktives-Wiki
Test-Wiki
Wiki wird geflickt
1 x im Quartal
Treffen mit Stakeholdern vorbereiten
Wiki Prototyp verifizieren mit Stake-holdern (FBs, FIS, ÖA)
Use Cases erfüllt?
ja
Ende

Crowdsourced Ontology Engineering

Developing an extendible frame for discourse


Community Manager
Semantic Wiki
sensitization, awareness
Visualization
WIKI
Researchers
explicit information
Quality Gate
Knowledge Transfer Manager
SPARQL Endpoint
implicit information
curated implicit information
Reasoner
Linked Data Store
explicit information
Linked Data Platform


Community Manager
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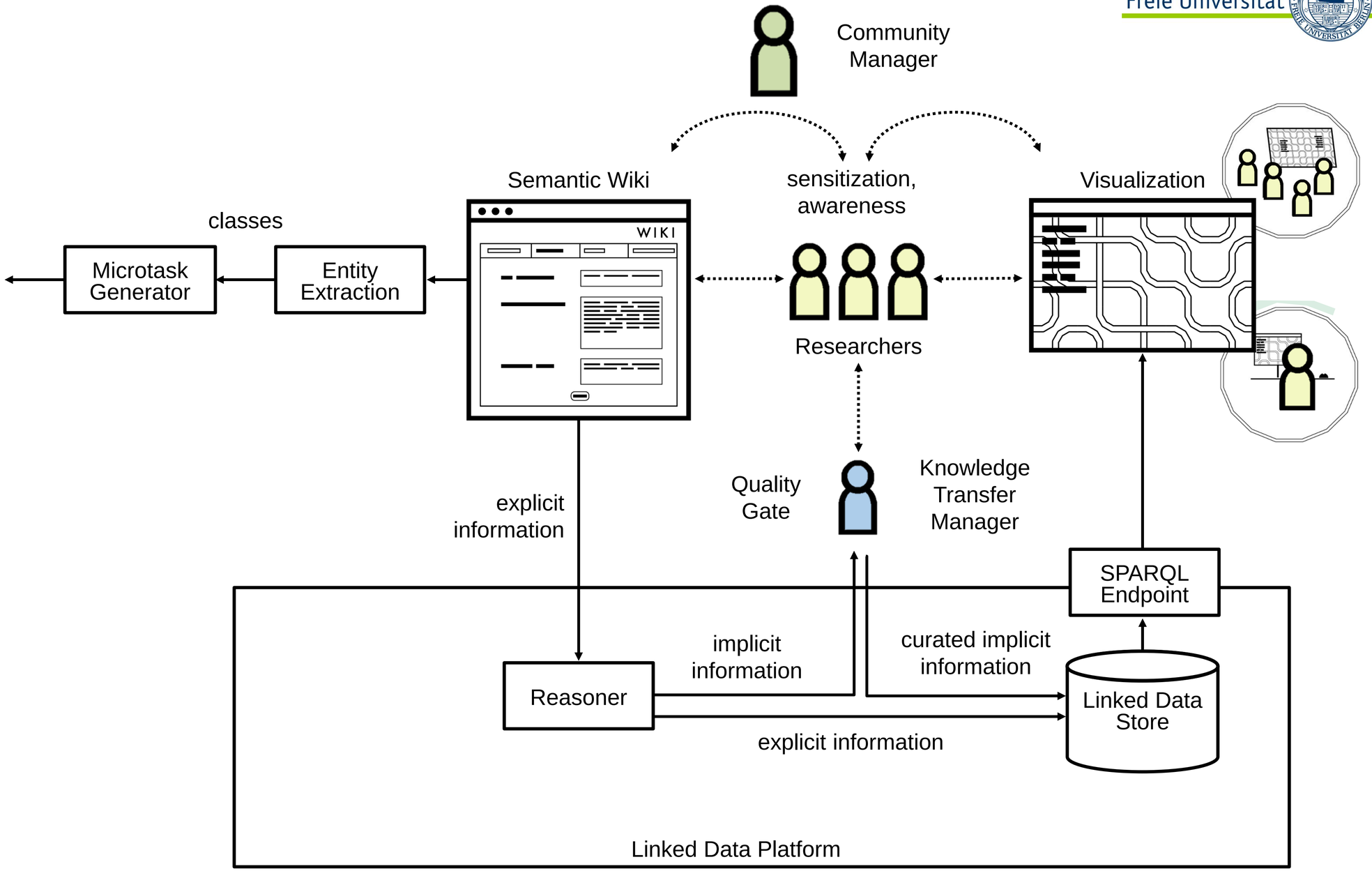
Community Manager
Semantic Wiki
sensitization, awareness
Visualization
classes
WIKI
Microtask Generator
Entity Extraction
Researchers
explicit information
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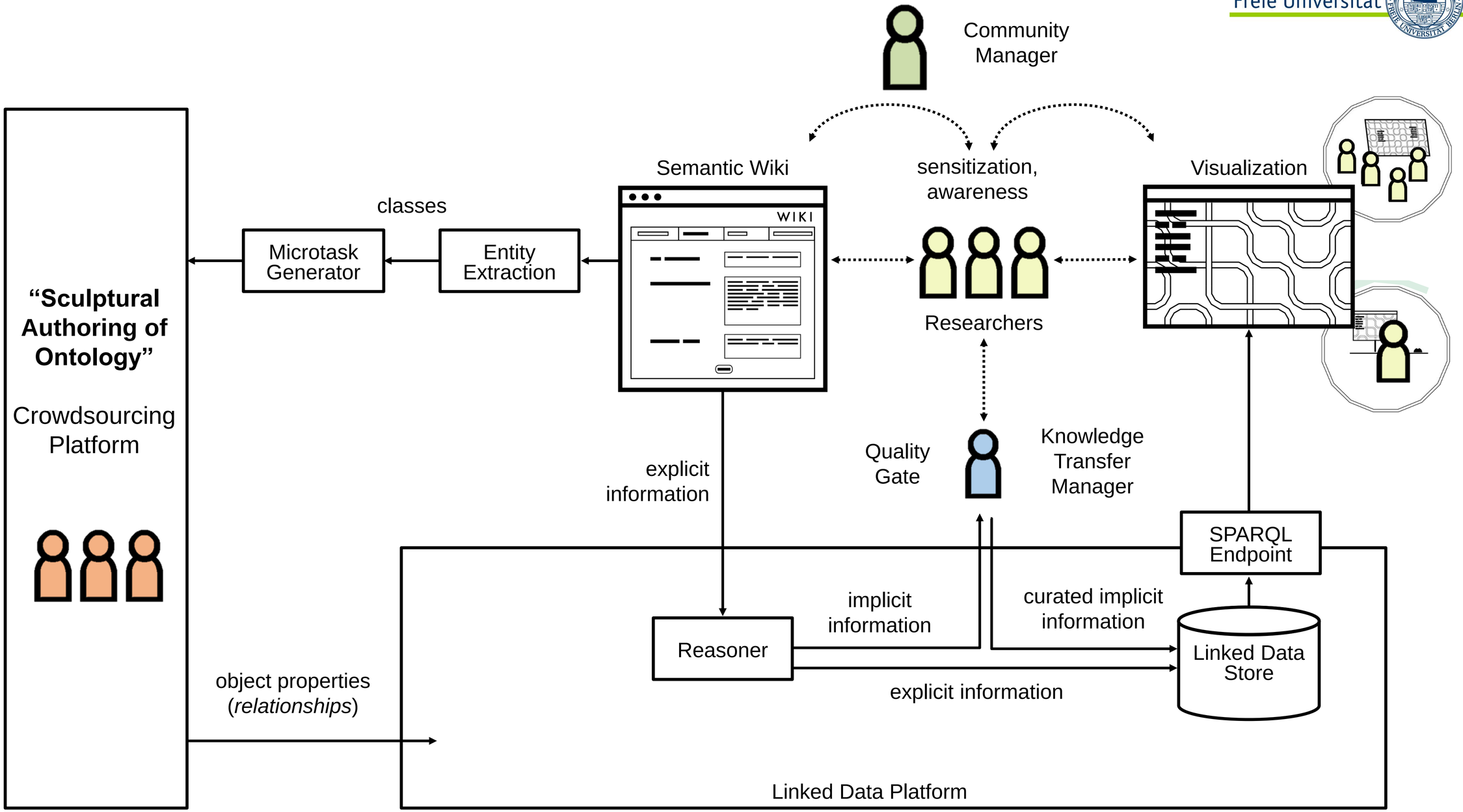
Community Manager
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classes
Microtask Generator
Entity Extraction
WIKI
Researchers
"Sculptural Authoring of Ontology"
Crowdsourcing Platform
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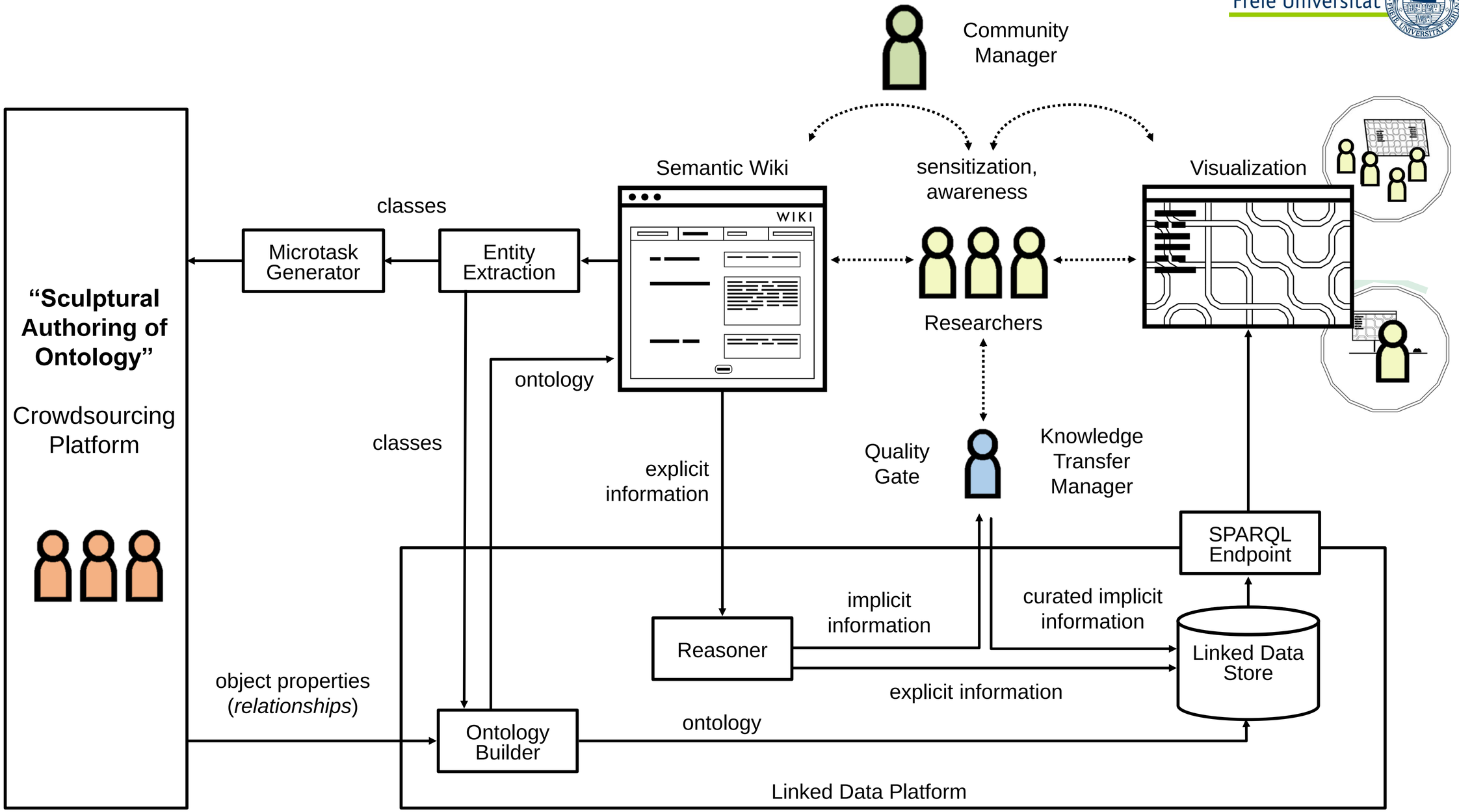
Quality Gate
Knowledge Transfer Manager
SPARQL Endpoint
implicit information
curated implicit information
Reasoner
Linked Data Store
explicit information
object properties (relationships)
Linked Data Platform


Community Manager
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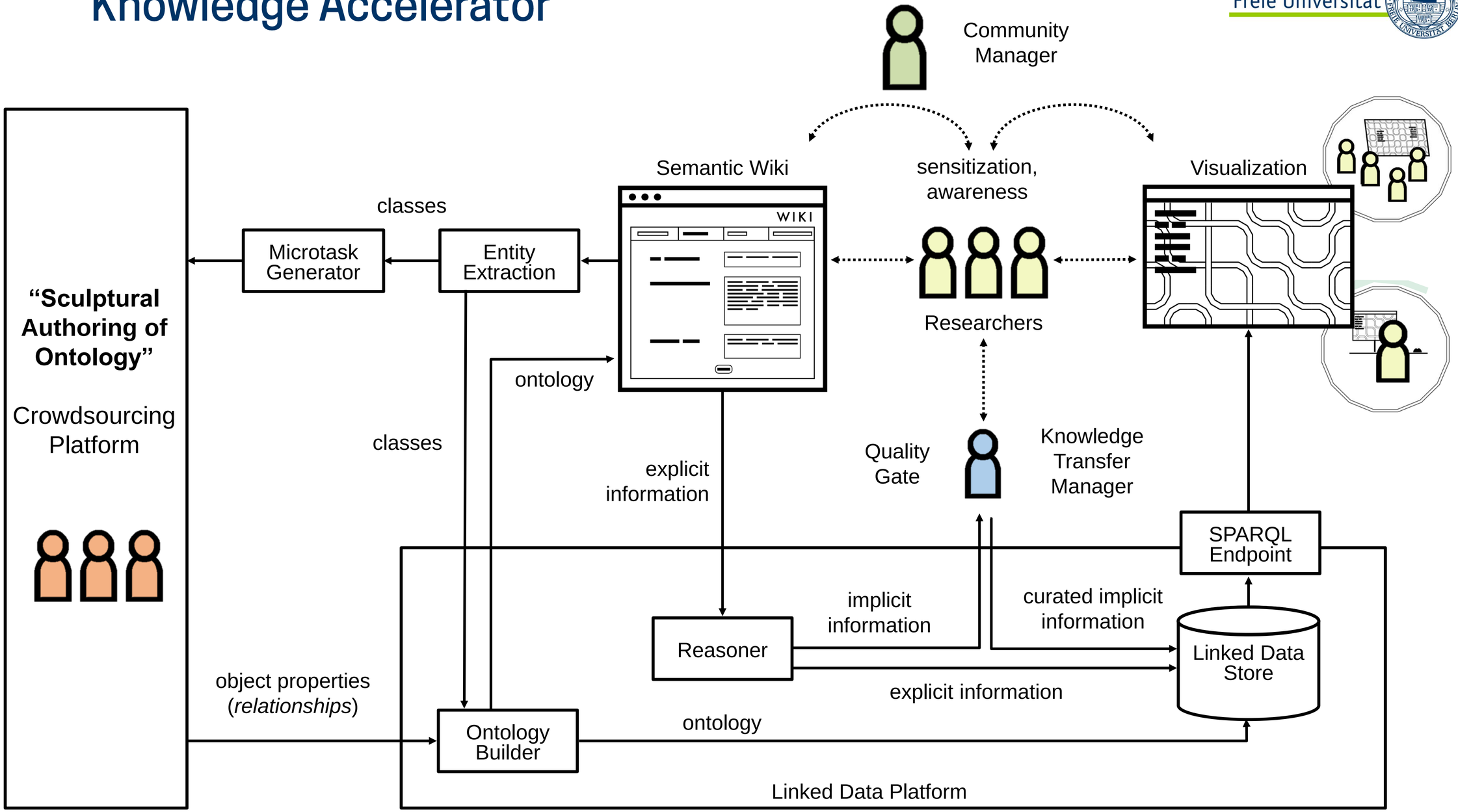
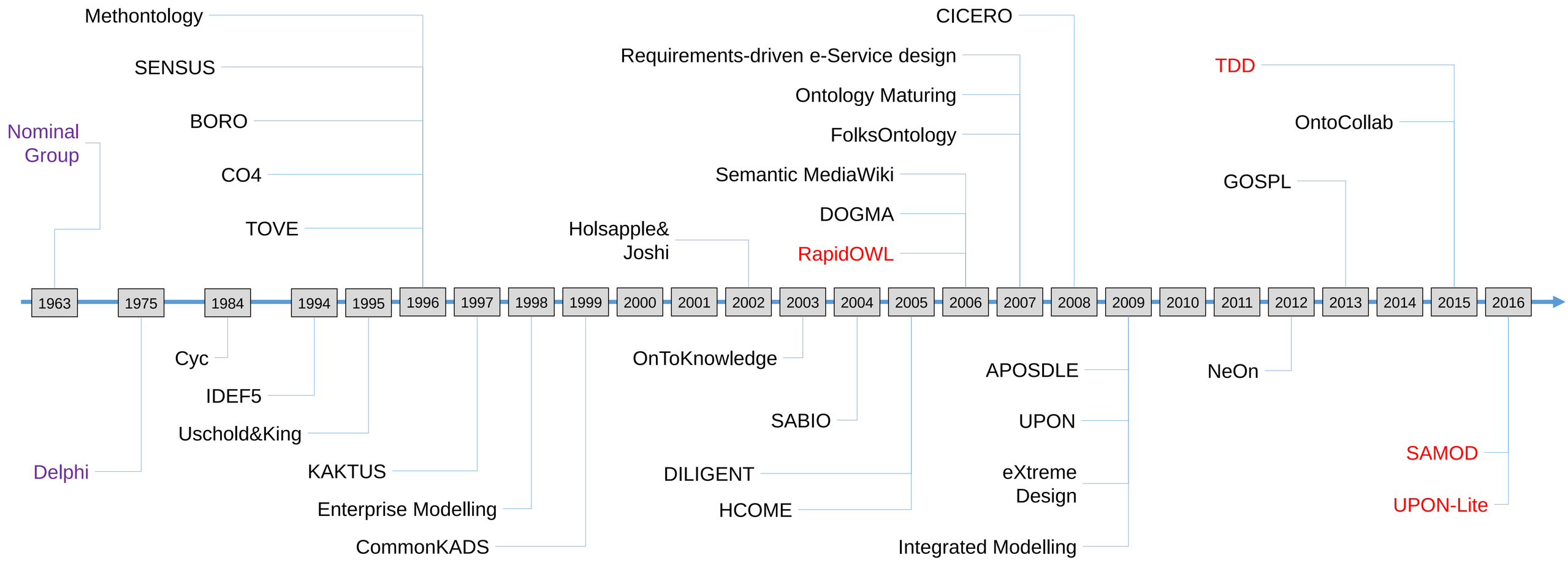
Crowdsourcing Platform
ontology
Researchers
classes
explicit information
Quality Gate
Knowledge Transfer Manager
SPARQL Endpoint
implicit information
curated implicit information
Reasoner
Linked Data Store
explicit information
object properties (relationships)
ontology
Ontology Builder
Linked Data Platform

Knowledge Accelerator



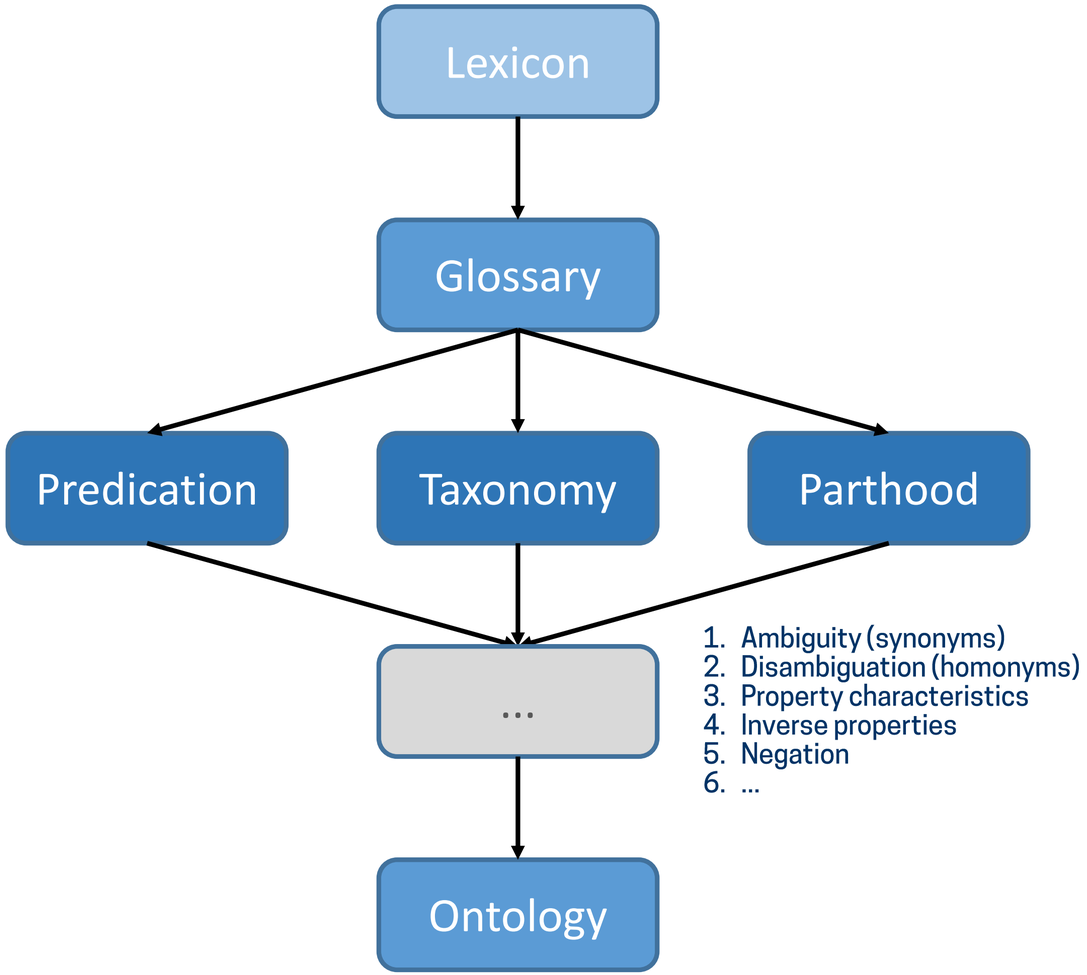
Ontology Engineering Methodologies



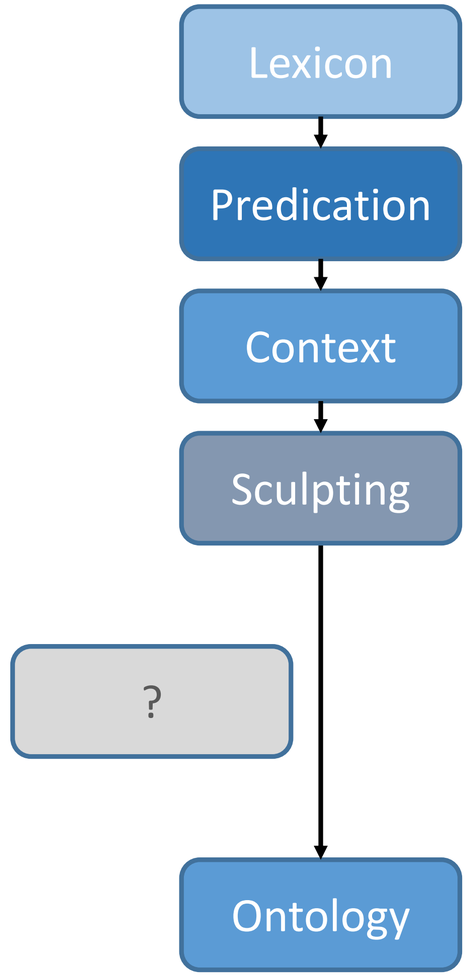
Generic Techniques → Agile

Domain Expert & Knowledge Engineer → End User

Additive Approach vs. Sculptural Approach



1. Ambiguity (synonyms)
2. Disambiguation (homonyms)
3. Property characteristics
4. Inverse properties
5. Negation
6. ...



Adapted from UPON Lite methodology: De Nicola, A., Missikoff, M. (2016): A Lightweight Methodology for Rapid Ontology Engineering. Communications of the ACM, Vol. 59 No. 3, Pages 79-86.

Extraction of Entities

Freie Universität Berlin

Source: Research Project Descriptions

Evaluation of NER Tools

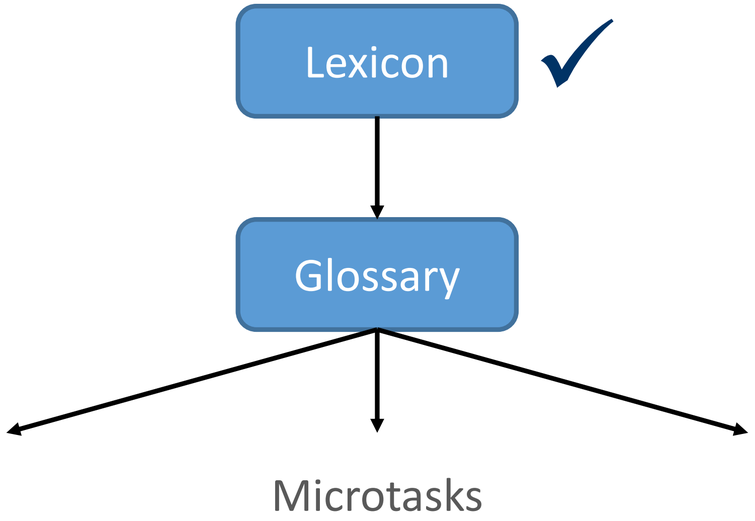
- DBPedia Spotlight
  - 10,109 concepts
  - 2,331 unique concepts
- Daendalion
  - 2,010 concepts
  - 1,015 unique concepts
- Textrazor
  - (TODO)

Example: DBPedia Spotlight

Concept	Abs. Frequency
Evolution	115
Project	111
Museum	85
Data	76
Analysis	74
Research	72
Science	72
Indium	71
Causality	70
Ontogenesis	67

Next Steps

1. Filter stopwords to build lexicon
2. Analysis
   - Identify false positives
   - Identify technical terms
3. Build glossary (Context)
4. Design microtasks
5. Crowdsourcing Experiments



Adapted from UPON Lite methodology: De Nicola, A., Missikoff, M. (2016): A Lightweight Methodology for Rapid Ontology Engineering. Communications of the ACM, Vol. 59 No. 3, Pages 79-86.

Design

Process of Prototyping

Szenarien

Suche

Eine zielgerichtete Nutzung der Visualisierung nach expliziten Elementen oder Ensembles wie Forschungsobjekten, -projekten oder -regionen.

Exploration

Eine erkundende, ergebnis-offene Nutzung der Visualisierung. Implizite Informationen haben vergleichbaren Stellenwert zu expliziten Informationen.

Validierung

Die Nutzung der Visualisierung durch den Knowledge Transfer Manager zur Validierung von impliziten Wissens-transferpotenzialen.

(Erblicken)

MTD-spezifisches Szenario, welches sich an Exploration anschließt: Das (Nicht-)Erblicken der Visualisierung im halb-öffentlichen Raum.

National Geographic Sonderausgabe 2015
Zielgruppe: Publikum; Fokus: Tristan

“Magie”, “Originalität”, “sich die Nase am Schaukasten platt drücken”

Geschäftsbericht 2016
Zielgruppe: Intern; Fokus: Mehrwert & Leistung

“Leuchtturm”

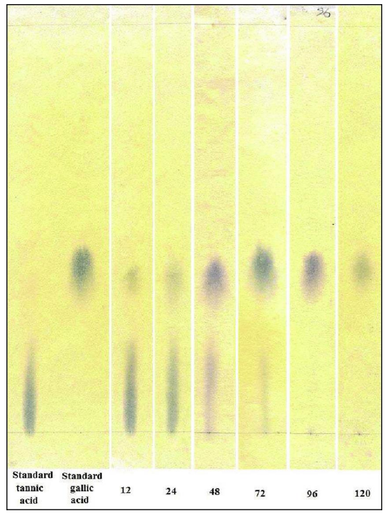
Naturkundemuseum 2020
Zielgruppe: Leibniz-Gemeinschaft; Fokus: Entwicklung

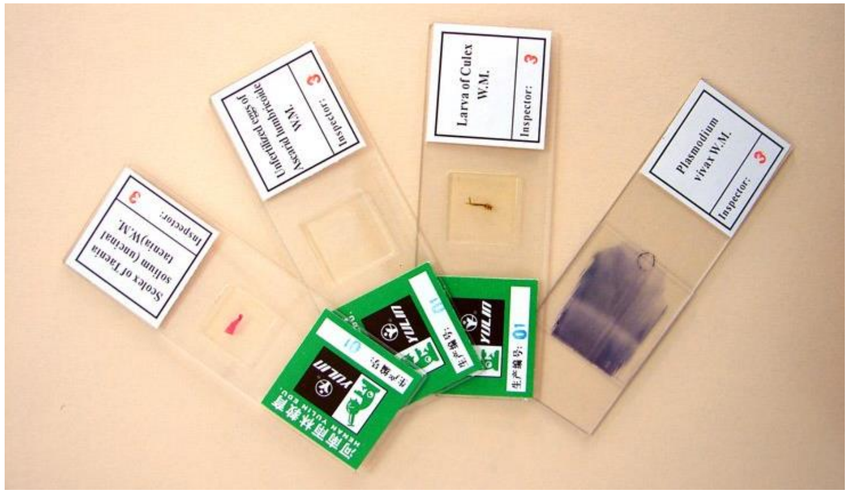
“Brücke”, “Organisationskultur”

Prof Dr Vogel

Webseiten-Videos

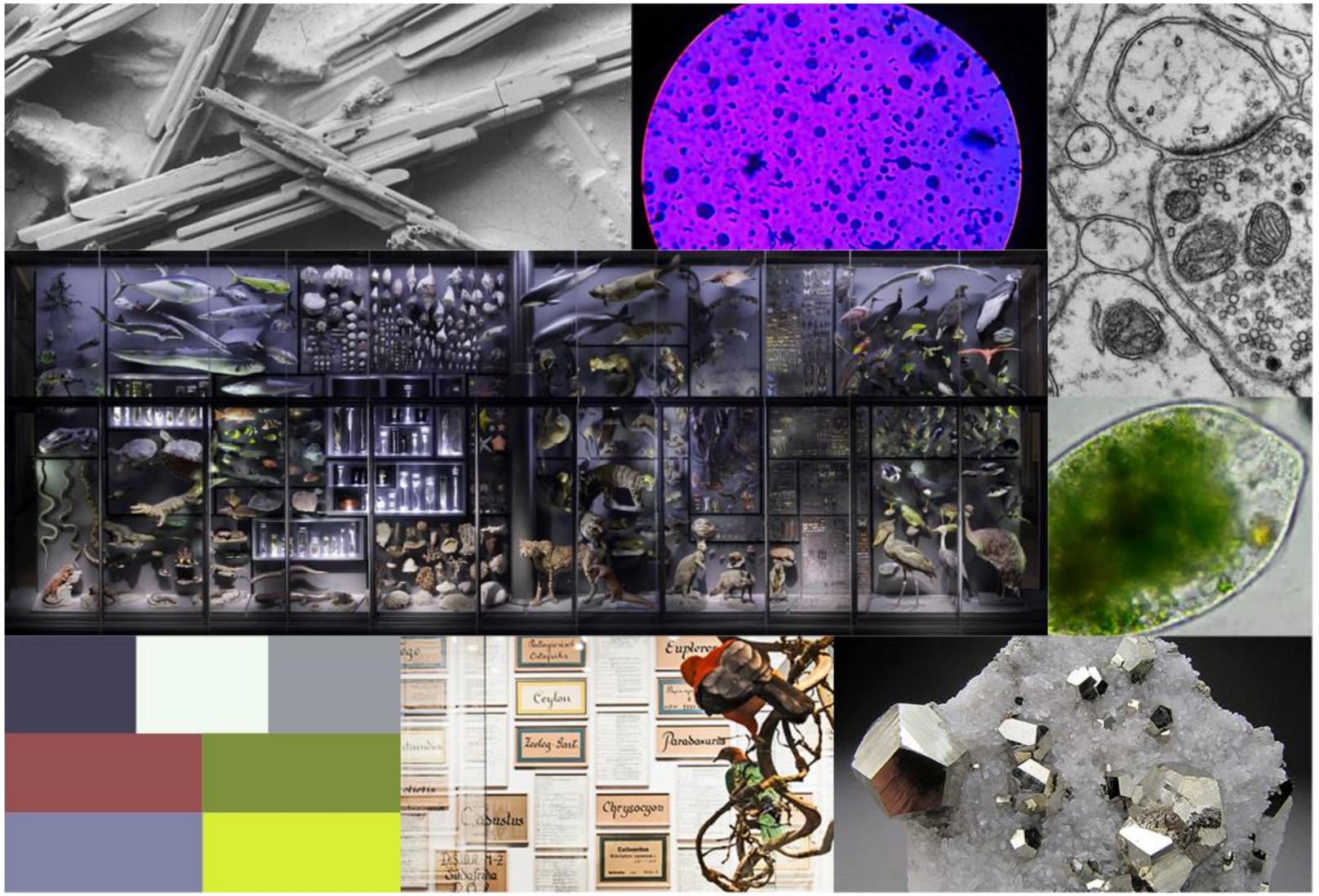
“Originalität”

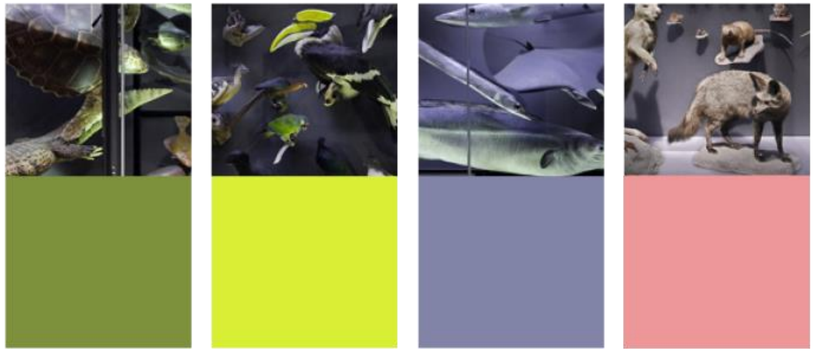




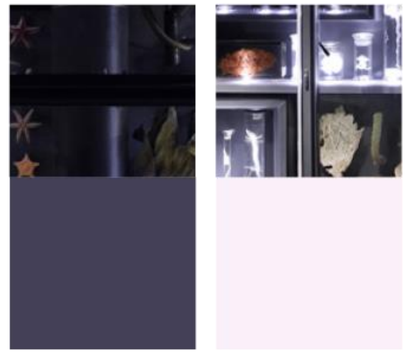
”Dynamik”

“Schaukasten”





FB1 FB2 FB3 FB4



System 1 System 2

Prototyp

V1

Freie Universität Berlin

Nutzerstudie

Ergebnisse der formativen Vorstudie 20.11.–30.11.2017

Freie Universität Berlin

23 Teilnehmer

14 W / 9 M

Forscher, Tutoren, SHKs, Studenten

Naturwissenschaften & Geisteswissenschaften

Test Phases

Goal:

- USABILITY
  - Identify Usability Issues in Concepts Observation, UEQ
- UX:
  - Rate Tangibility of Transfer Potential & Metaphors Observation, UEQ + Likert
  - Survey if there is an understandable link between wiki & vis

We measure task completion and user behaviour passively through observation and recording; and measure user impression and usability directly through standardised questionnaires.

Minute	Phase[1]	Type	Task	Question(s)	Resources	Evaluation
0	User Consent	Form	Please read and sign the provided consent form.	-	HCC-Consent-Form[4]	/
2	First Contact	Open-Ended Think-Aloud	Please spend 5 minutes exploring the application, voicing your thoughts aloud.	-	HCC-Observation[5] + Morae	Morae *QUAL & QUAN* *(Observation sheet as backup)*
7	Task	Direct & Scenario [2]	1. You are contacted by peers from another institution. They want to know which of your research departments runs the most projects and ask you to find out. 2. Find out who is leading the research in project NeFo 3 and contact them. 3. You want to use the application to present an overview of currently ongoing projects at a group meeting. Choose an appropriate visualisation. 4. Find out what kind of new insights the application can provide. 5. You want to add information to an existing research project . Find out how. 6. What new insight has been found for Project BIORES? Find a way to distribute this information.	-		
17	Impression[3]	UEQ + Custom Likert	Please fill out this form: first by rating the application on the provided scales on page 1; then by rating the statements on page 2.	Full UEQ + Custom Likert	HCC-UEQ Sheet	UEQ-Excel *QUAL-QUAN*
25	User Info	Form	Please provide us with the following information.	-	HCC-Participant-Form	QUAN
29	Compensation	Form	Many thanks for your participation!	-	HCC-Compensation-Form	€
30mins						

Ref.

[1] https://www.usertesting.com/blog/2015/05/18/open-ended-vs-specific-tasks-and-questions/

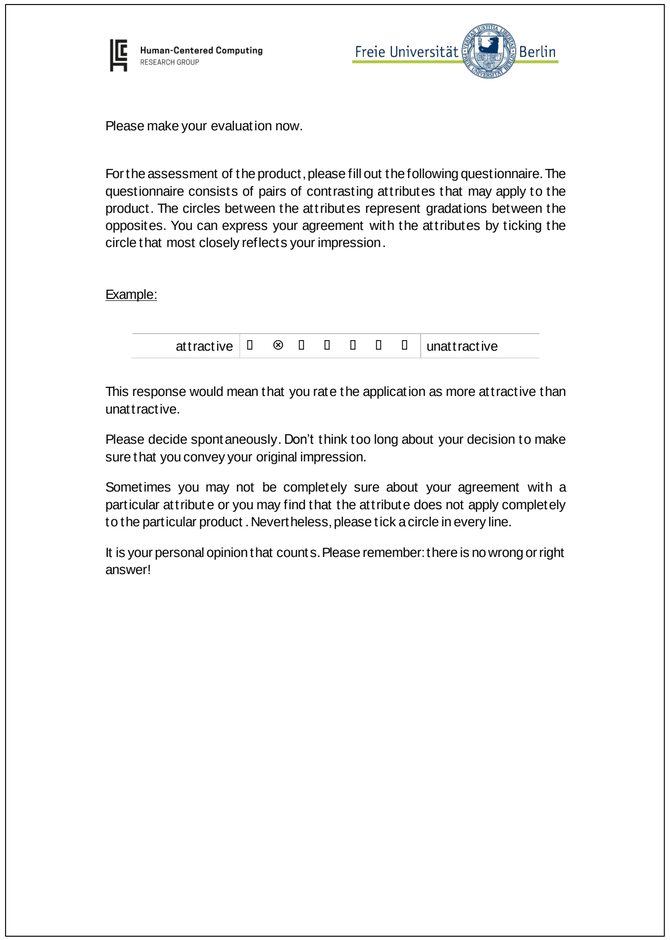
[2] https://design.canonical.com/2013/08/usability-testing-how-do-we-design-effective-tasks/

[3] Literature suggests that UEQ be filled out immediately after tasks; UEQ Handbook_V3.pdf

Verlauf

1. Freie Nutzung
2. Aufgaben
3. Nutzer-Evaluation
4. Nutzer-Metriken

Nutzer-Evaluation



Human-Centered Computing
RESEARCH GROUP

Freie Universität Berlin

Please make your evaluation now.

For the assessment of the product, please fill out the following questionnaire. The questionnaire consists of pairs of contrasting attributes that may apply to the product. The circles between the attributes represent gradations between the opposites. You can express your agreement with the attributes by ticking the circle that most closely reflects your impression.

Example:

attractive	○	⊗	○	○	○	○	○	unattractive

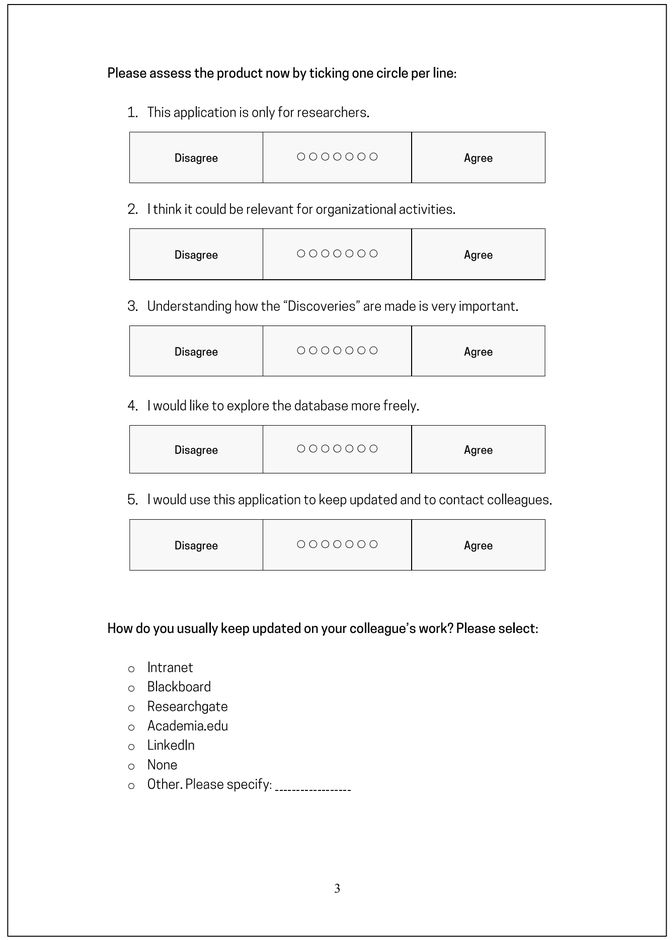
This response would mean that you rate the application as more attractive than unattractive.

Please decide spontaneously. Don't think too long about your decision to make sure that you convey your original impression.

Sometimes you may not be completely sure about your agreement with a particular attribute or you may find that the attribute does not apply completely to the particular product. Nevertheless, please tick a circle in every line.

It is your personal opinion that counts. Please remember: there is no wrong or right answer!

Standardevaluation



Please assess the product now by ticking one circle per line:

1. This application is only for researchers.

Disagree	○ ○ ○ ○ ○ ○ ○	Agree

2. I think it could be relevant for organizational activities.

Disagree	○ ○ ○ ○ ○ ○ ○	Agree

3. Understanding how the "Discoveries" are made is very important.

Disagree	○ ○ ○ ○ ○ ○ ○	Agree

4. I would like to explore the database more freely.

Disagree	○ ○ ○ ○ ○ ○ ○	Agree

5. I would use this application to keep updated and to contact colleagues.

Disagree	○ ○ ○ ○ ○ ○ ○	Agree

How do you usually keep updated on your colleague's work? Please select:

- Intranet
- Blackboard
- Researchgate
- Academia.edu
- LinkedIn
- None
- Other. Please specify: _____

3

Statement-Rating


Explore
Cultures
Processes
Discoveries
Featured Discovery
Collaboration Opportunity for Researchers!
New Project
SO233 WALVIS II
Zeitliche und geochemische Entwicklung des Walvisrückens im Südatlantik
CULTURES
PROCESSES
DISCOVERIES
HELP
DELL

Setting

Aufgaben

1. Sie werden von Kollegen einer anderen Institution kontaktiert. Diese möchten wissen, welcher Forschungsbereich die meisten Projekte hat und bitten Sie dies herauszufinden.

2. Finden Sie heraus wer die Forschung im Projekt NeFo 3 leitet und kontaktieren Sie diese Person.

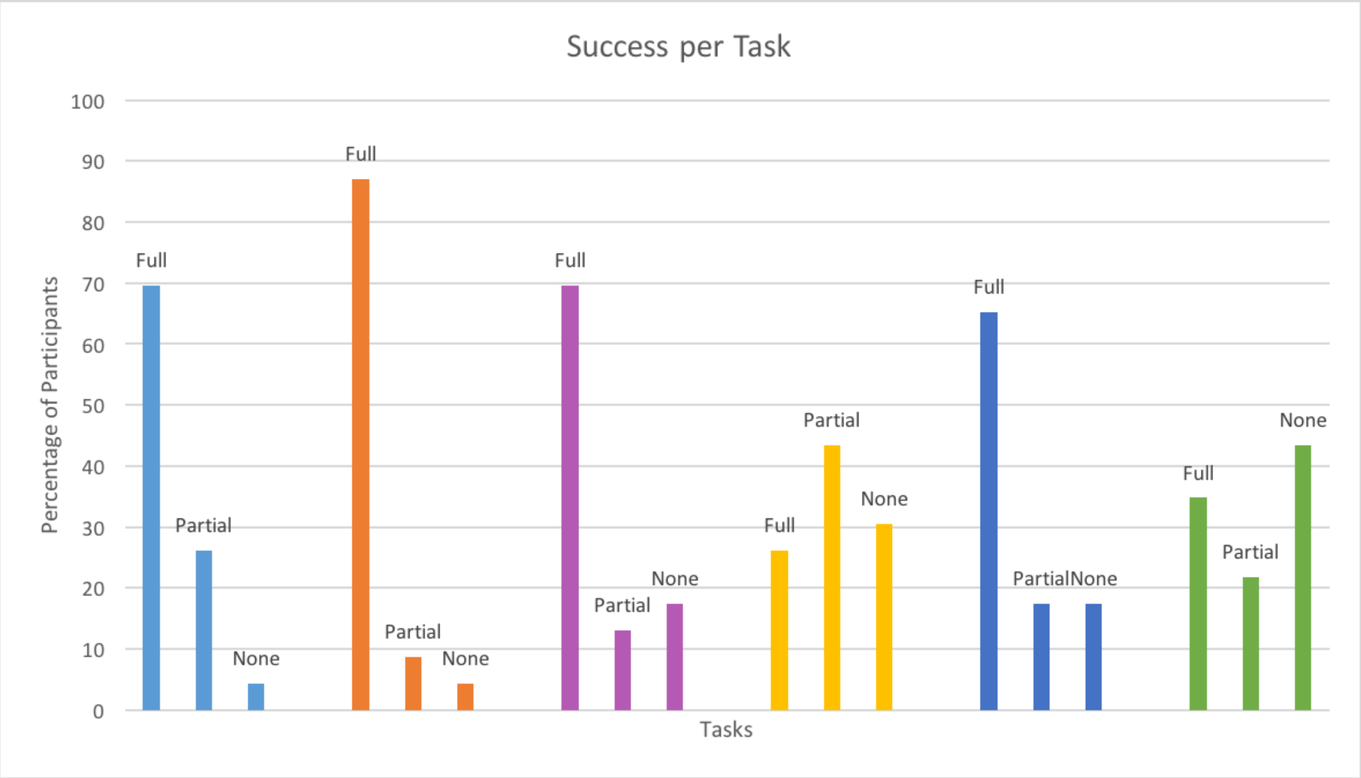
3. Sie möchten die Applikation nutzen um bei einem nächsten Gruppentreffen aktuell laufende Projekte zu präsentieren. Wählen Sie eine entsprechende Visualisierung.

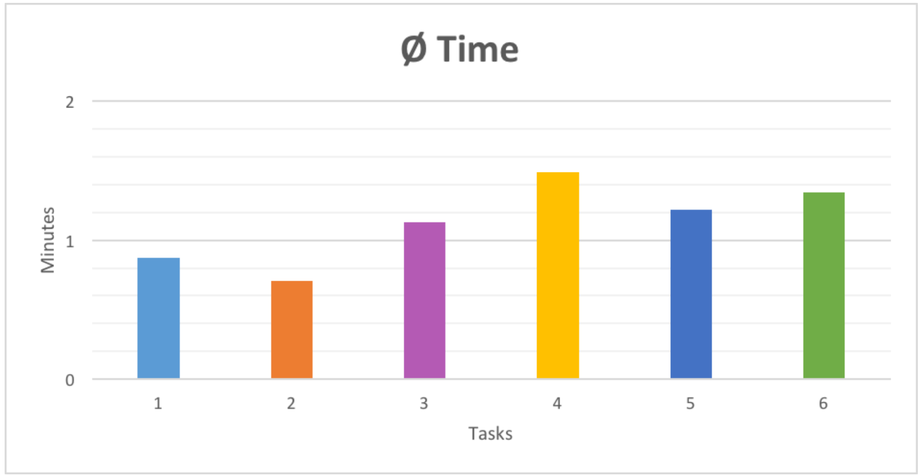
4. Finden Sie heraus was für neue Entdeckungen diese Applikation liefert.

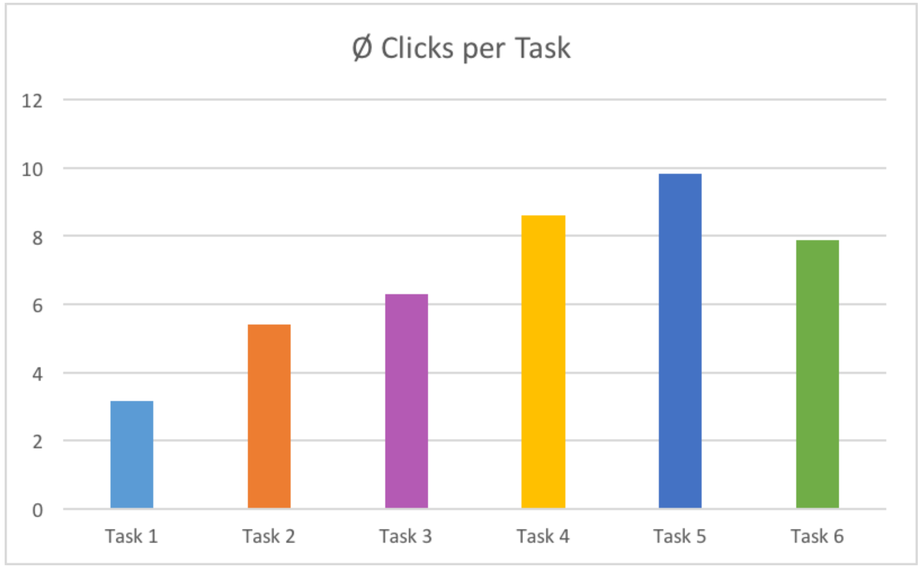
5. Sie möchten Informationen zu einem bestehenden Projekt hinzufügen. Finden Sie heraus wie.

6. Was für eine neue Entdeckung wurde für das Projekt BIORES gemacht? Finden Sie einen Weg diese Information zu verbreiten.

Aufgaben

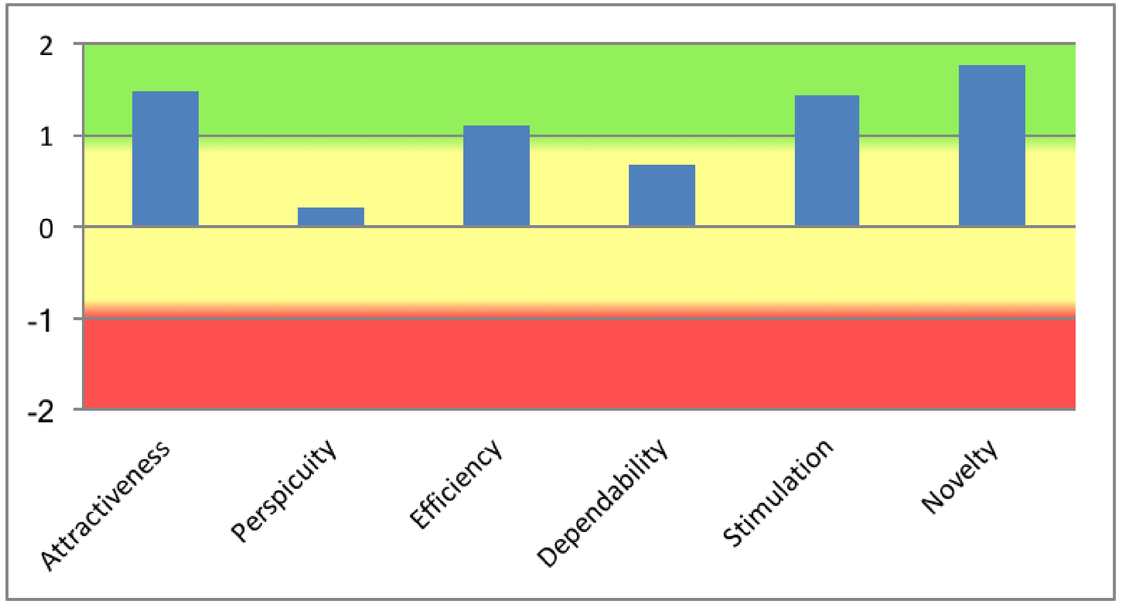

Success per Task
Percentage of Participants
100
90
80
70
60
50
40
30
20
10
0
Full
Partial
None
Full
Partial
None
Full
Partial
None
Full
Partial
None
Full
Partial
None
Full
Partial
None
Tasks

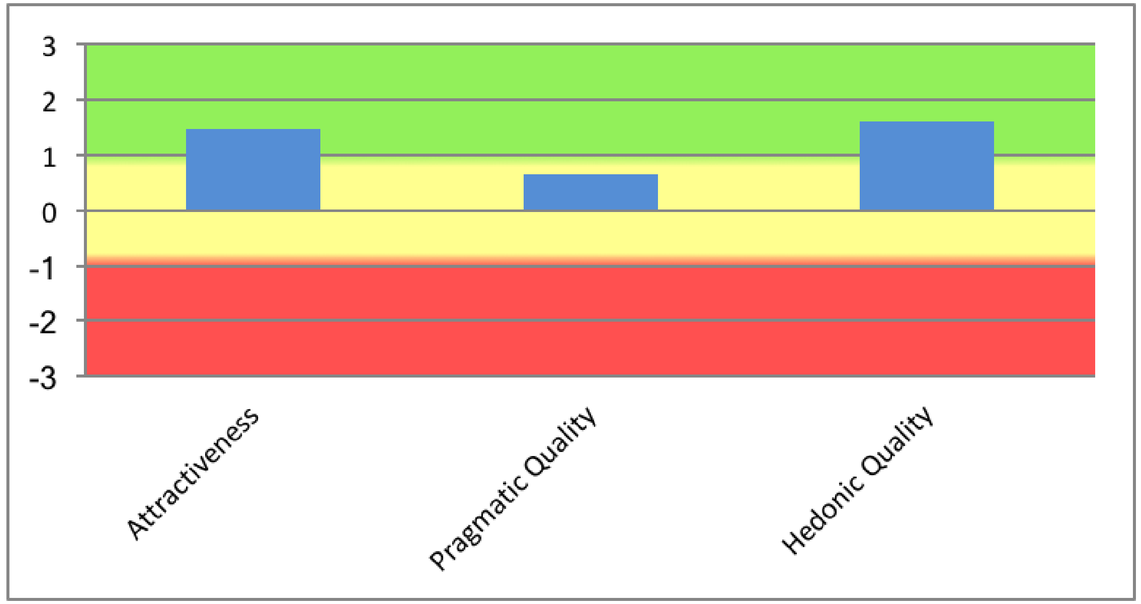

Ø Time
Minutes
2
1
0
1
2
3
4
5
6
Tasks


Ø Clicks per Task
12
10
8
6
4
2
0
Task 1
Task 2
Task 3
Task 4
Task 5
Task 6

Nutzer-Evaluation

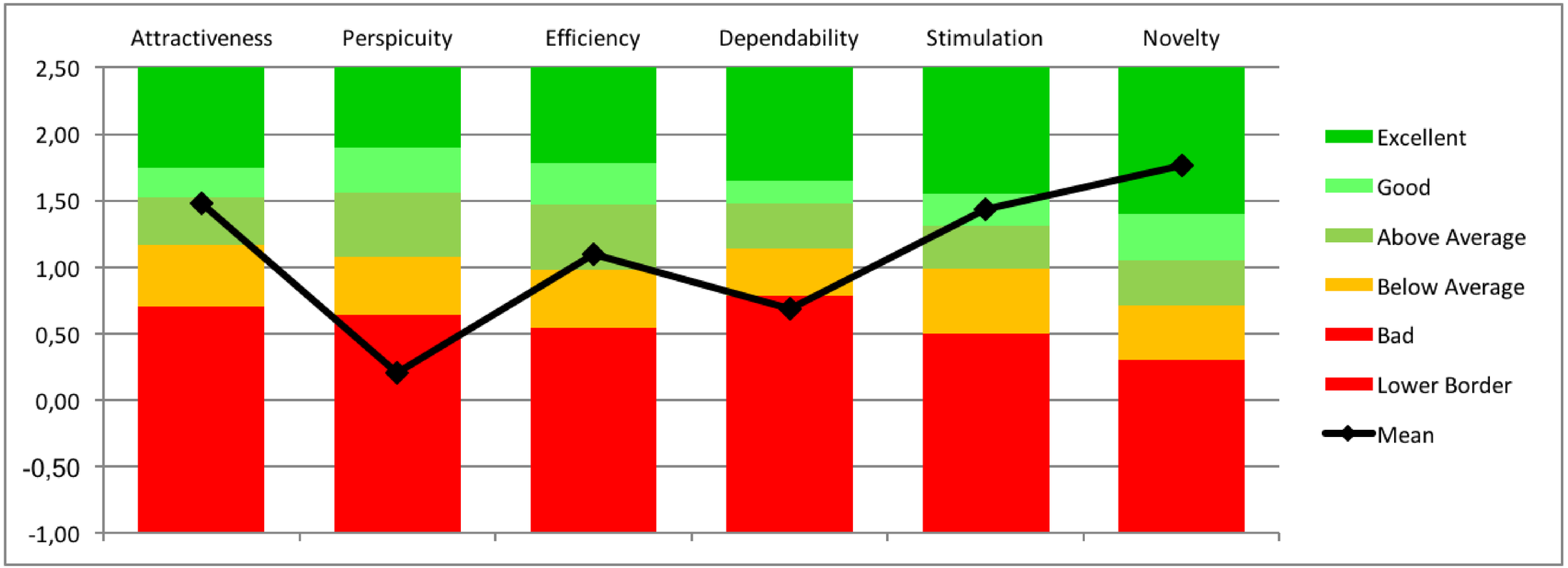
1. Standardisiert





Nutzer-Evaluation

1. Standardisiert



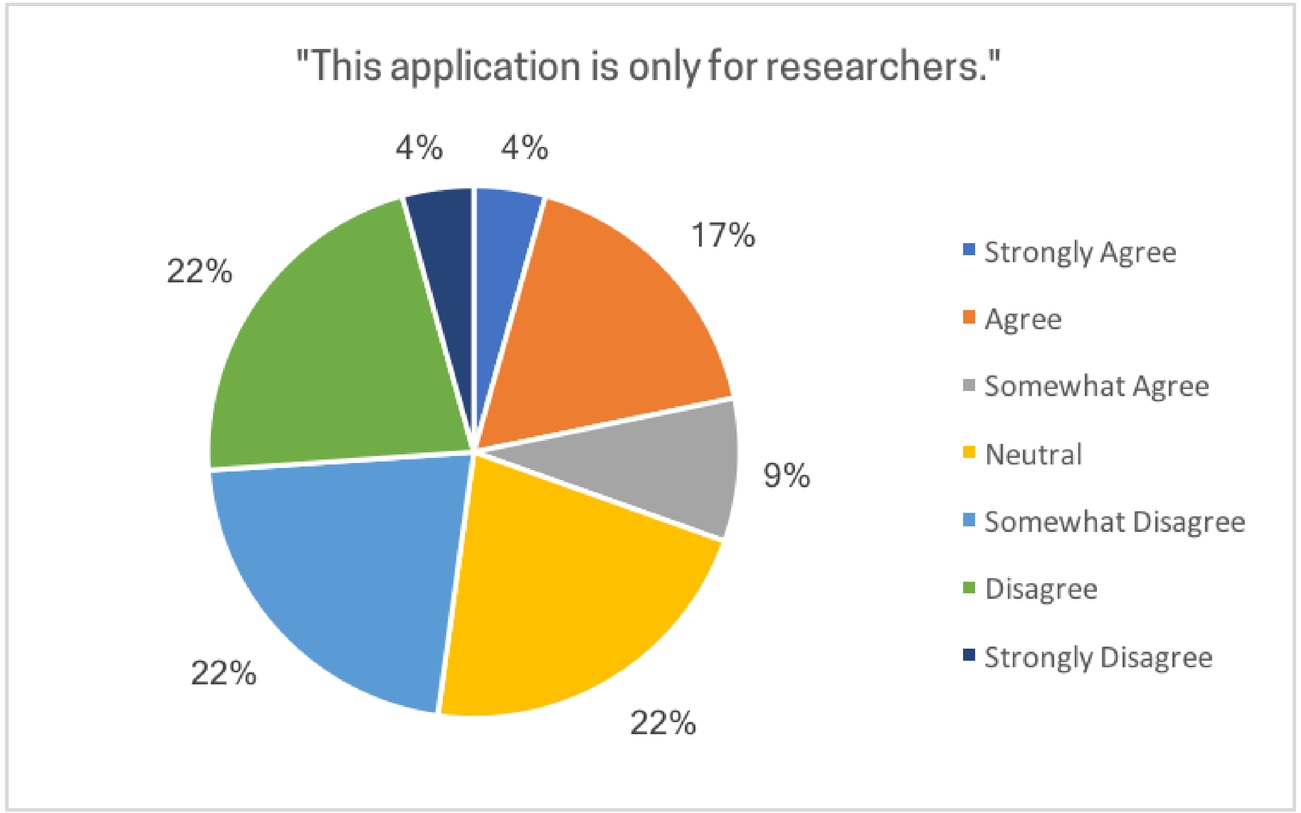
Nutzer-Evaluation

2. Statement-Rating

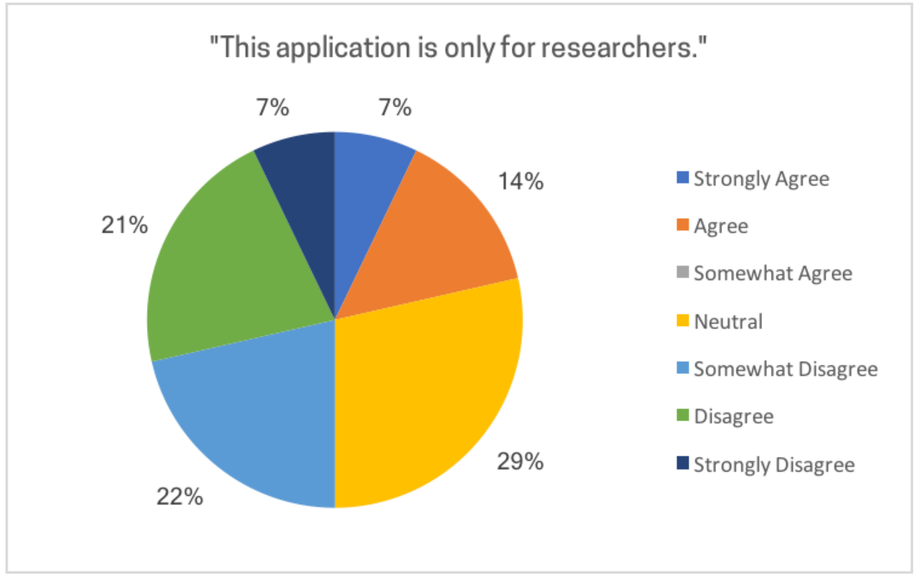
1. Diese Applikation ist nur für Forscher.
2. Ich glaube sie könnte für organisatorische Aktivitäten relevant sein.
3. Es ist sehr wichtig zu verstehen wie die “Discoveries” entstehen.
4. Ich würde gerne das Datenset freier explorieren können.
5. Ich würde diese Applikation nutzen um mich up-to-date zu halten und um Kollegen zu kontaktieren.

Nutzer-Evaluation

2. Statement-Rating



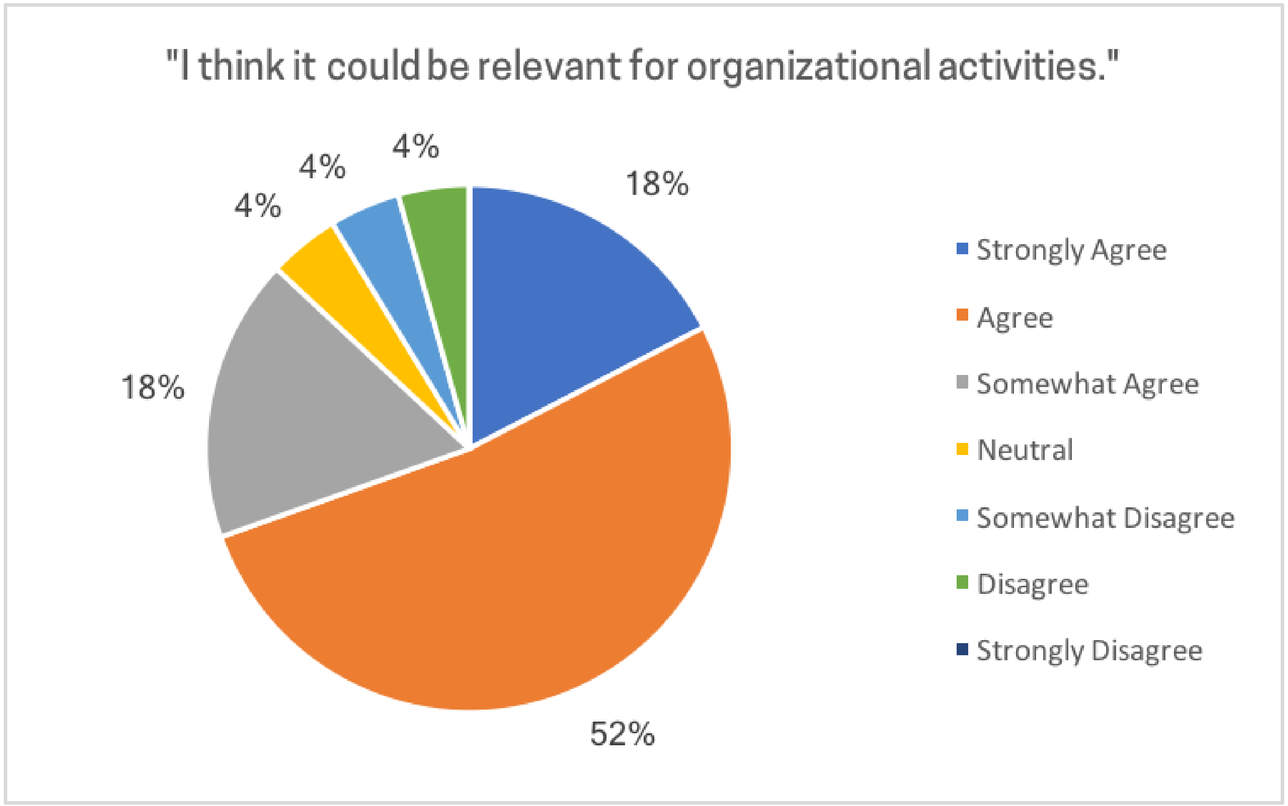
General



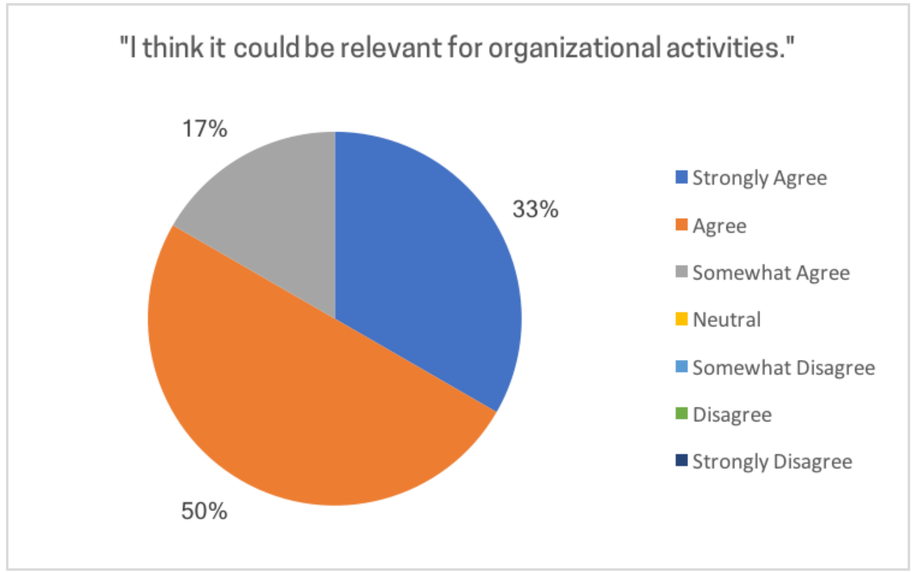
Life Sciences

Nutzer-Evaluation

2. Statement-Rating



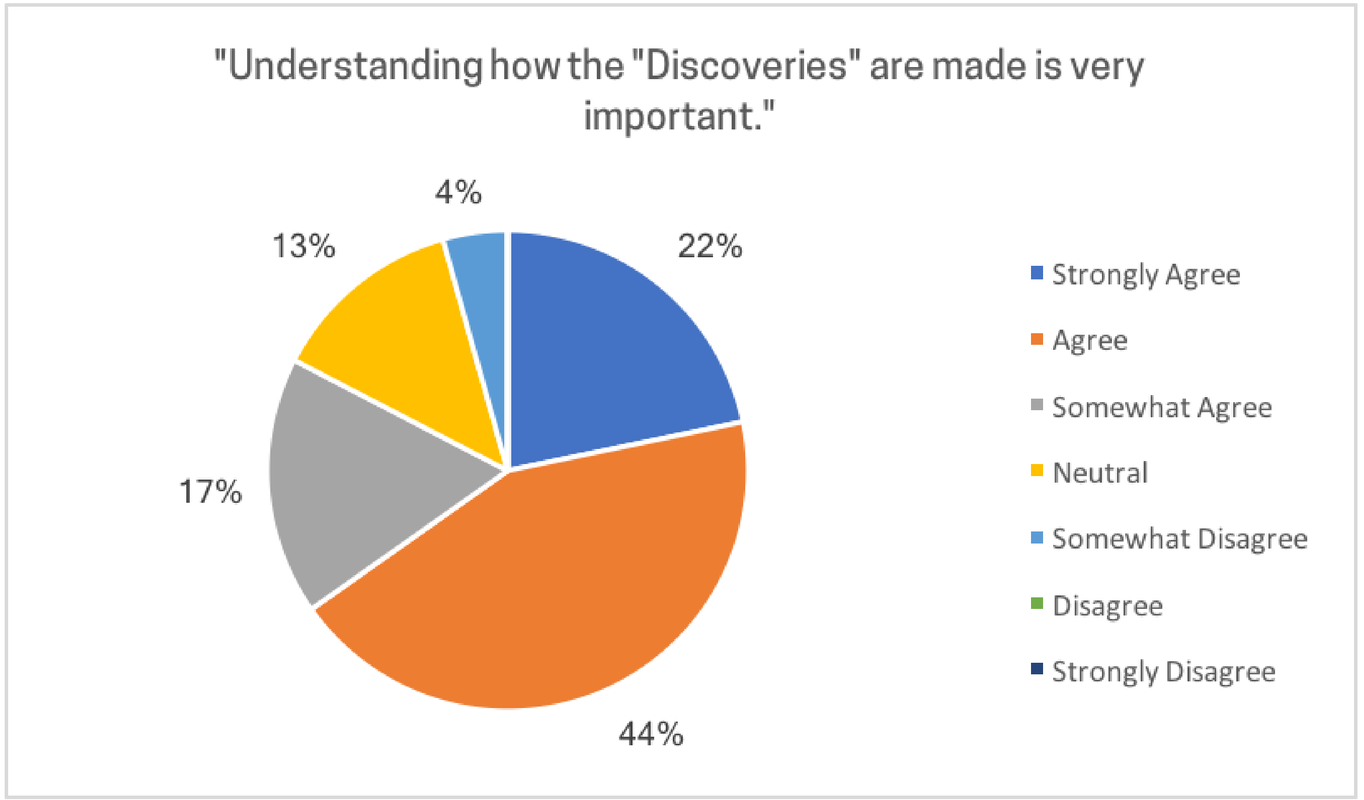
General



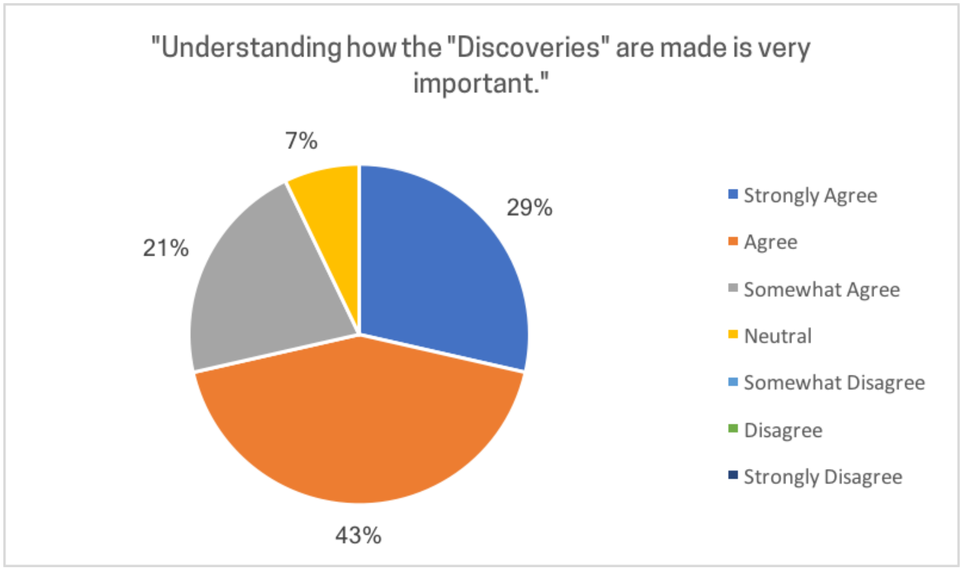
Researchers

Nutzer-Evaluation

2. Statement-Rating



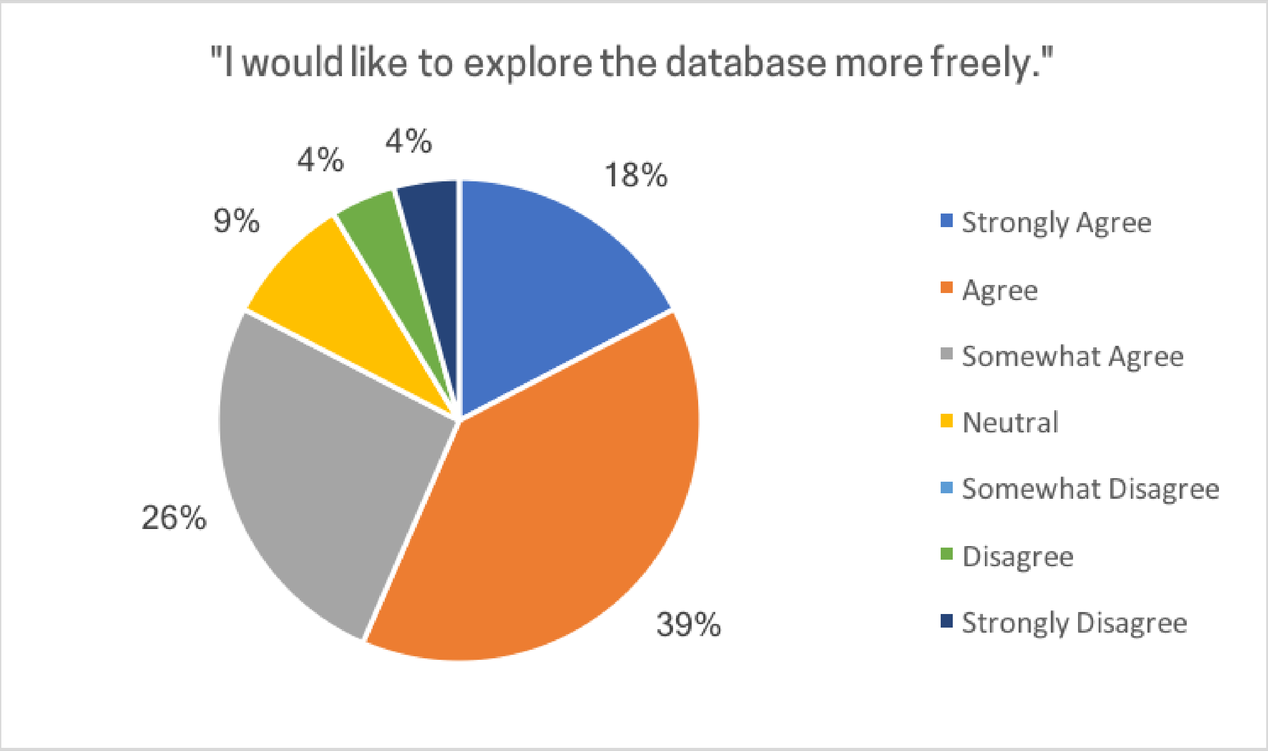
General



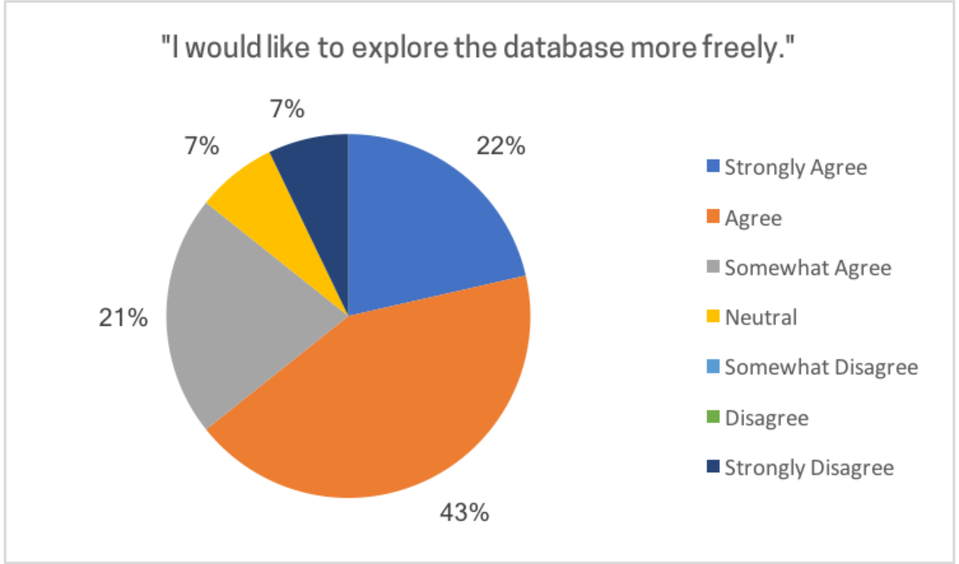
Life Sciences

Nutzer-Evaluation

2. Statement-Rating



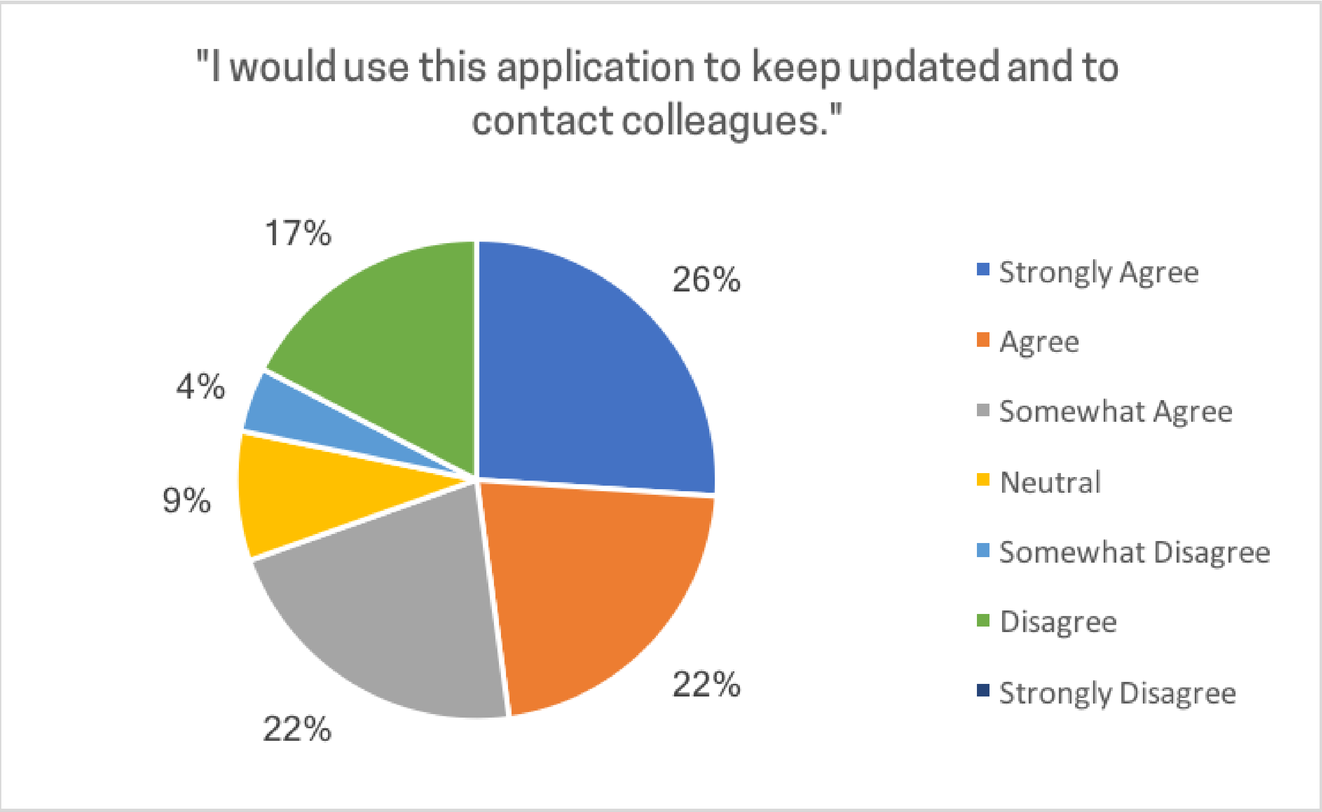
General



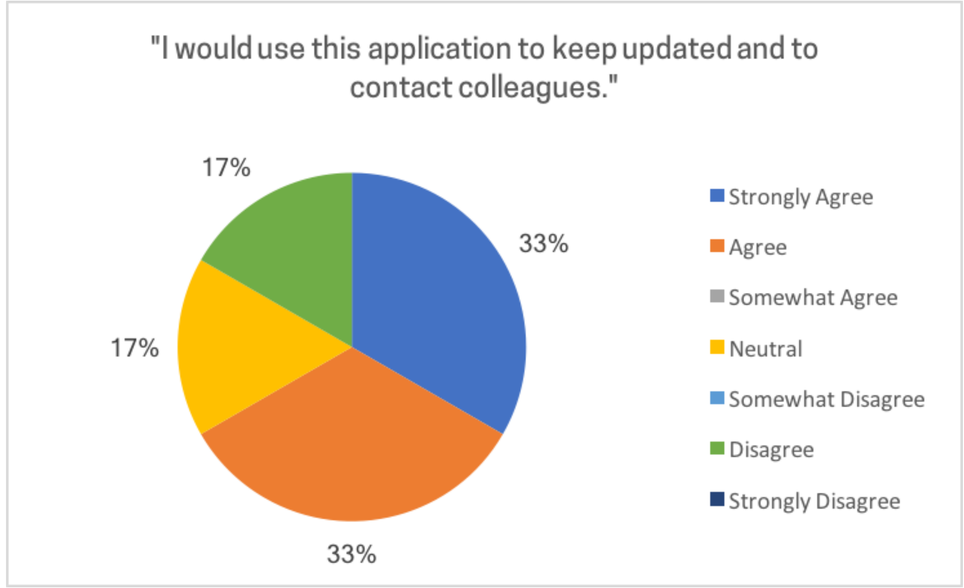
Life Sciences

Nutzer-Evaluation

2. Statement-Rating



General

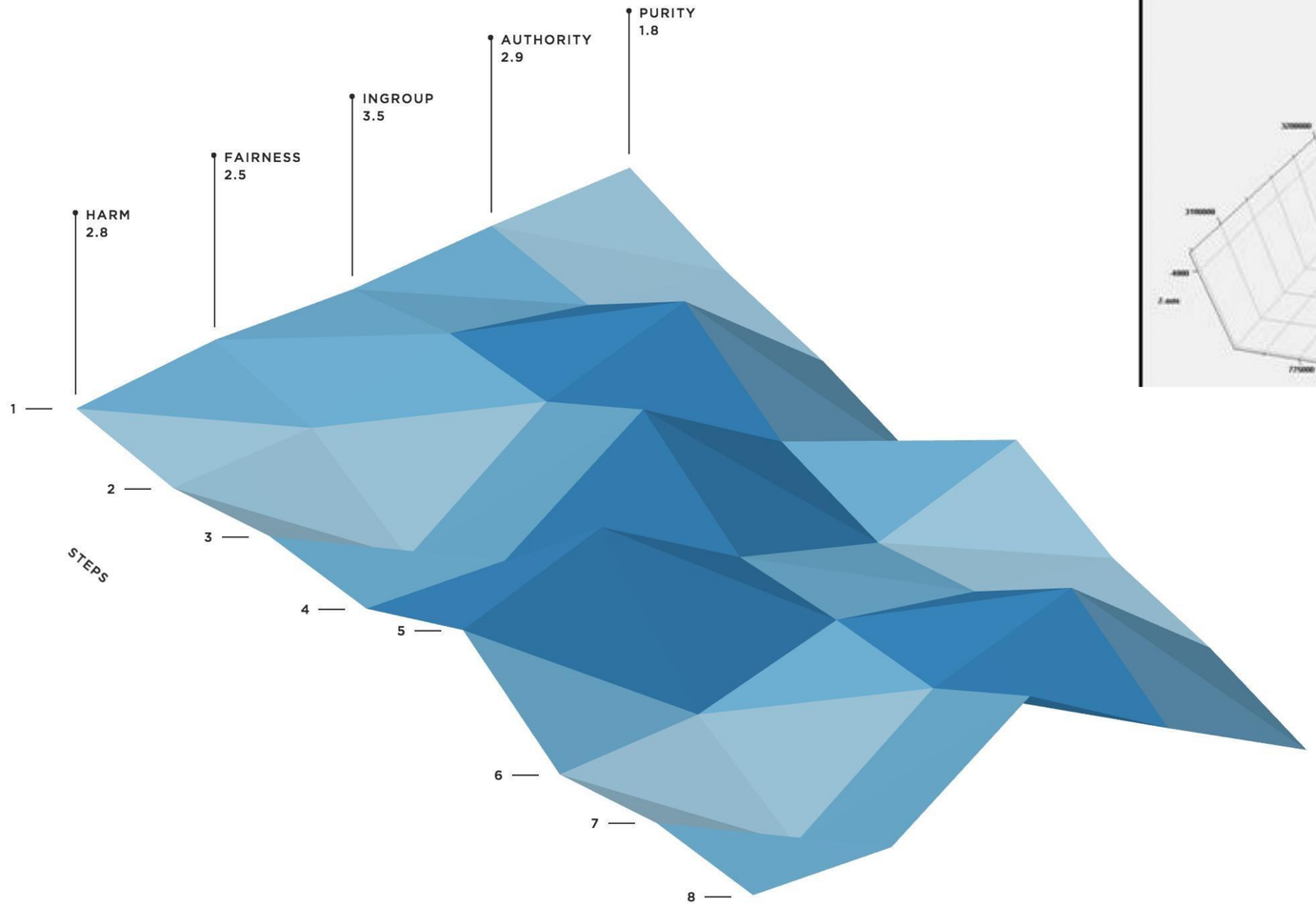


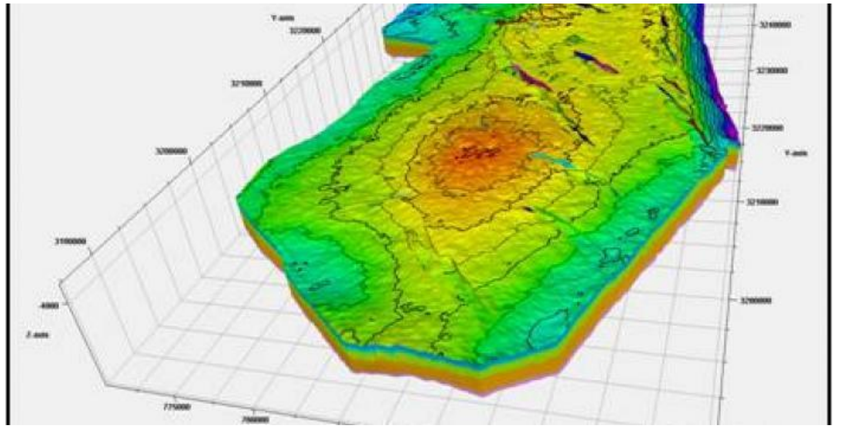
Life Sciences

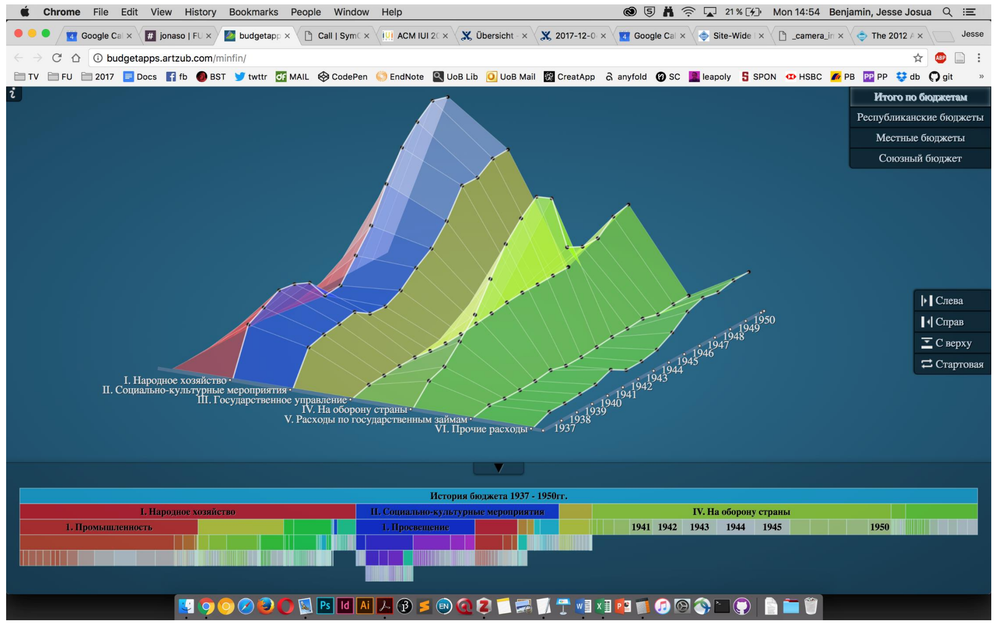
Ausblick

Weiterentwicklung des Prototyps

1. Alternativen für Potential-Visualisierung testen
2. Suchfunktion mit Filtern
3. Filterbare Projektliste
4. Interaktives Organigramm
5. Neue Visualisierung: “Daten-Feldstudie”


HARM
2.8
FAIRNESS
2.5
INGROUP
3.5
AUTHORITY
2.9
PURITY
1.8
1
2
3
4
5
6
7
8
STEPS




Chrome File Edit View History Bookmarks People Window Help
budgetapps.artzub.com/minfin/
Итого по бюджетам
Республиканские бюджеты
Местные бюджеты
Союзный бюджет
I. Народное хозяйство
II. Социально-культурные мероприятия
III. Государственное управление
IV. На оборону страны
V. Расходы по государственным займам
VI. Прочие расходы
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
Слева
Справ
С верху
Стартовая
История бюджета 1937 - 1950гг.
I. Народное хозяйство
II. Социально-культурные мероприятия
IV. На оборону страны
I. Промышленность
I. Просвещение
1941 1942 1943 1944 1945 1950

Research

Jesse

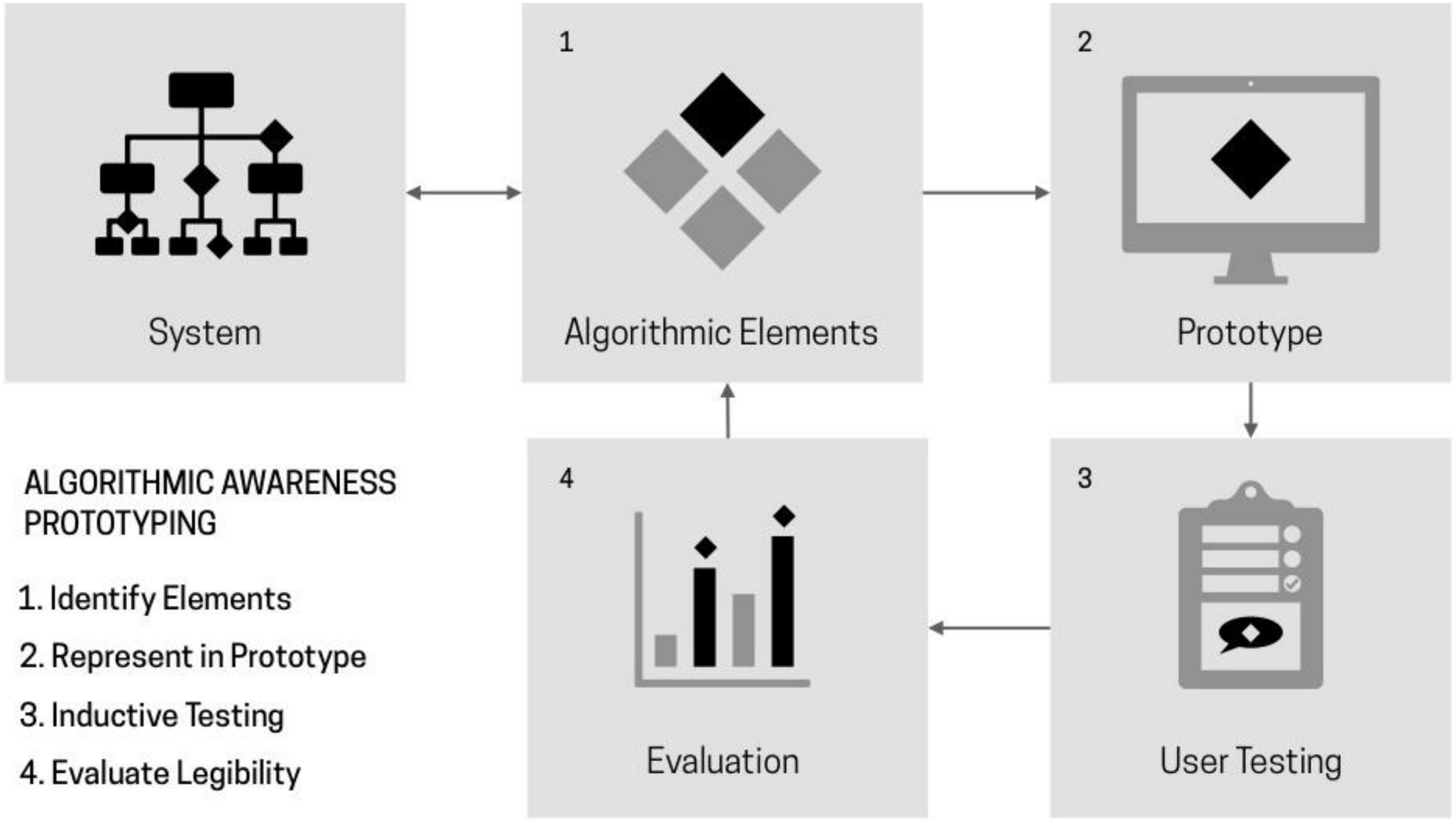
Development of a Design Methodology for Automated Intersubjective Systems

How can algorithmic processes be made perceivable, while at the same be simplified enough for actionable insights?

Which algorithms are we talking about?

How to approach this practically?

Which methods and models are of use?

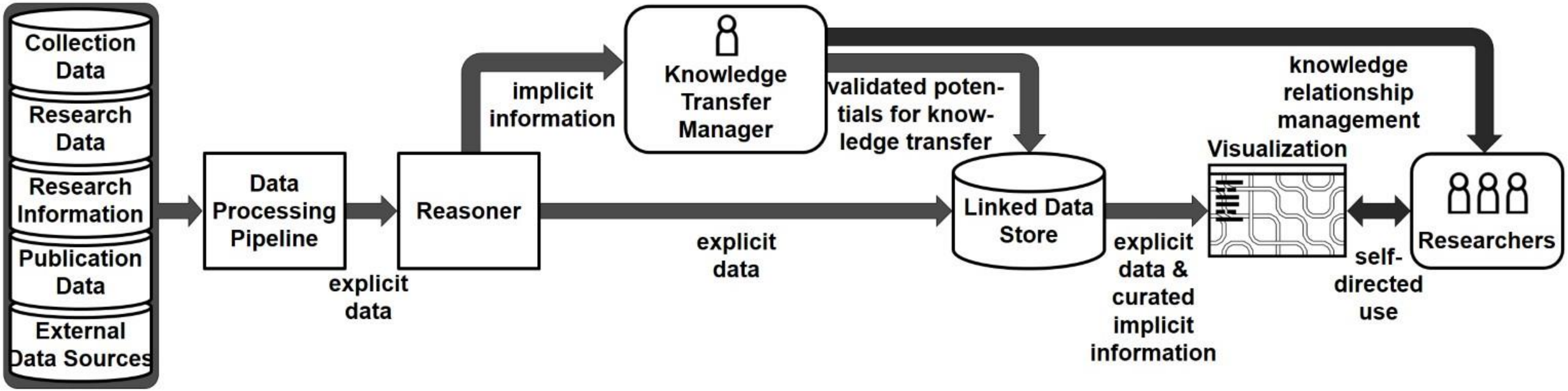


ALGORITHMIC AWARENESS PROTOTYPING

1. Identify Elements
2. Represent in Prototype
3. Inductive Testing
4. Evaluate Legibility

The Role of the Knowledge Transfer Manager (KTM)

Quality Gate & Boundary Spanner



Discussion

Freie Universität Berlin

[Backup Slides]

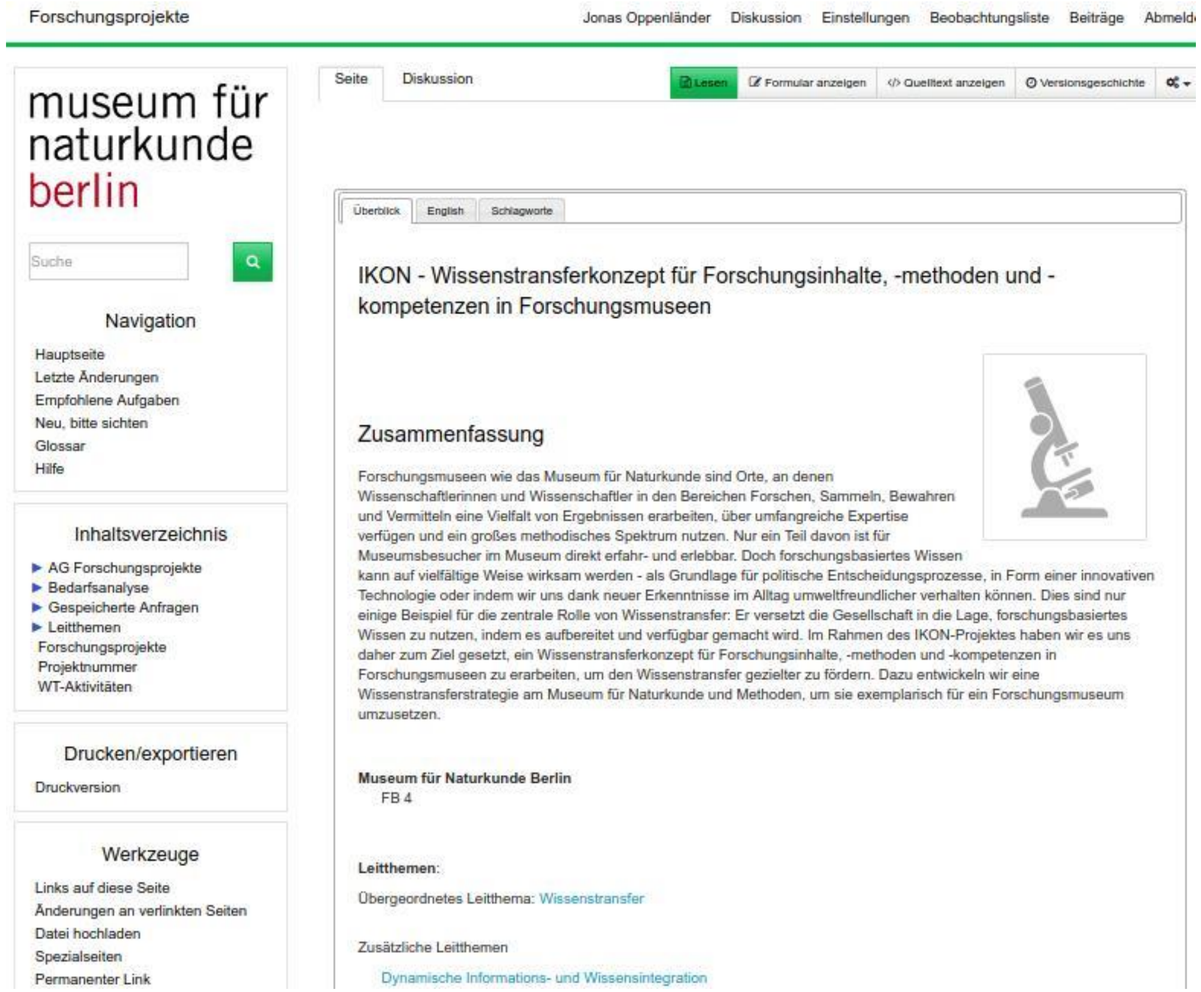
Ontology

Current State and Next Steps

Ontology

Current State

- TBox: „Kerndatensatz Forschung“
  - Overview
- ABox: Sample data from MfN Wiki with Research Project Information



Ontology Engineering

Freie Universität Berlin

Next Steps

1. Prune KDF to a minimum
2. Extend with concepts and properties from existing terminologies

   Dublin Core, FOAF/vCard, Organisation Ontology, FRAPO, Europeana, SKOS,

   FaBIO/Bibo, GND, CIDOC-CRM, Getty Locations, PROV-O/voiD
3. Extend with own concepts and properties, if necessary

Data Integration

Integration of MfN-internal and external data sources

MfN-internal Sources available to IKON – Current State

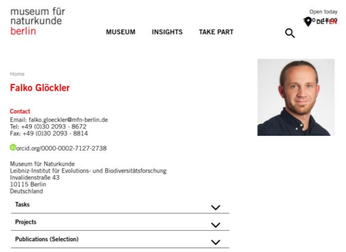
Wiki

Research Projects

MfN Website

Researchers

- Research interests
- Research projects
- Publications



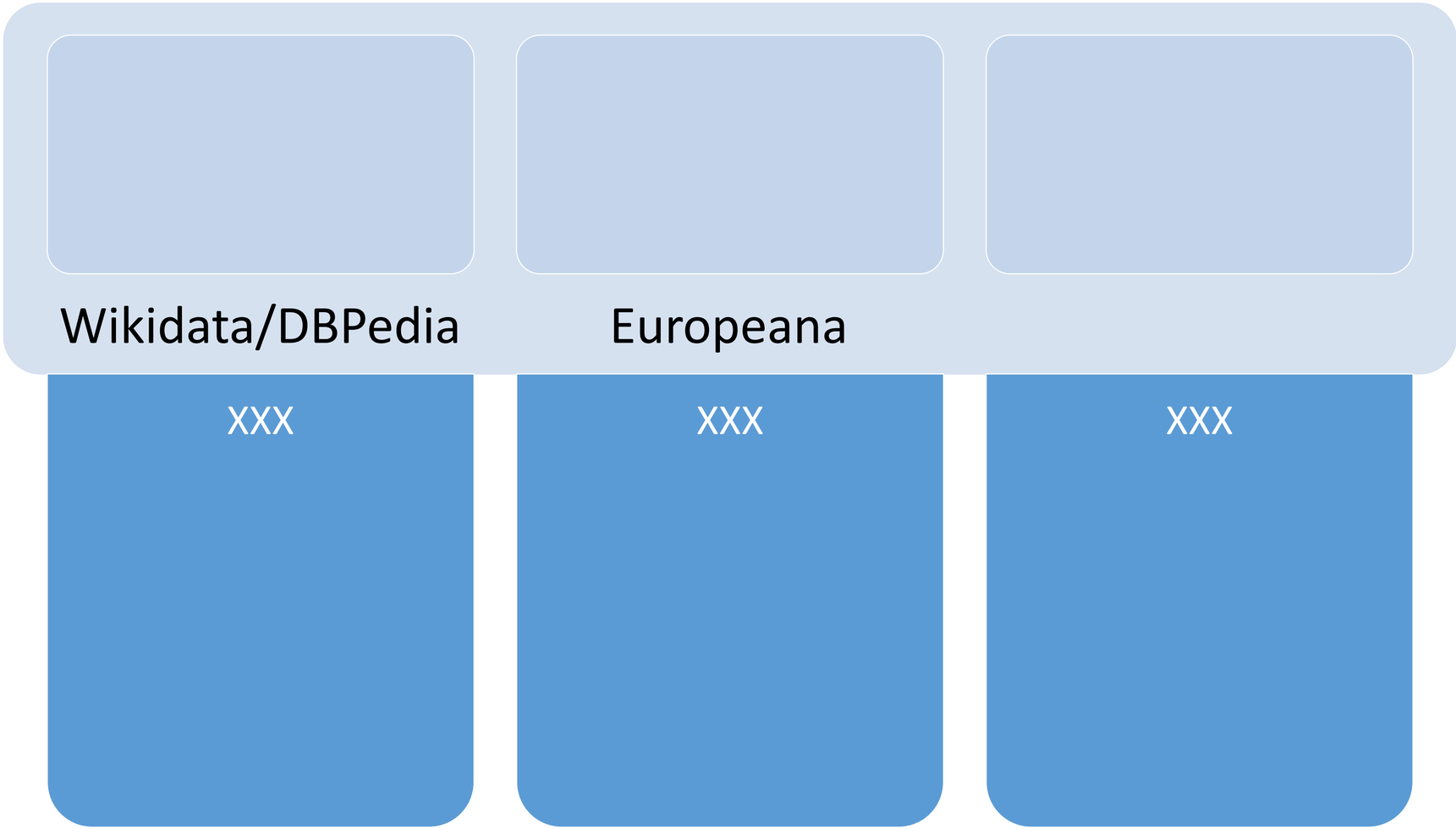
Research Objects

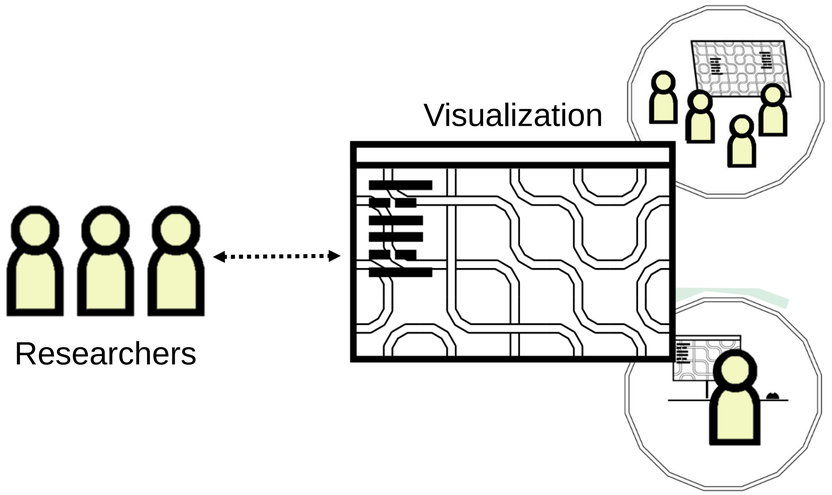
Collection data (coll.mfn-berlin.de)

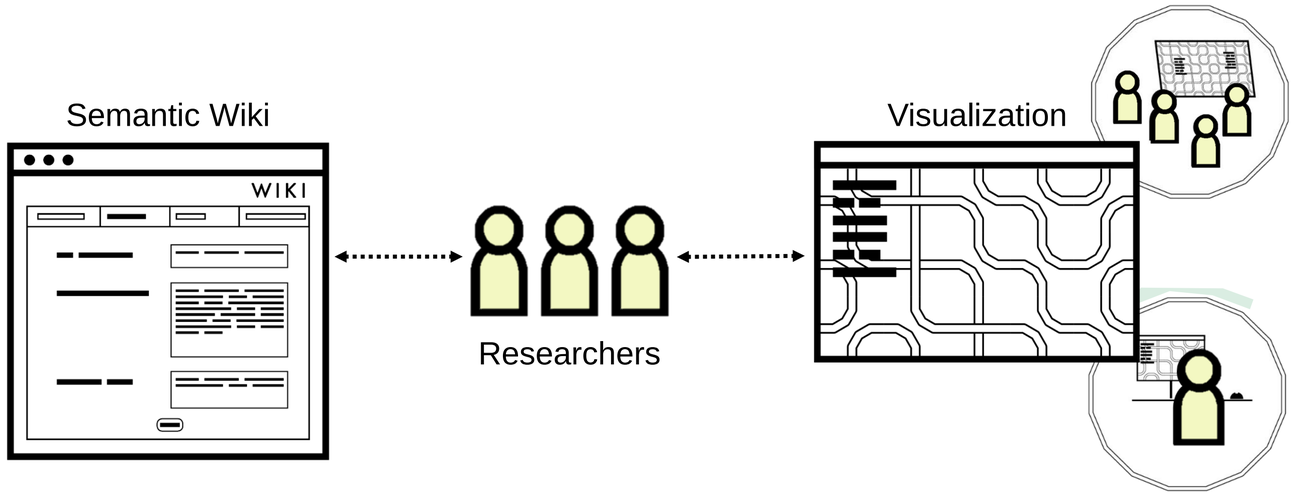
Collector Wiki

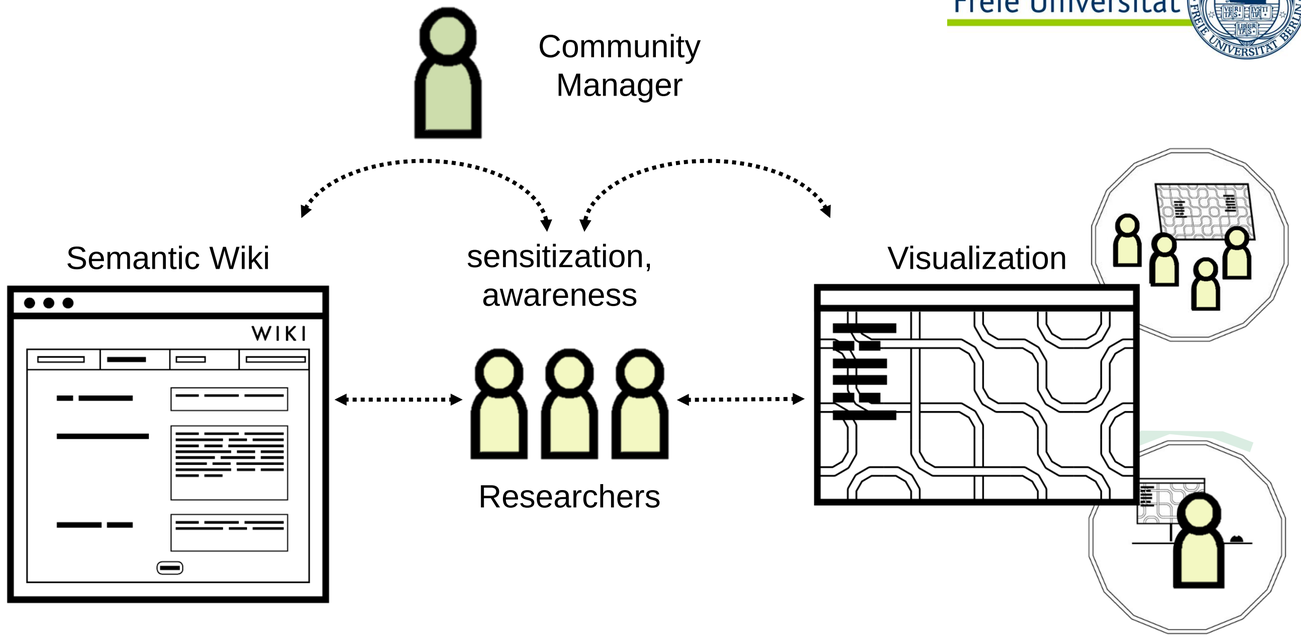
(no access, yet)

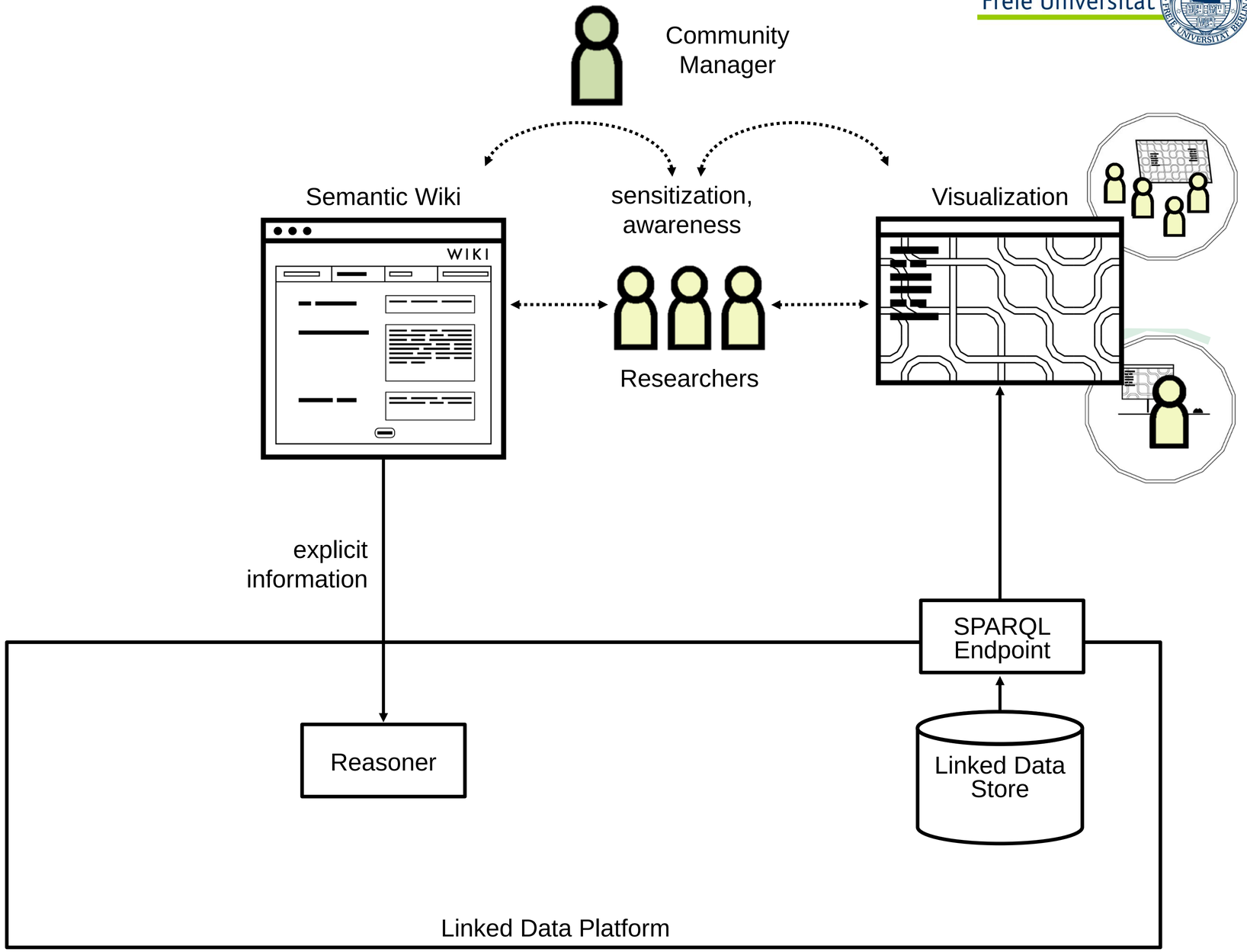
Potential External Sources

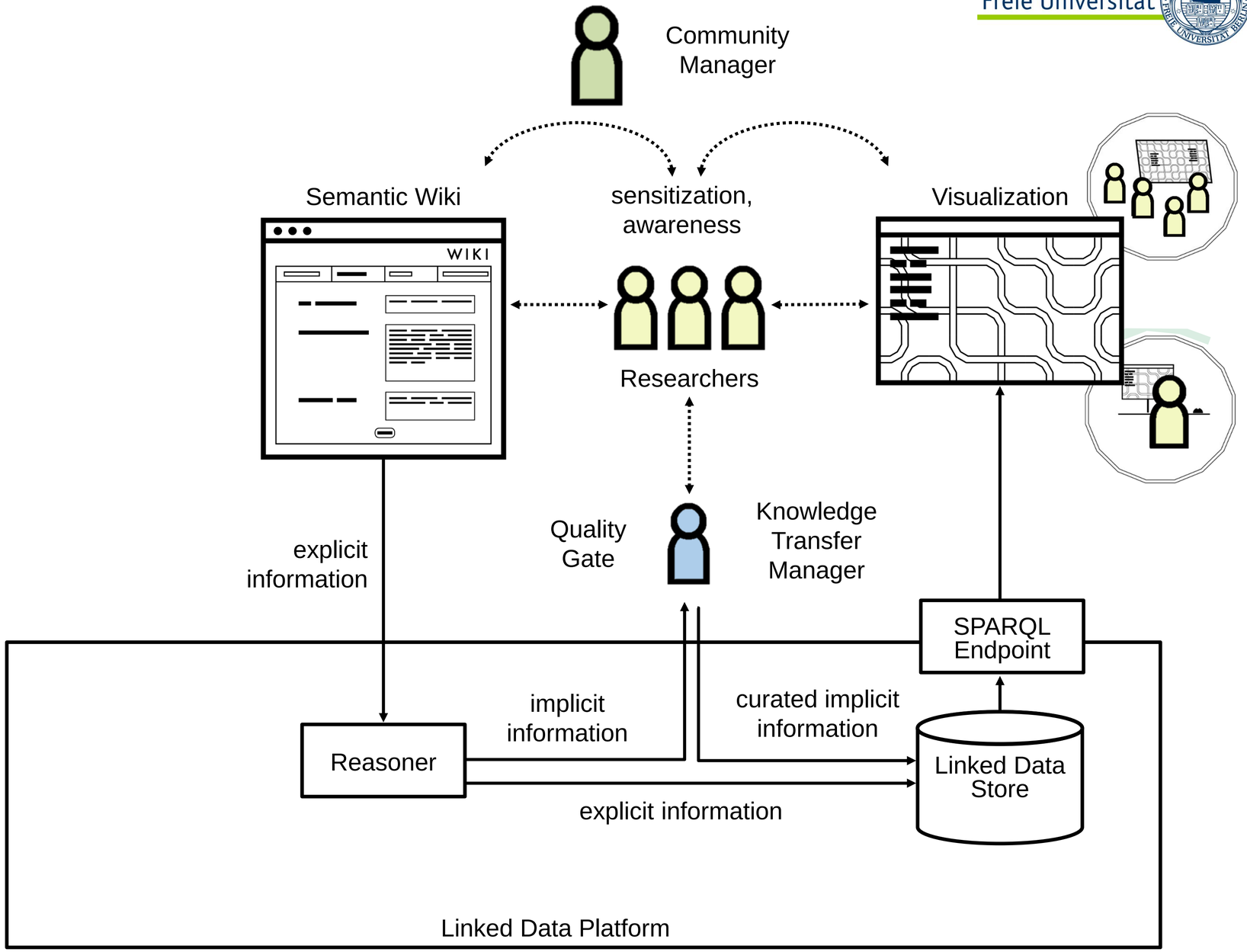



Visualization
Researchers


Semantic Wiki
WIKI
Researchers
Visualization


Community
Manager
Semantic Wiki
sensitization,
awareness
Visualization
WIKI
Researchers


Community Manager
Semantic Wiki
sensitization, awareness
Visualization
WIKI
Researchers
explicit information
SPARQL Endpoint
Reasoner
Linked Data Store
Linked Data Platform


Community Manager
Semantic Wiki
sensitization, awareness
Visualization
WIKI
Researchers
explicit information
Quality Gate
Knowledge Transfer Manager
SPARQL Endpoint
implicit information
curated implicit information
Reasoner
Linked Data Store
explicit information
Linked Data Platform