Design and Implementation of a Systematic Catalog of Natural Language Processing Use Cases in the Legal Domain

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Outline

1. **Motivation**
   - Legal Tech and Natural Language Processing
   - Related Work

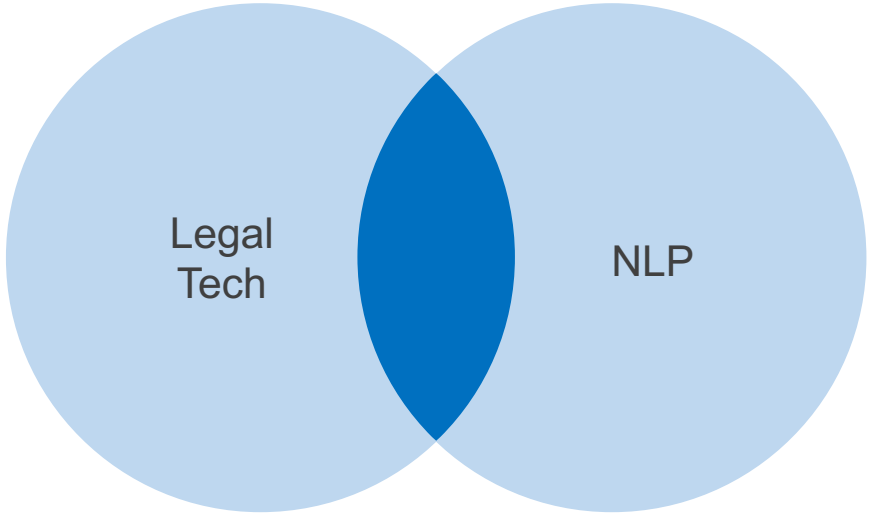
2. **Research Questions, Methodology and Results**
   - RQ1 Use Case Validation
   - RQ2 Model and Structure
   - RQ3 Design and Implementation
   - RQ4 System Usability Evaluation

3. **Discussion**
   - Limitations
   - Future Work

Motivation

Legal Tech

- Case law databases
- Document automation
- Legal decision making
- …



NLP

- Topic modeling
- Summarization
- Named Entity Recognition
- …

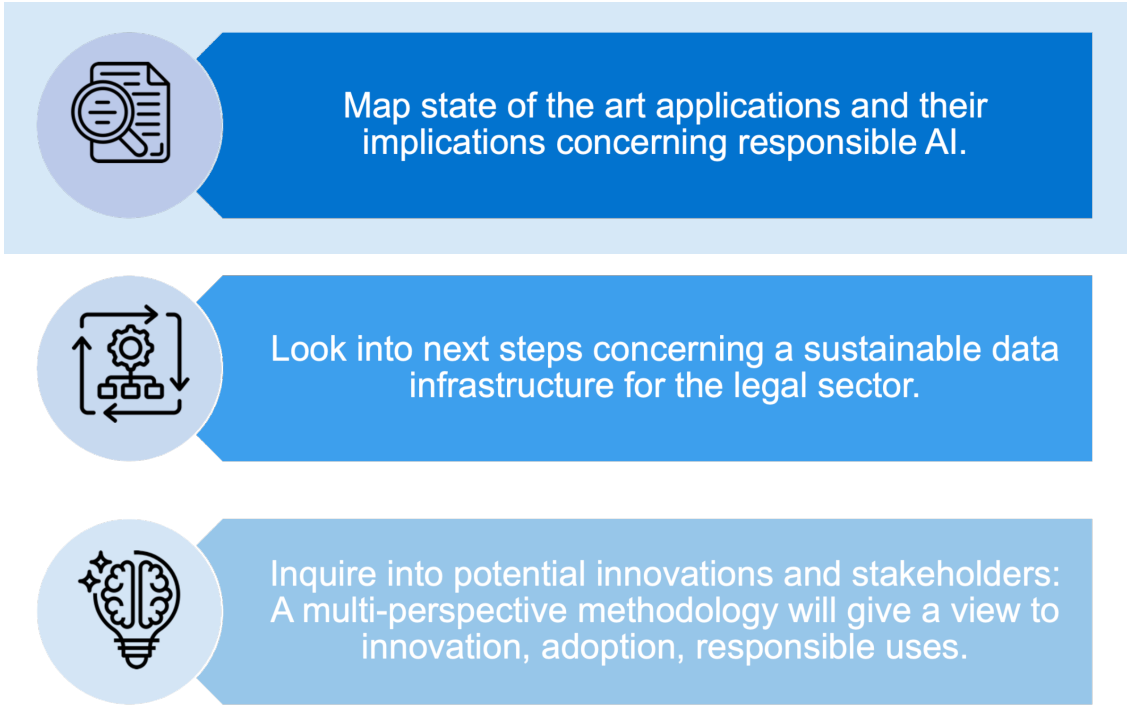
Key Ideas

What **Legal Tech use cases** can be assisted by which **NLP techs**?
How to represent them in a joint knowledge base?

Motivation – NLawP Project

Natural Language Processing and Legal Tech

- How can AI technologies impact the legal sector in disruptive ways
- Existing results: Legal Tech use case and related NLP technology list
- **Thesis Goal**: a systematic catalog - *Tech Map*
  - The first deliverable of NLawP Project

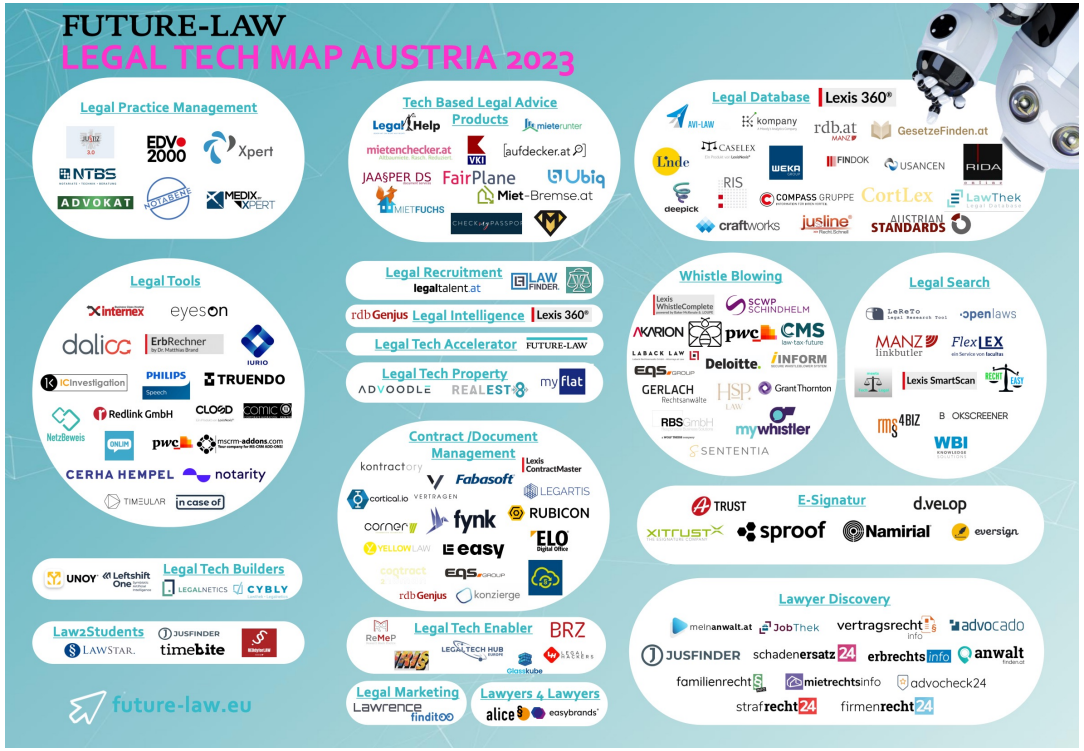


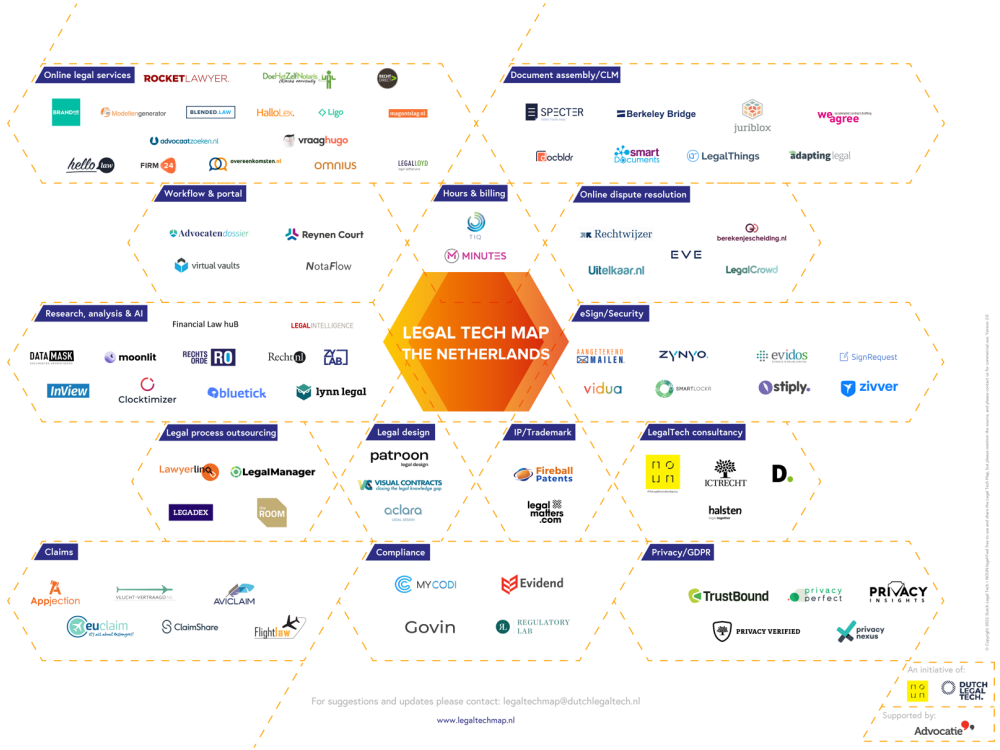
See Sebis – NLawP for more information

Motivation – Tech Map

Research Gap

- Several existing Legal Tech Maps
- Almost all of them focus on Legal Tech companies instead of technologies and their use cases





Example tech (company) maps from other institution: Austrian legal Tech Map 2023, Legal Geek Startup Map, Stanford LegalTech List , and Dutch Legal Tech

Research Questions

RQ1
Validate Use Cases

How can Legal Tech use cases from previous research be validated?

RQ2
Structure & Model

How can one structure the use cases into a joint knowledge base with bidirectional relations, and from an engineering perspective, what entities are needed to implement such a joint knowledge base?

RQ3
Design & Implementation

What is required to create a user-friendly and intuitive tech map, which facilitates indexing, exploring, searching and navigating among the knowledge base?

RQ4
Evaluate Usability

How can the usability of the tech map be evaluated, e.g., with Technology Acceptance Model (TAM), especially for legal practitioners?

RQ1 Use Case Validation

- **Research Question**
  How can Legal Tech use cases from previous research be validated?

- **Research Method**: structured survey
  - **Questionnaire Design**
    - Demographic questions
      - Professional background
      - Experience
    - Use case validation questions
      - Legal relevance
      - ELSA concerns
        Ethical, Legal, Social Aspects
    - Open-ended questions
      - General suggestions
      - Follow-up interest
  - **Survey Distribution**

Legal Relevance

Please select whether you agree with the following statement for each use case.

This use case is relevant and important in the legal field.

	Disagree		Neutral		Agree	N/A
1. Automation of Auditing *	○	○	○	○	○	○
2. GDPR Compliance *	○	○	○	○	○	○

ELSA Concerns

Please select whether you agree with the following statement for each use case.

This use case involves ethical, legal, or social risks.

	Disagree		Neutral		Agree	N/A
1. Automation of Auditing *	○	○	○	○	○	○
2. GDPR Compliance *	○	○	○	○	○	○

RQ1 Use Case Validation

- **Research Question**
  How can Legal Tech use cases from previous research be validated?

- **Research Method**: structured survey
  - **Questionnaire Design**
  - **Survey Distribution**
    - Individual contacts
      - Contacts from previous research
      - LinkedIn
    - Social media: profession- and interest-based groups
      - LinkedIn
      - Facebook
      - Reddit

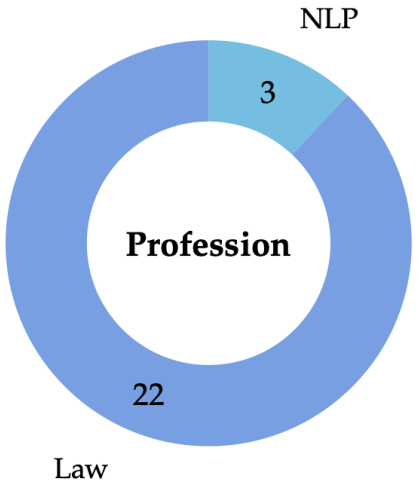
RQ1 Use Case Validation - Results

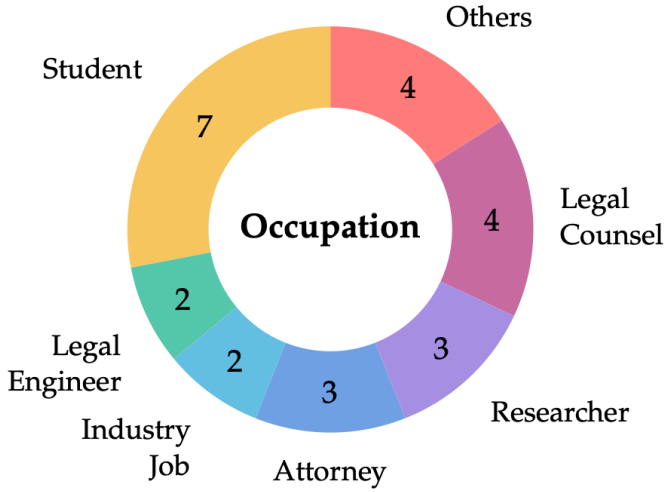
Demographic Analysis

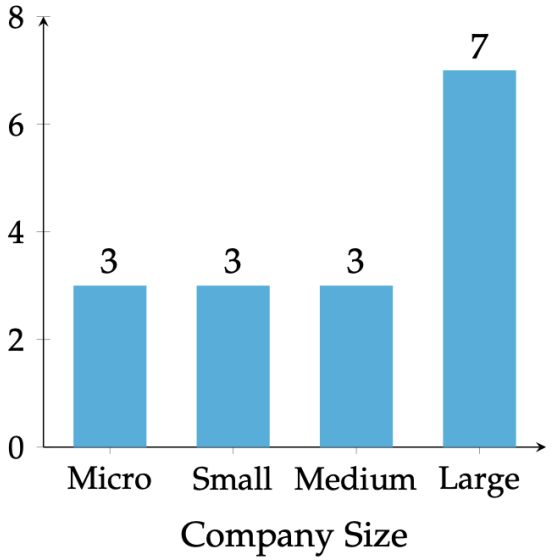
- 25 responses in total
- 88% respondents are legal professionals

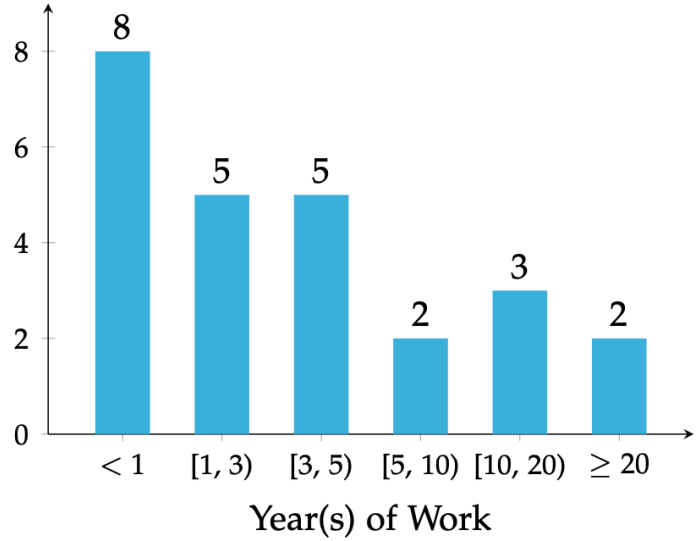
- Diverse experience
  - Occupation
  - Company size
  - Year(s) of work

Rich pool of perspectives and ideas









RQ1 Use Case Validation - Results

Use Case Validation Results

- Strongly disagree - 1, strongly agree - 5

- Content Lifecycle Management
  Most legal relevant, least ELSA concerned
- Judge: Decision Making
  Most ELSA concerned
- Ranking of Lawyers
  Least legal relevant

- This analysis falls out of our scope, but…
- Our results serve as groundwork for further analysis

Use Case	Legal Relevance		ELSA Concern	
	Mean	Normalized	Mean	Normalized
Automation of Auditing	3.72	4.49	2.88	2.80
GDPR Compliance	3.57	4.11	2.87	2.78
Risk Assessment	3.42	3.73	3.08	3.30
File Difference Tracking	3.76	4.59	2.60	2.10
Document Classification	3.88	4.90	2.36	1.50
Content Lifecycle Management	3.92	5.00	2.16	1.00
Error Detection	3.80	4.69	2.40	1.60
Contract Generation	3.64	4.29	2.80	2.60
Legal Document Enrichment	3.58	4.13	2.67	2.28
Summarization	3.72	4.49	2.64	2.20
Anonymization	3.44	3.78	2.76	2.50
Information Extraction	3.83	4.77	2.68	2.30
Document Retrieval	3.75	4.57	2.46	1.75
Judge: Decision Making	2.68	1.84	3.76	5.00
Legal Reasoning	2.88	2.35	3.46	4.25
Strategy Recommendations	3.68	4.39	2.96	3.00
Chatbot: Client-intake and Drafting	3.75	4.57	2.96	3.00
Question Answering	3.40	3.68	2.67	2.28
Ranking of Lawyers	2.35	1.00	3.00	3.10
Changes in Law	3.54	4.03	2.76	2.50
Database for Court Decisions	3.79	4.67	2.46	1.75
Matter Management	3.48	3.88	2.30	1.35

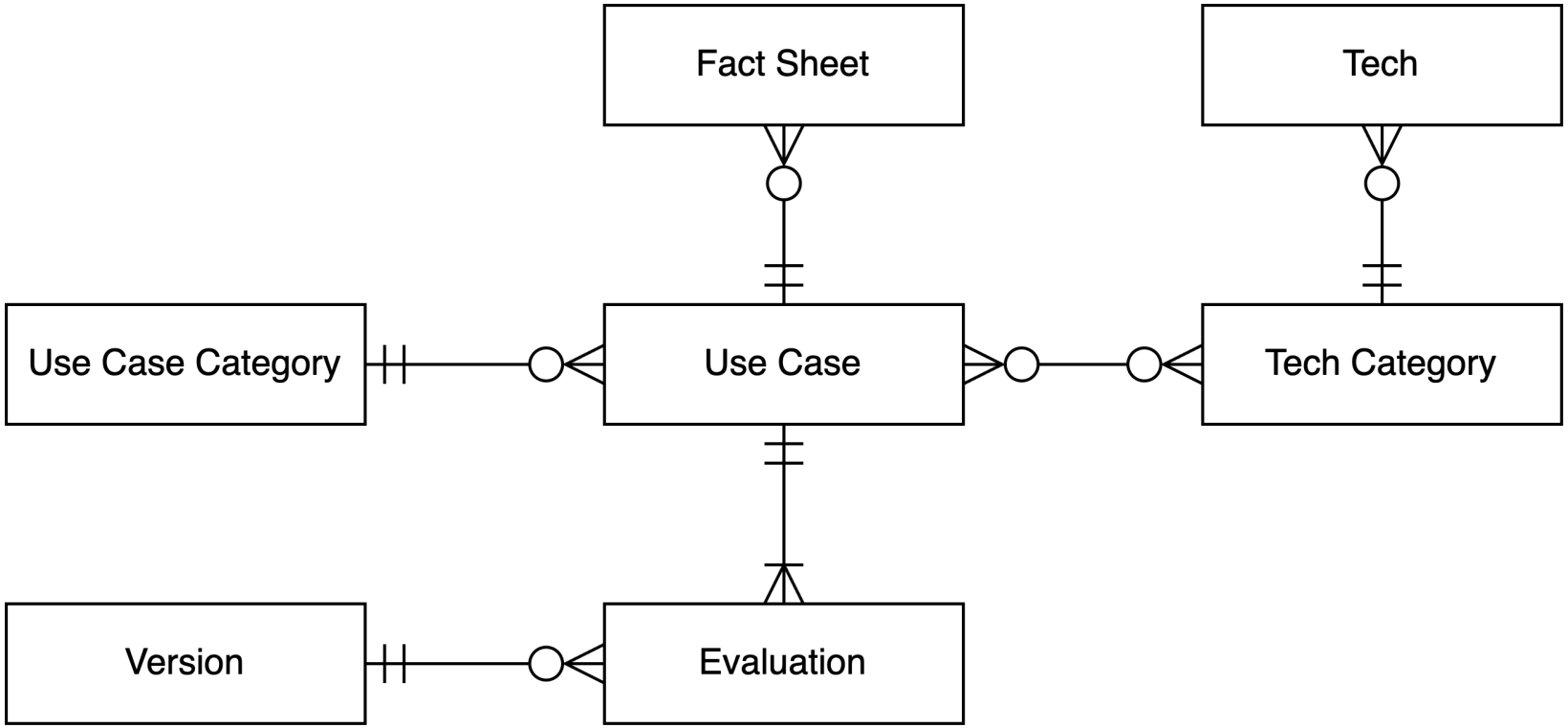
RQ2 Structure and Model

- **Research Question**
  How can one structure the use cases into a joint knowledge base with bidirectional relations, and from an engineering perspective, what entities are needed to implement such a joint knowledge base?

- **Research Method**: System Modeling
  - Data Model
  - Tech Stack
  - Deployment

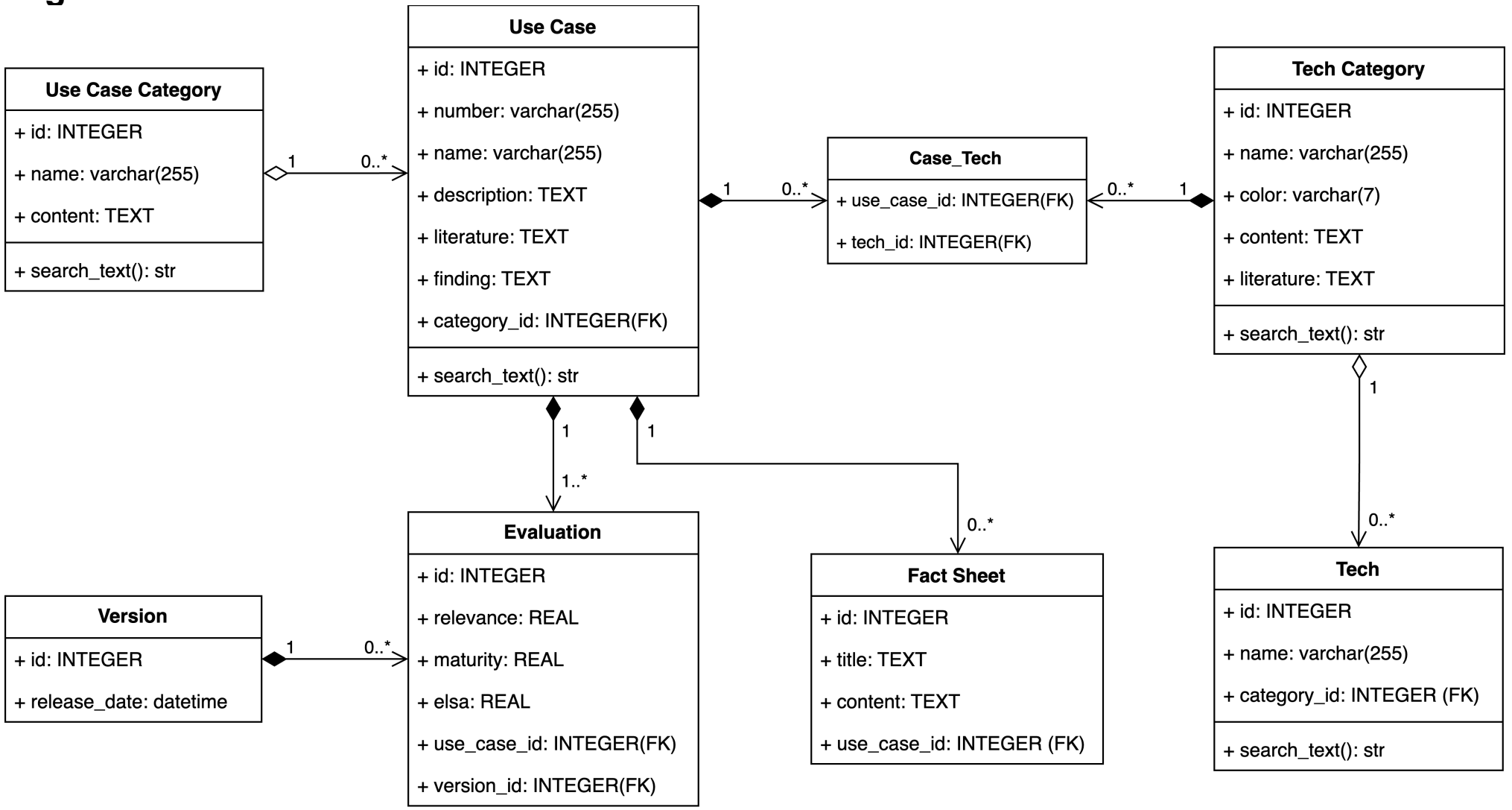
RQ2 Structure and Model - Data Model

ER Diagram



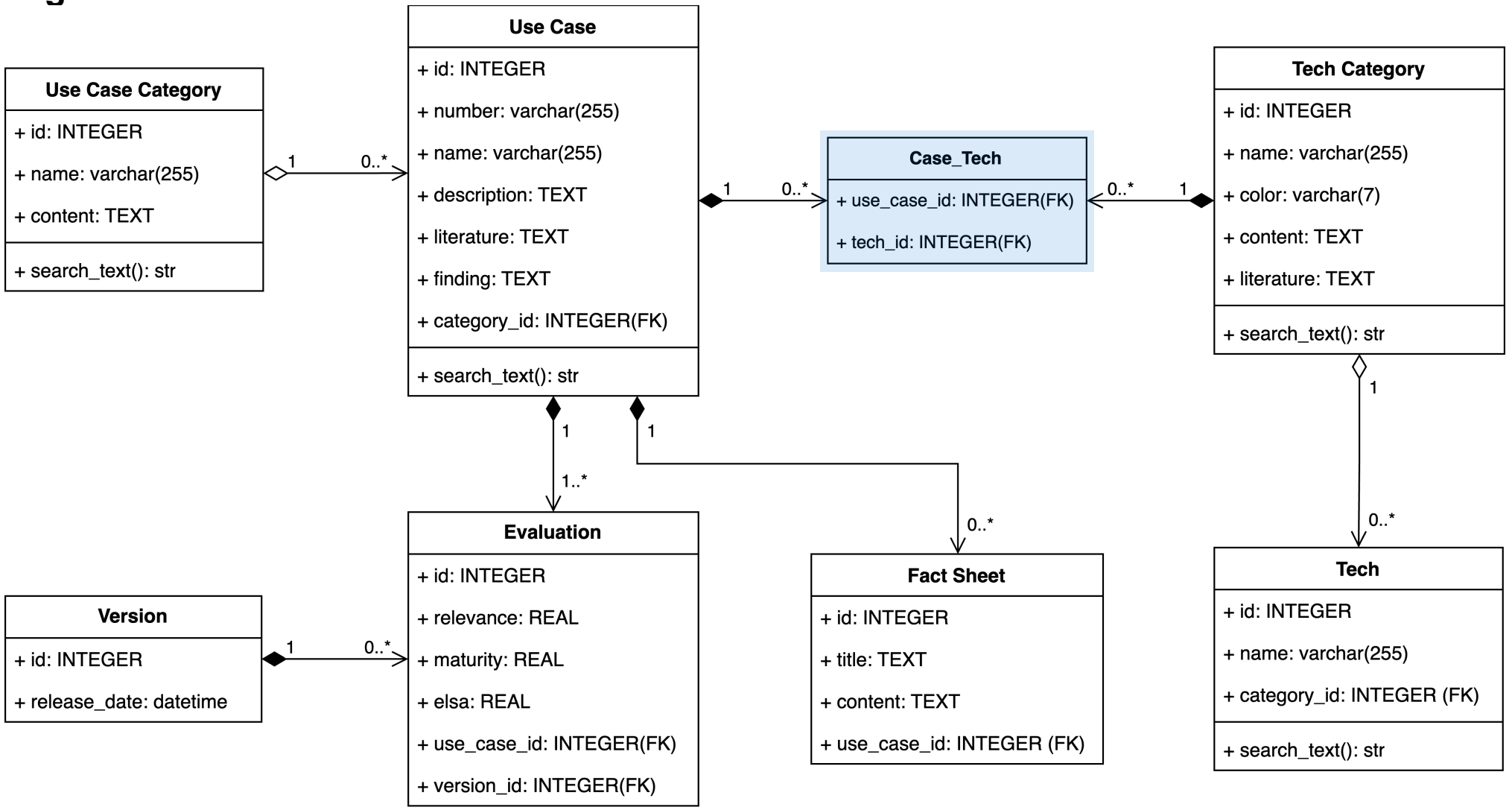
RQ2 Structure and Model - Data Model

Class Diagram



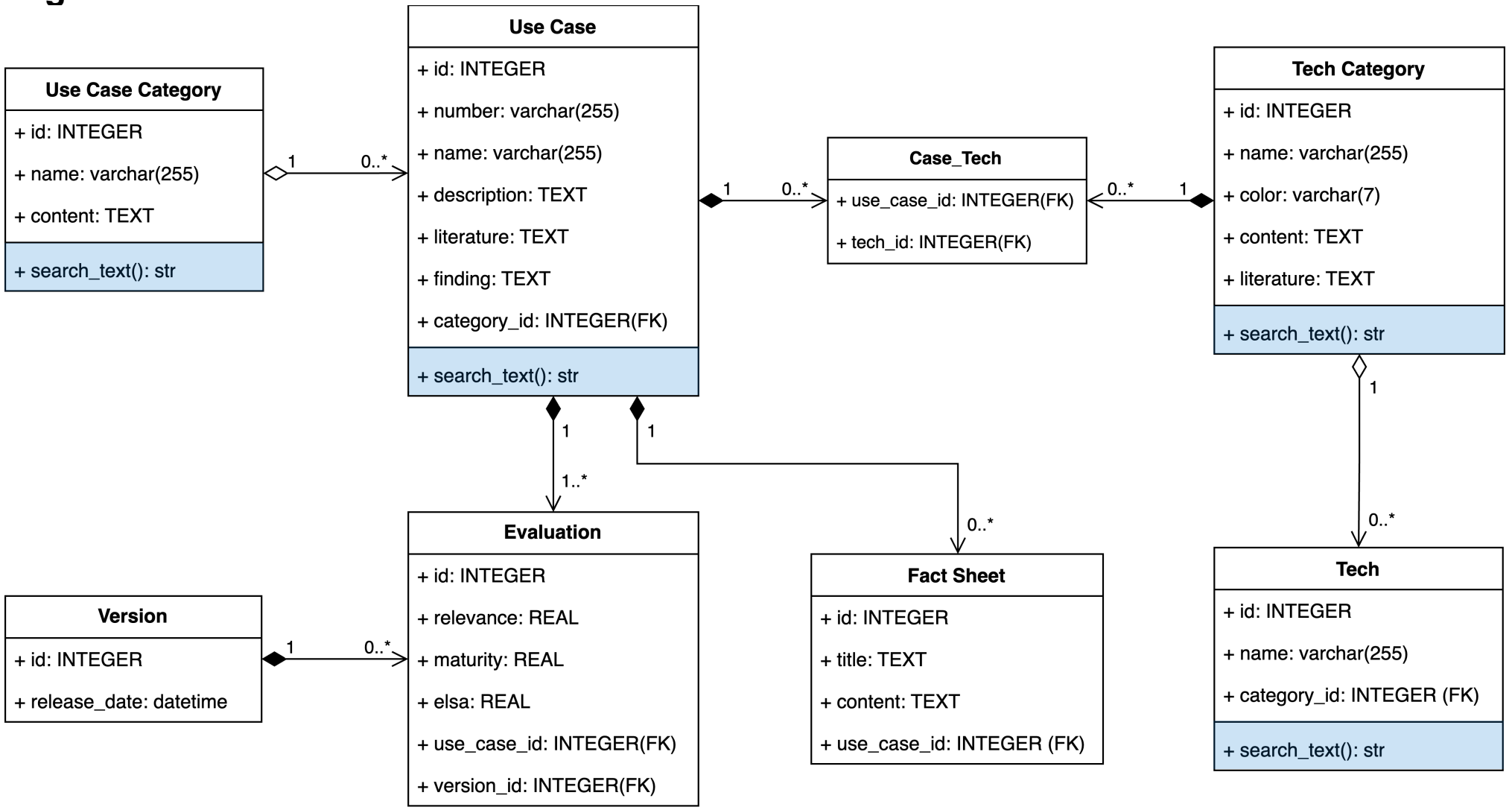
RQ2 Structure and Model - Data Model

Class Diagram



RQ2 Structure and Model - Data Model

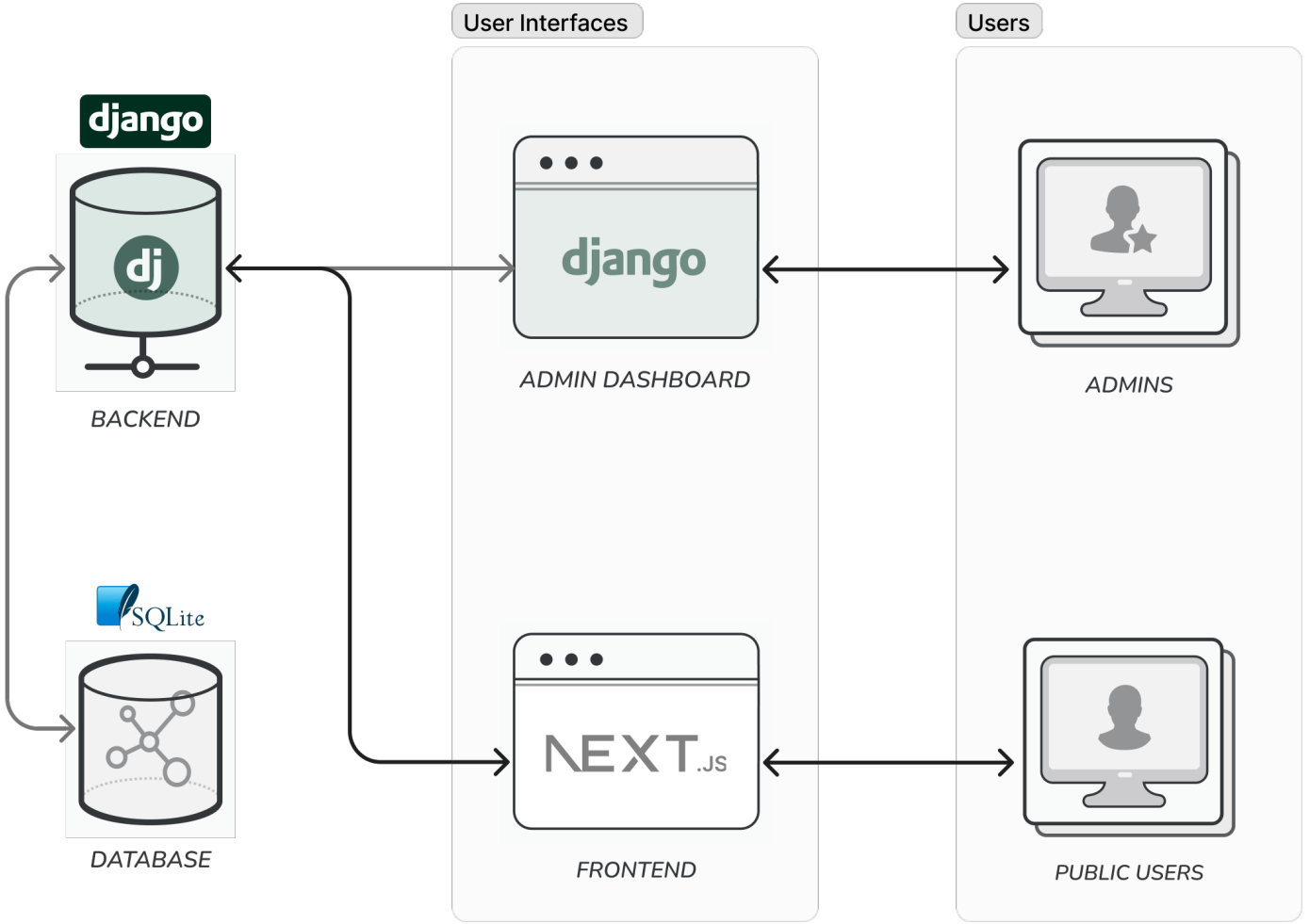
Class Diagram



RQ2 Structure and Model - Tech Stack

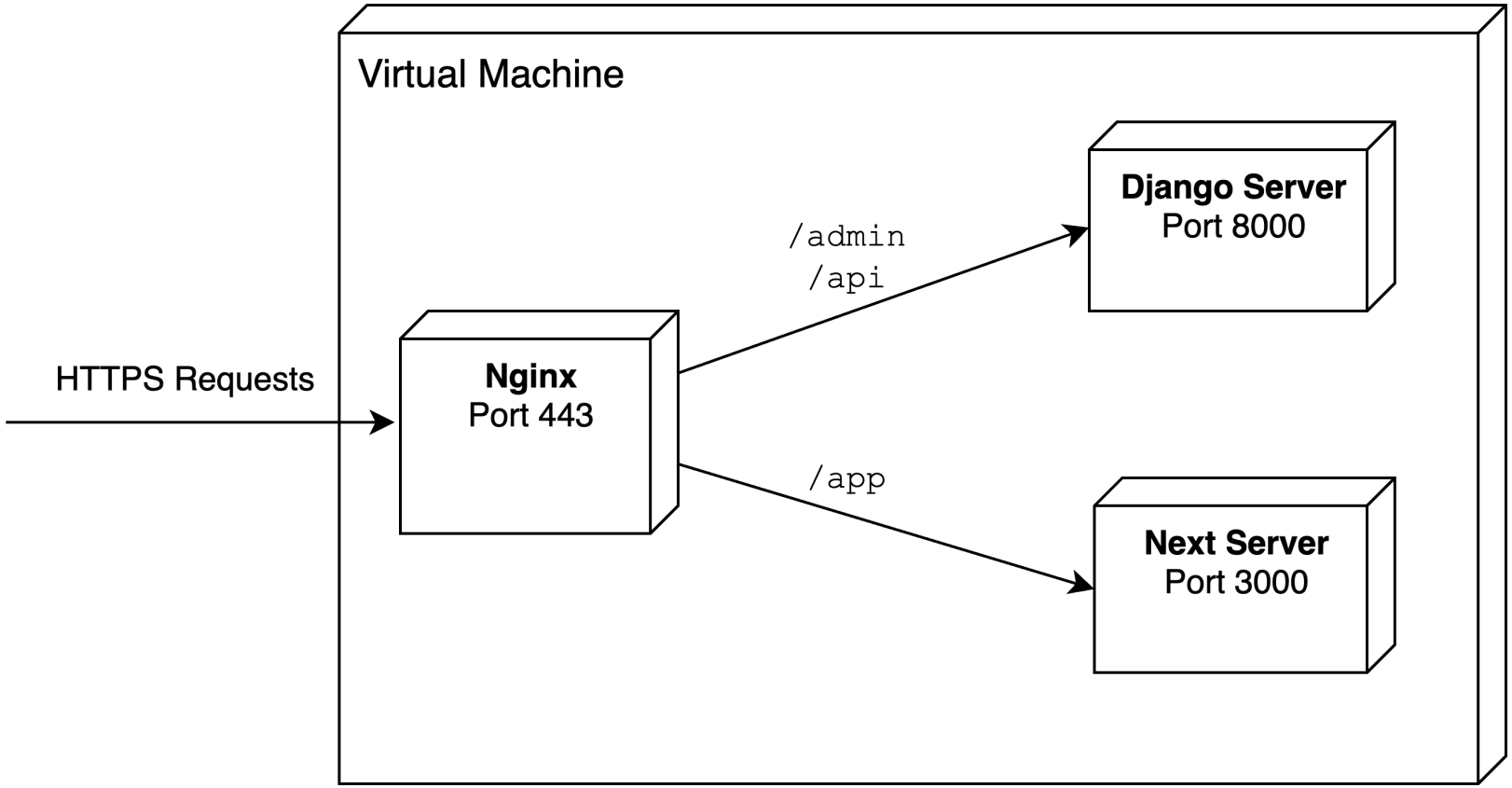
Architecture and Tech Stack

- Database: SQLite3
- Backend: Django
- Tech Map App: Next.js
- Dashboard: Django Admin Site



RQ2 Structure and Model - Deployment

Deployment Diagram



RQ3 Design and Implementation

- **Research Question**
  What is required to create a user-friendly and intuitive tech map, which facilitates indexing, exploring, searching and navigating among the knowledge base?

- **Results** (Live Demo)
  - Tech Map application
  - Admin Dashboard

RQ4 Usability Evaluation

- **Research Question**
  How can the usability of the tech map be evaluated, e.g., with Technology Acceptance Model (TAM), especially for legal practitioners?

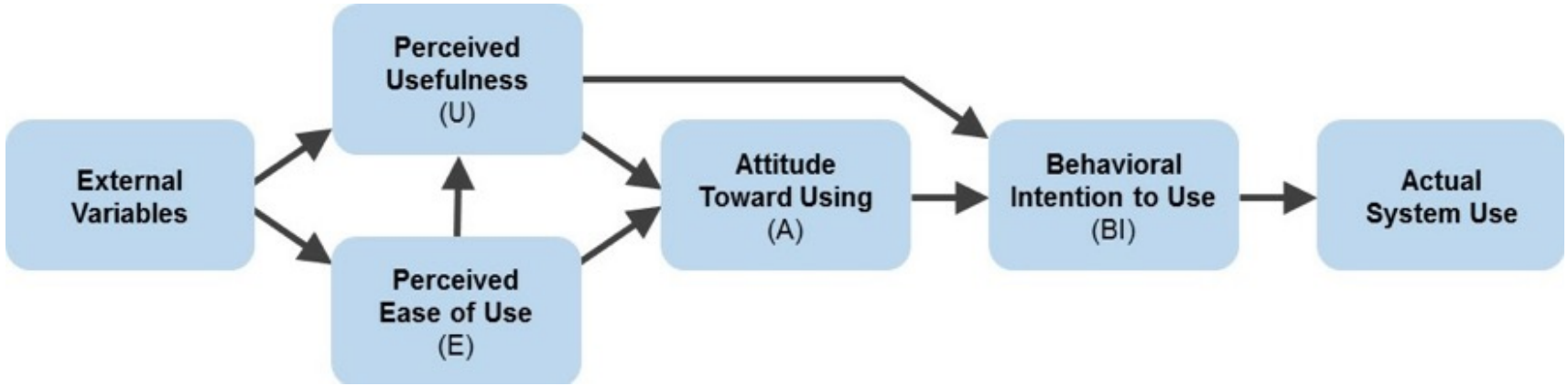
- **Research Method**
  Interviews and structured survey

RQ4 Usability Evaluation

Questionnaire Design

Based on Technology Acceptance Model (TAM)

- Perceived usefulness (PU)
- Perceived ease of use (PEU)



RQ4 Usability Evaluation

Questionnaire Design

Based on Technology Acceptance Model (TAM)

Common TAM Questions

PU

No.	Question
1	Using [this technology] in my job would enable me to accomplish tasks more quickly.
2	Using [this technology] would improve my job performance.
3	Using [this technology] in my job would increase my productivity.
4	Using [this technology] would enhance my effectiveness on the job.
5	Using [this technology] would make it easier to do my job.
6	I would find [this technology] useful in my job.

PEU

No.	Question
7	Learning to operate [this technology] would be easy for me.
8	I would find it easy to get [this technology] to do what I want it to do.
9	My interaction with [this technology] would be clear and understandable.
10	I would find [this technology] to be flexible to interact with.
11	It would be easy for me to become skillful at using [this technology].
12	I would find [this technology] easy to use.

Our Derived Questions

TAM Construct	Question
Perceived Usefulness	I would find the Tech Radar web app useful in general.
	I would find the Tech Radar web app useful specifically in my job.
Perceived Ease of Use	Learning to operate the Tech Radar web app would be easy to me.
	I would find it easy to get the Tech Radar web app to do what I want it to do.
	I would find the Tech Radar web app easy to use.
Behavioral Intention	I presently intend to use the Tech Radar web app regularly at work.

	Disagree		Neutral		Agree
I would find the Tech Radar web app useful in general. *	○	○	○	○	○

RQ4 Usability Evaluation - Results

Positive Feedback in General

- Well-designed
- User-friendly
- Informative

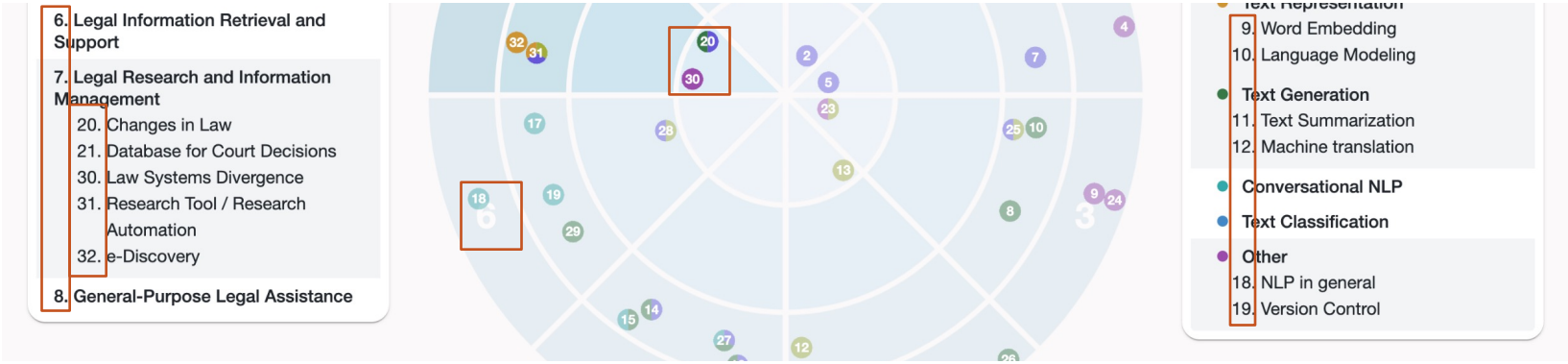
RQ4 Usability Evaluation - Results

Positive Feedback in General

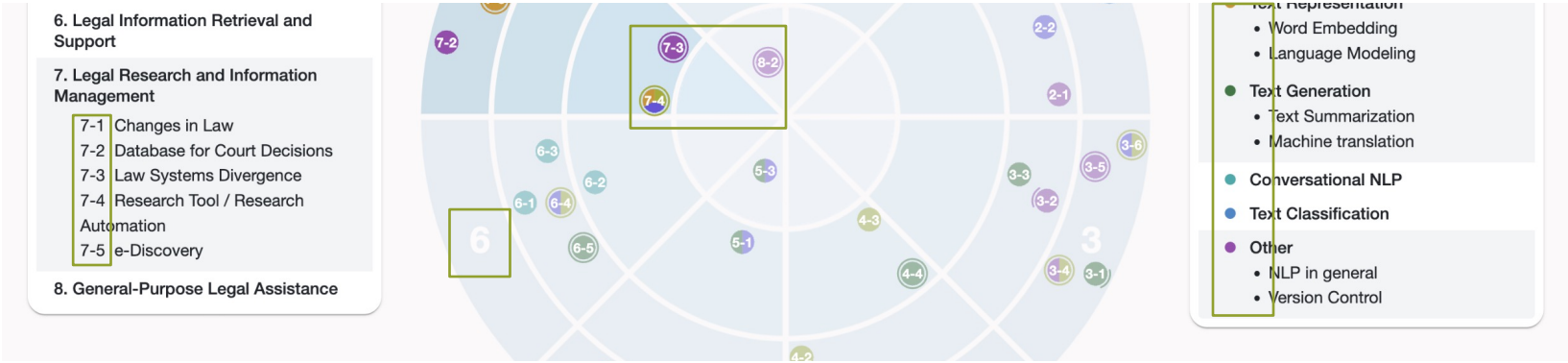
- Well-designed
- User-friendly
- Informative

Suggested Improvements

- Numbering system ✅



Before



After

RQ4 Usability Evaluation - Results

Positive Feedback in General

- Well-designed
- User-friendly
- Informative

Suggested Improvements

- Numbering system ✅
- Help documents

Use Case 1-2

GDPR Compliance

In the modern age of big data, the processing of such data has been regulated by comprehensive and far-reaching legislation. The foremost example comes with the General Data Protection Regulation (GDPR), which mandates the use of proper technical and organizational measures to ensure data protection. The process of complying with such regulations, therefore, represents an important point for many organizations, particularly those involved in data processing.

Related Literature

1. A Combined Rule-Based and Machine Learning Approach for Automated GDPR Compliance Checking, Rajaa EL HAMDANI 🔗
2. Frequent use cases extraction from legal texts in the data protection domain, Leone, V., Di Caro, L. 🔗

Evaluation Metrics

Relevance	Tech Maturity	ELSA Concerns
1.50	4.66	2.50

* Survey conducted in 09.2023

** Scores are not accurate during beta test*

- Legal Relevance: 1 - least relevant, 5 - most relevant
- Tech Maturity: 1 - least mature, 5 - most mature
- ELSA Concern: 1 - least -concerned, 5 - most concerned

End of Page

Editor's note:
- Abstract
- Rationale
- …

- Survey conduction
- Evaluation criteria
- Score calculation
- …

Discussion - Limitations

- **Use Case Validation Responses**
  - Overrepresentation of law students (7/25)
  - May lead to a relatively low relevance of the results
  - Mitigating factor: diversity of professional experience of other respondents

- **System Usability Evaluation**
  - Timing constraints
  - Small number of responses & interviews
  - Continuous iteration and evaluation

Discussion – Future Work

- **Continuous Update & Release**
  - Keep up with the technology trend
- **Features**
  - Responsive design
  - Manual overwrite blip coordinates
  - Help documents
- **Portable Report (PDF)**
  - Detailed content for further exploration
  - Enhanced accessibility
  - Cater to diverse audience preferences

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