

Supporting Q&A Processes in Requirements Elicitation: *Bad Smell Detection and Version Control*

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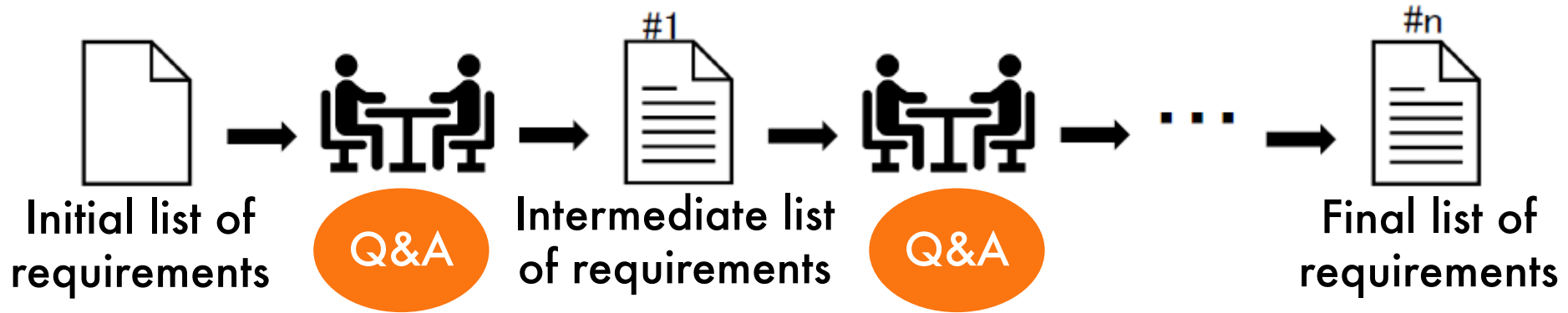
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Requirements Elicitation



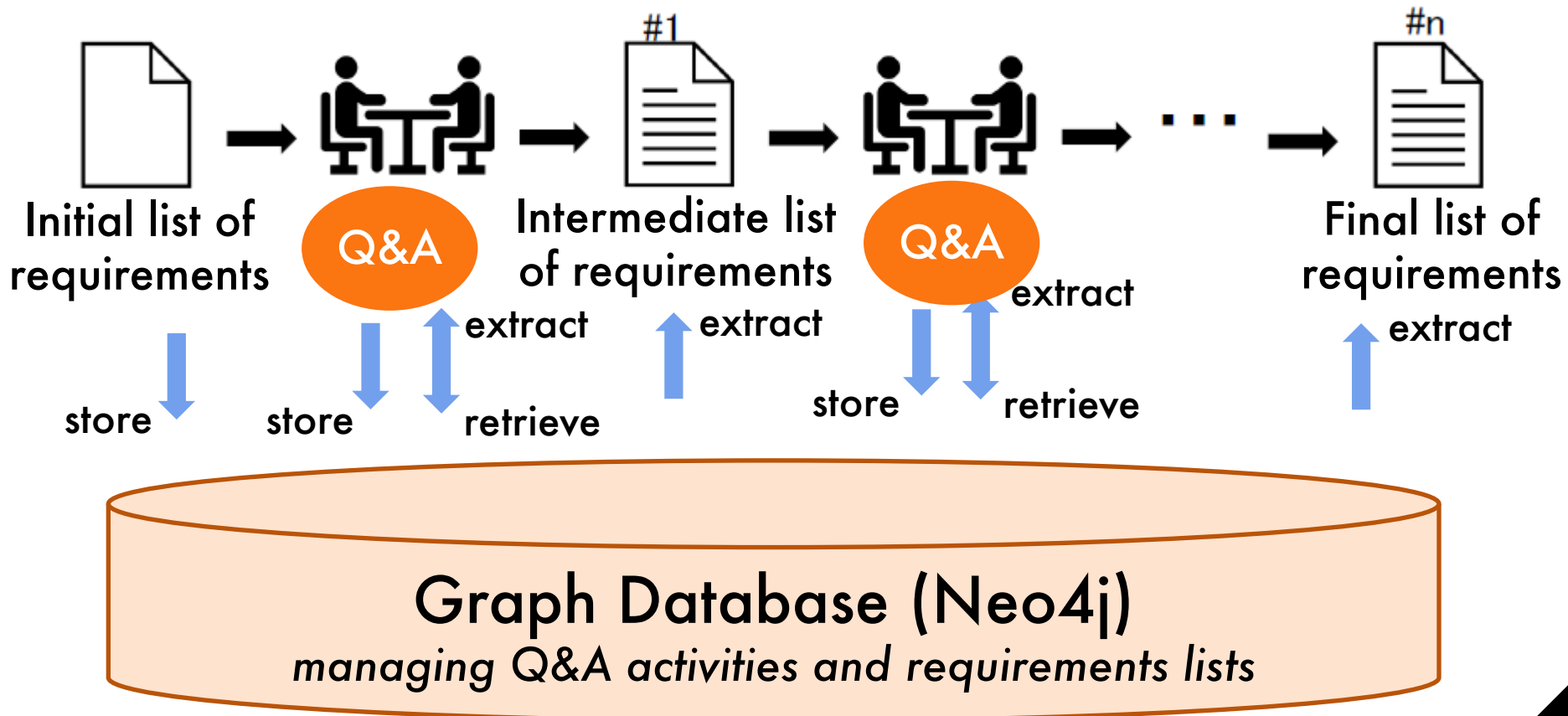
- Quality of final requirements depends on the quality of Q&A processes
- What're the aspects to decrease the quality of Q&A processes?



Bad Smell

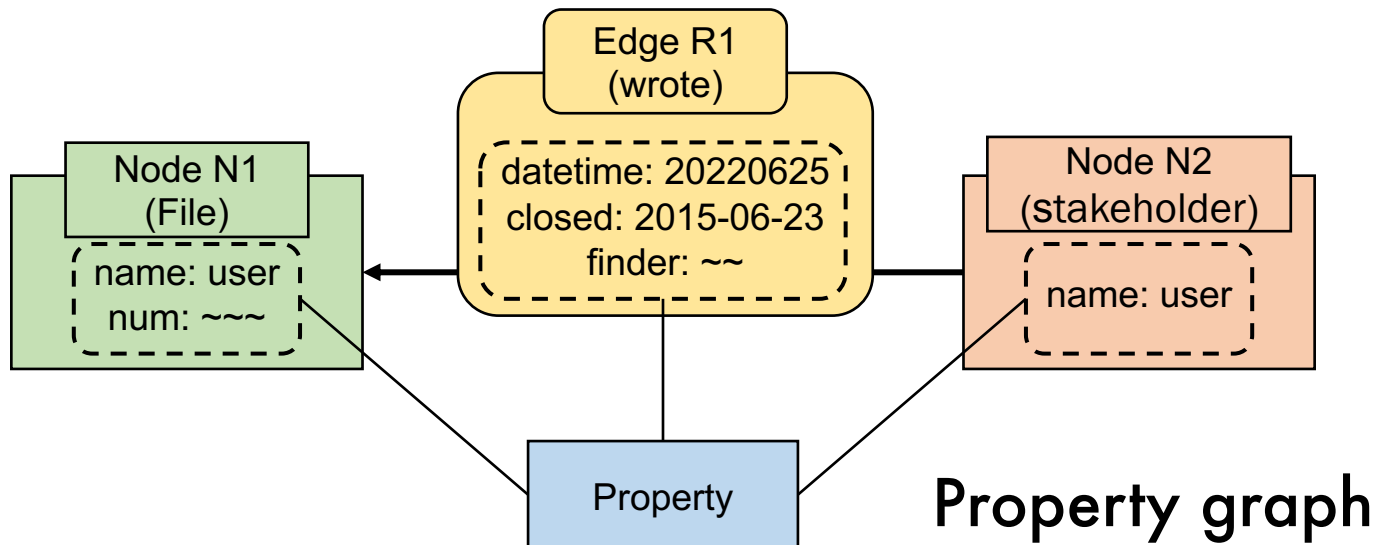
Proposed Approach

- Store Q&A history to graph database
 - Process improvement by detecting smells from history
 - Version control

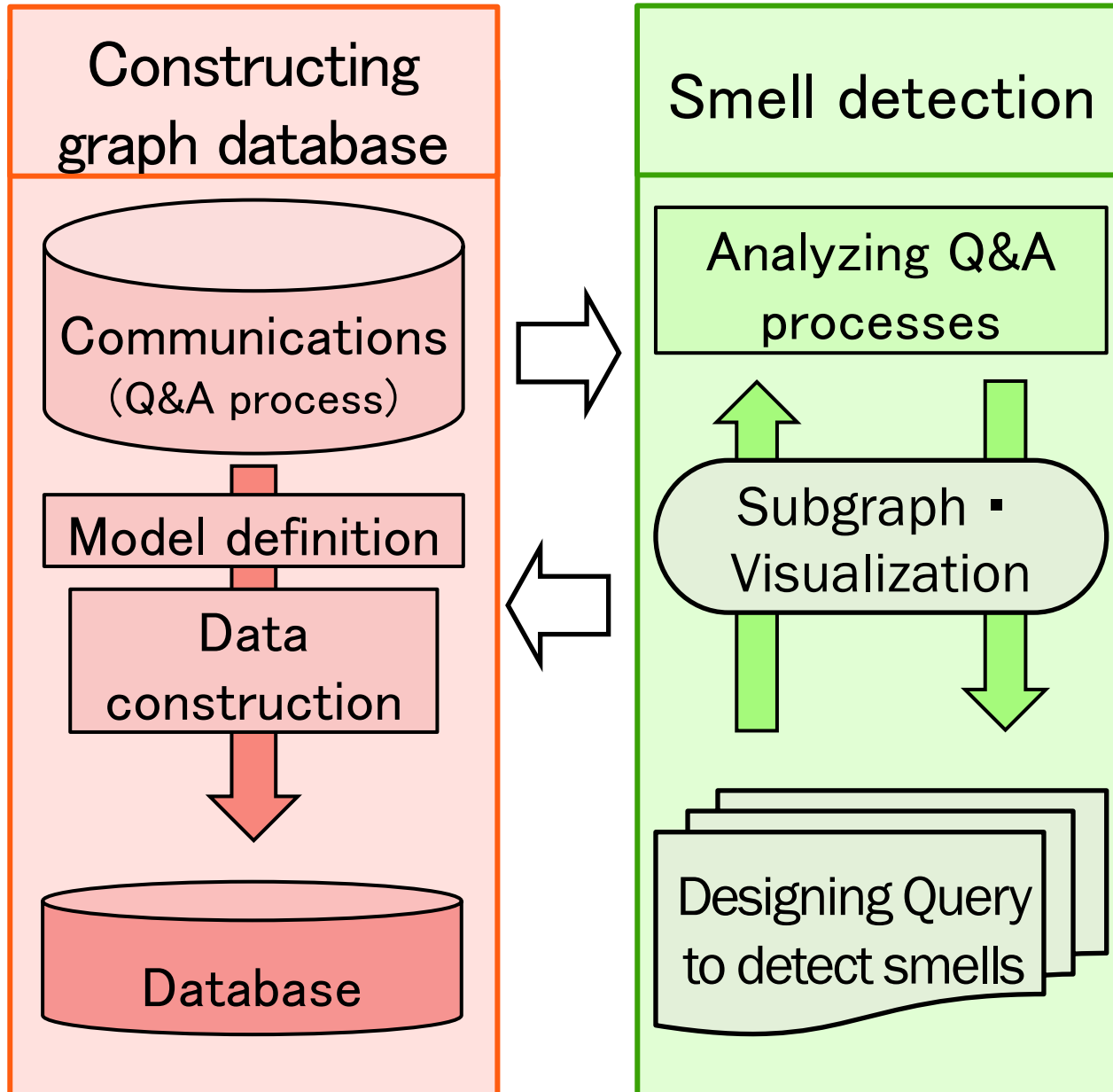


Graph Database

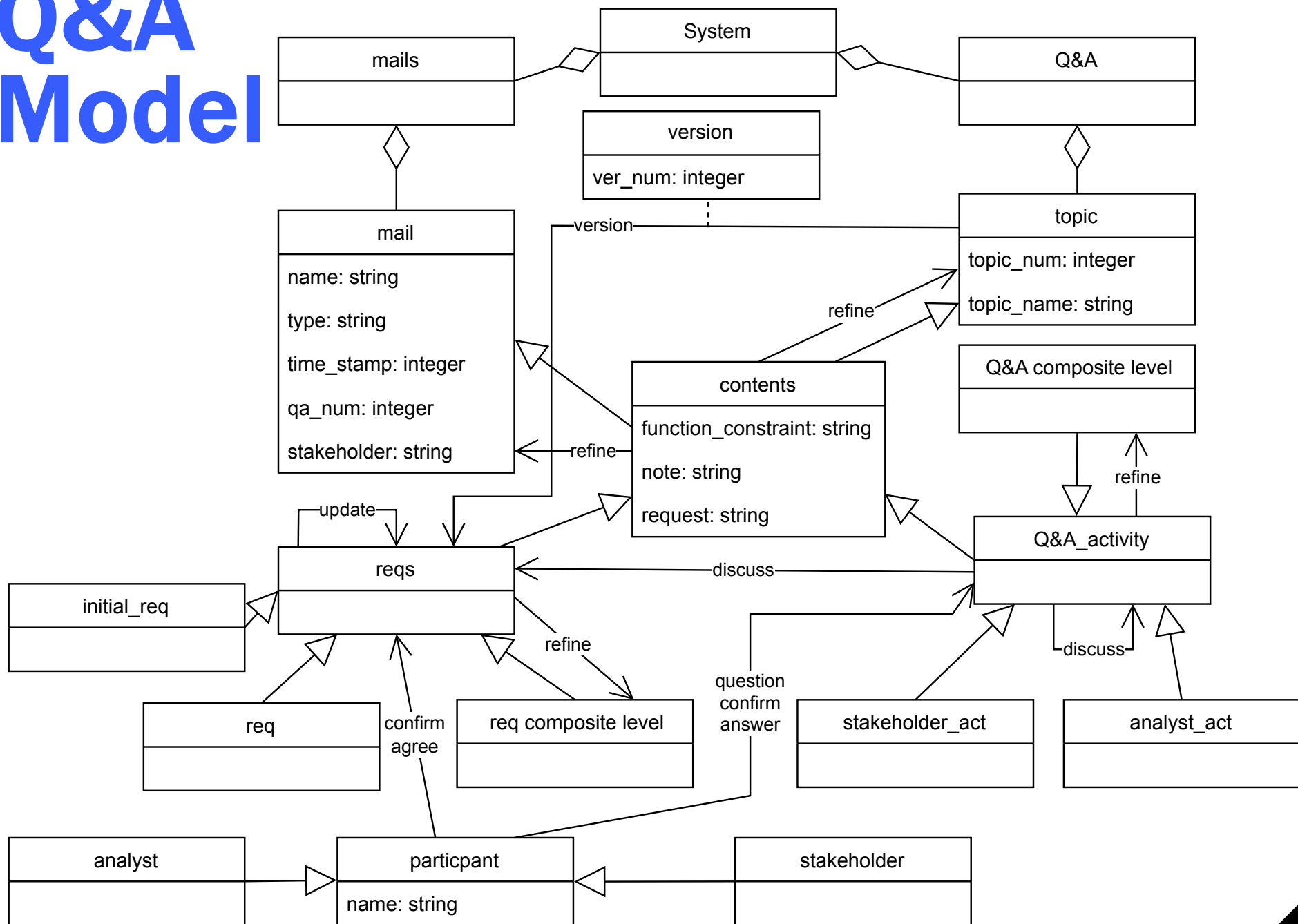
- **Database system using graph structure**
 - Neo4j: Cypher as a query language
- **Benefits**
 - Flexibility
 - Ease of visualization to the complex structure
 - Capable for dynamic changes



Our Approach

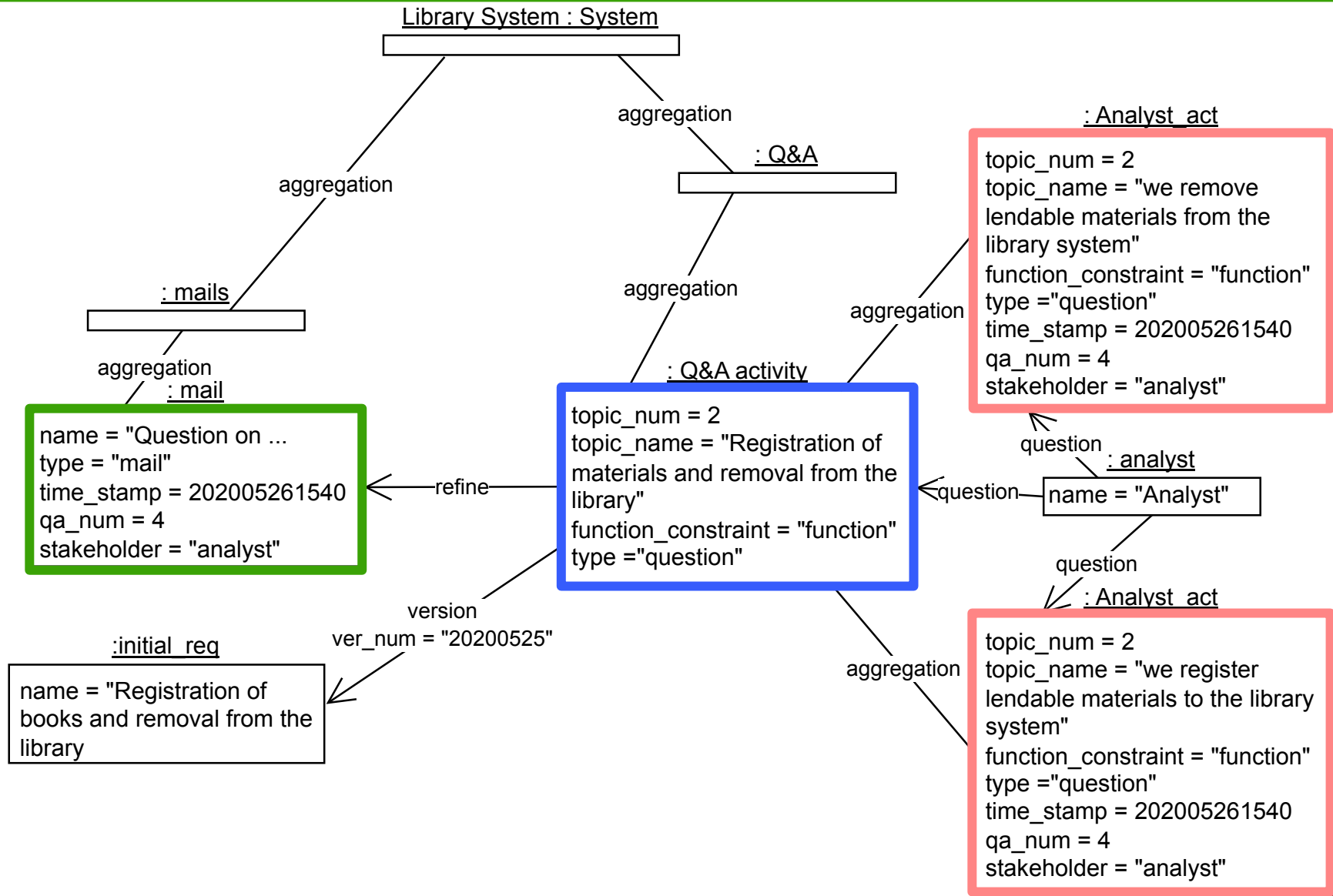


Q&A Model



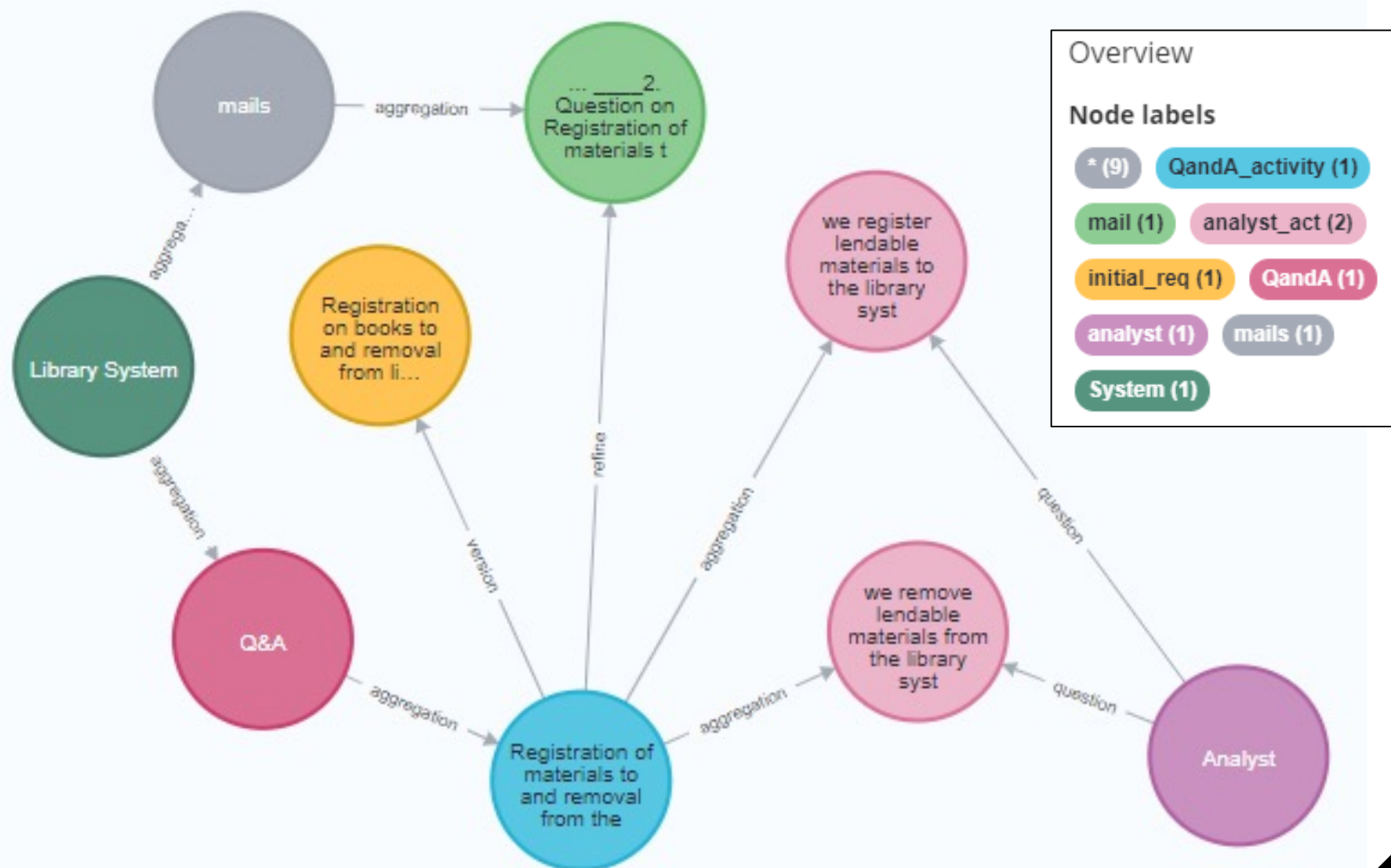
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2. Question on Registration of materials to and removal from the library: Does it mean we register lendable materials to the library system, and we remove lendable materials from the library system?



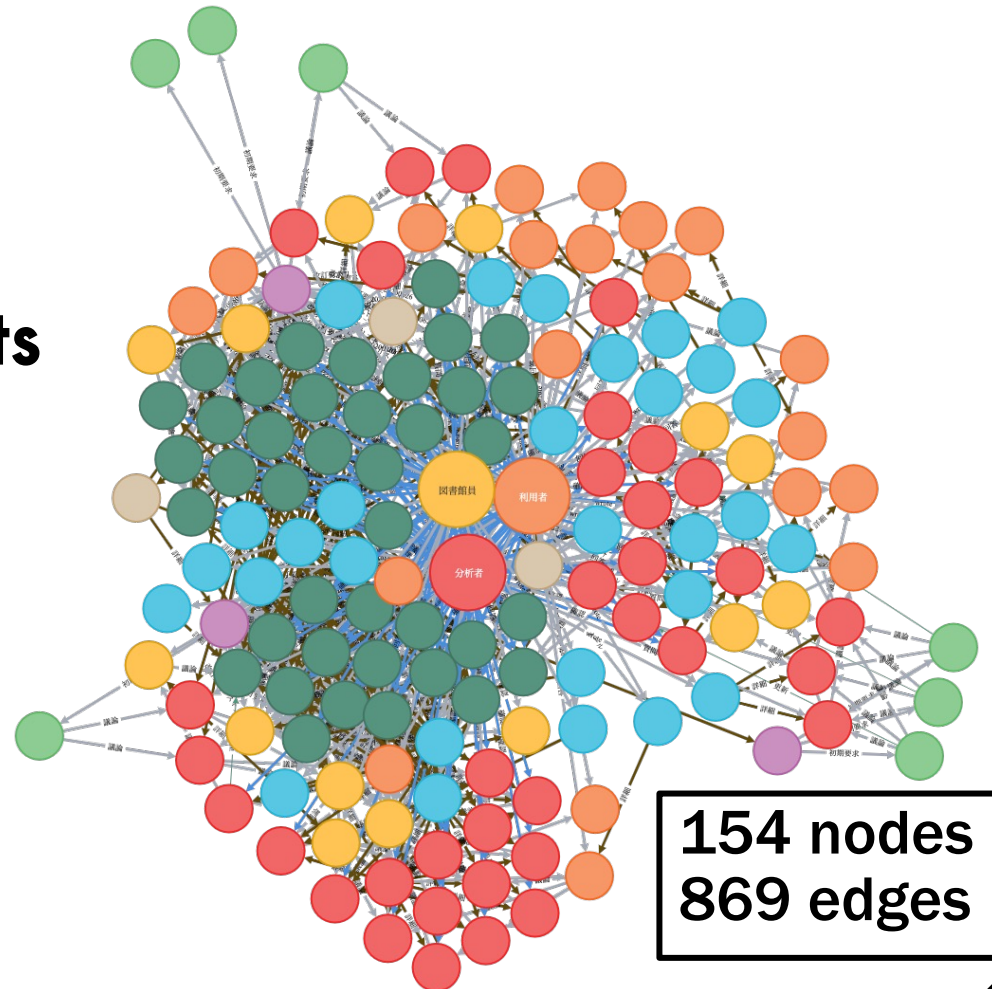
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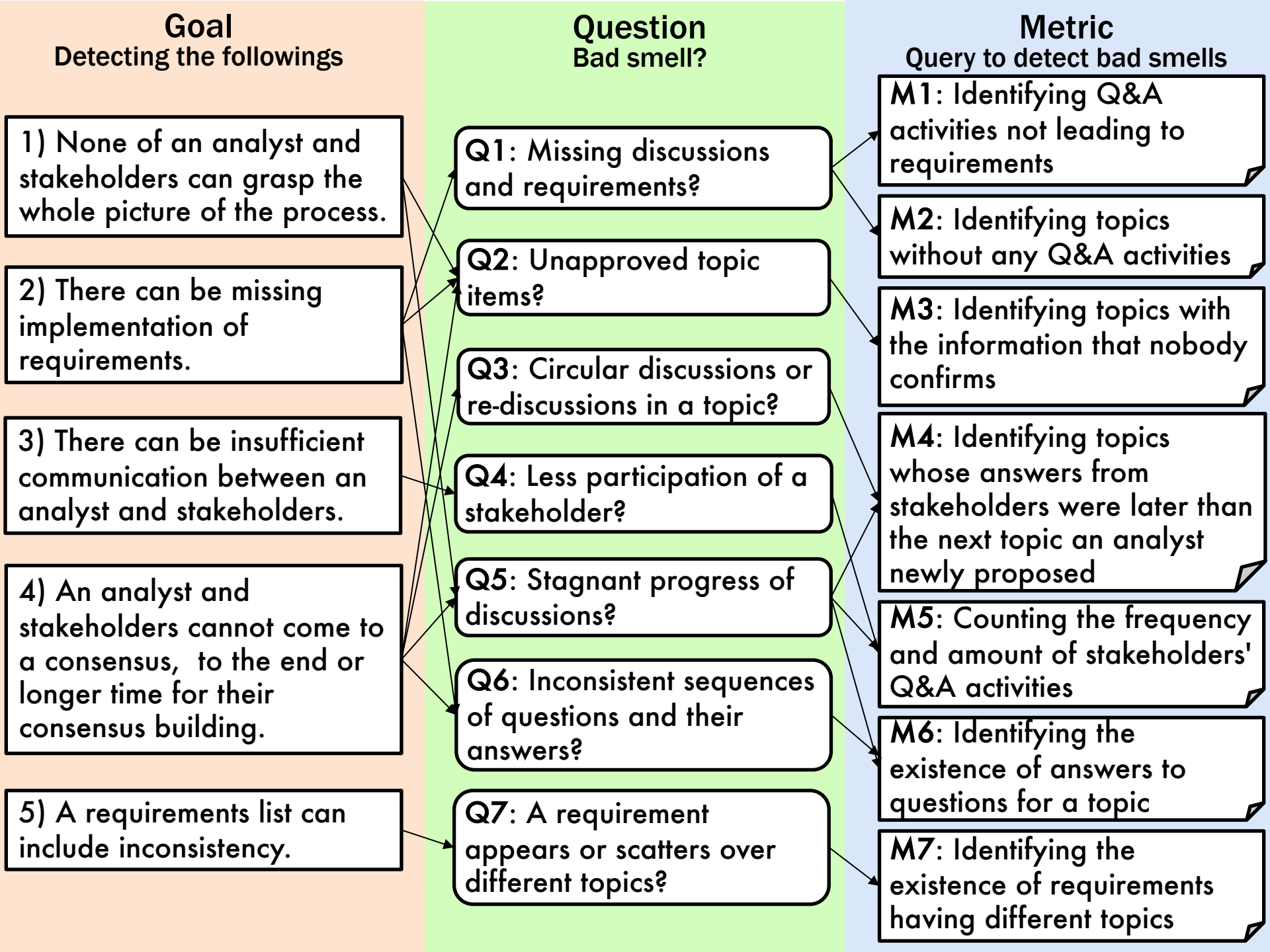
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Graph Constructed

- **7 initial requirements**
 - Registration of books to and removal from the library
- **43 mails**
 - 1 analyst
 - 2 stakeholders
- **40 final requirements**





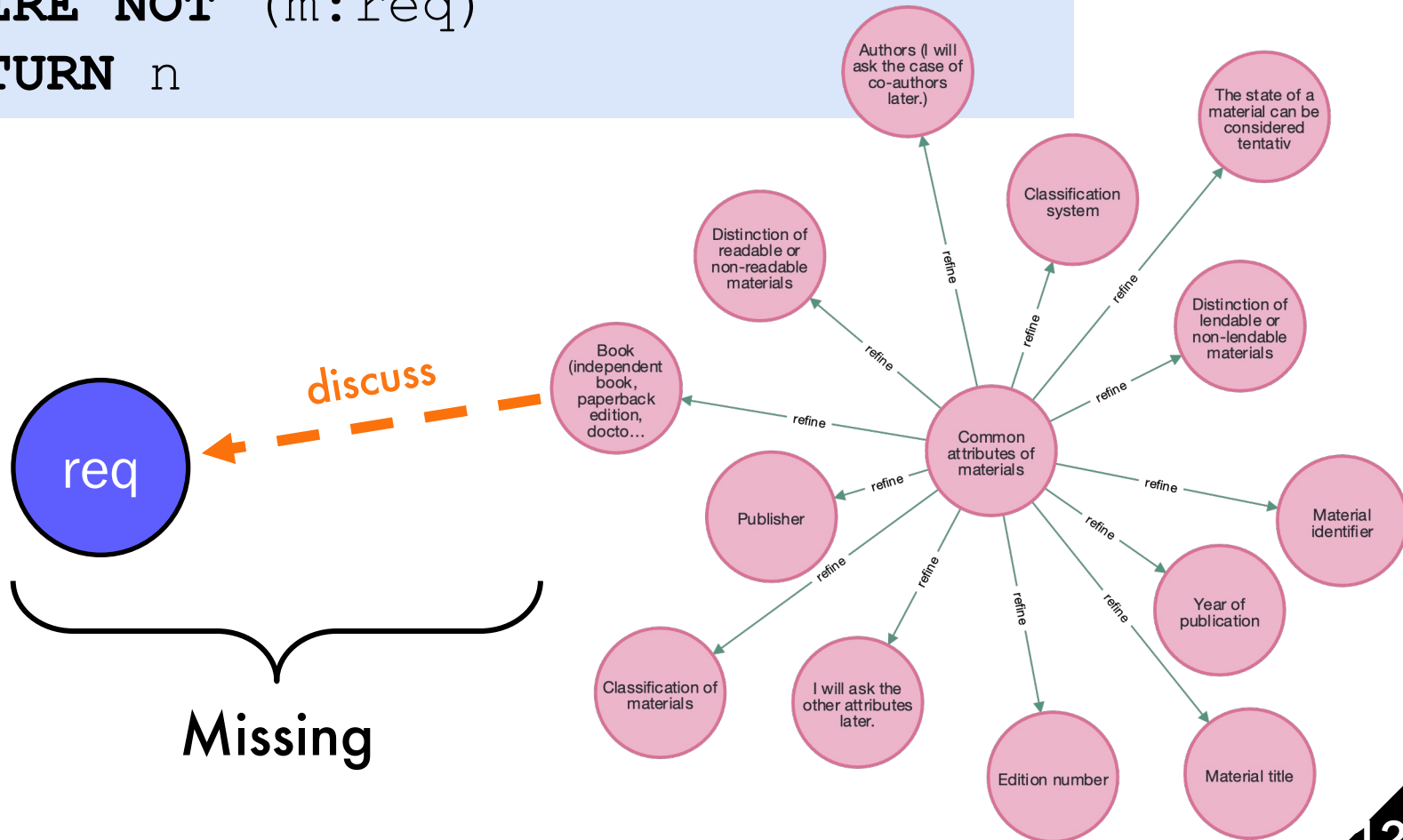
Detecting Missing Discussion

2) There can be missing implementation of reqs.

Q1: Missing discussions and requirements?

M2: Identifying Q&A activities not leading to reqs

```
MATCH (n:analyst_act) -[:discuss] -> (m)
WHERE NOT (m:req)
RETURN n
```

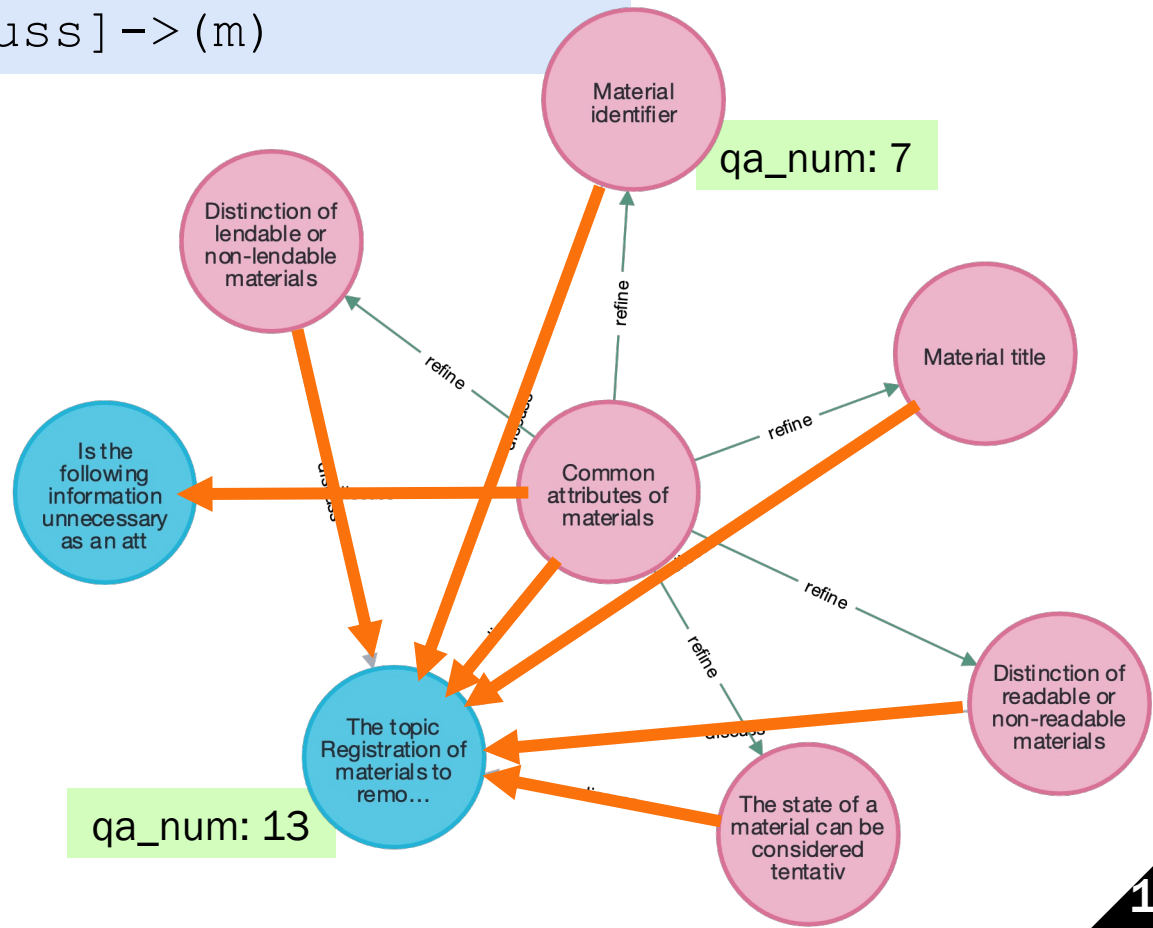


Detecting Circular Discussion

M4: Identifying topics whose answers from stakeholders were later than the next topic an analyst newly proposed

```
MATCH (n) - [:discuss] -> (m { type: "answer" })  
WHERE (n.qa_num + DELTA < m.qa_num)  
RETURN (n) - [:discuss] -> (m)
```

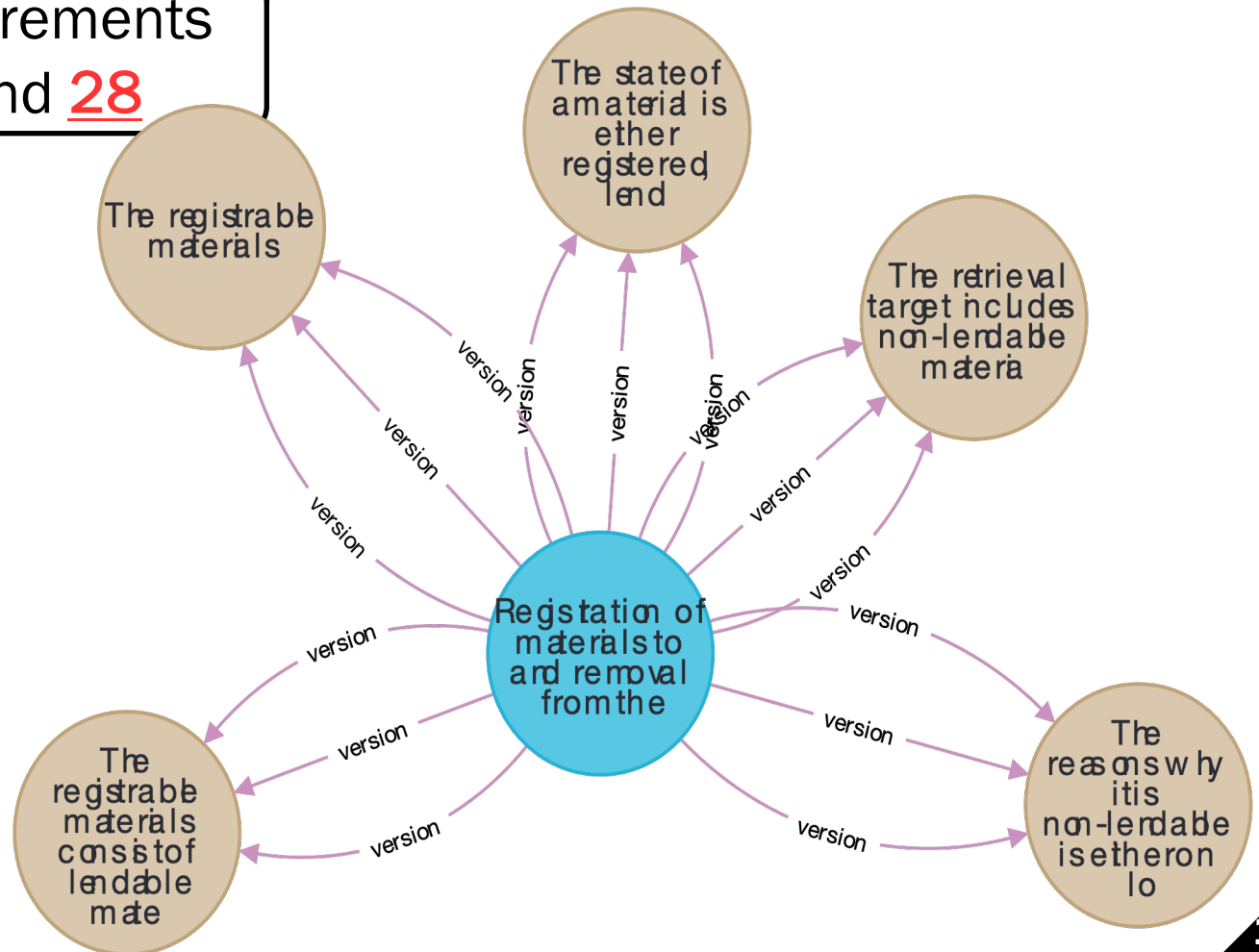
In case DELTA=3:

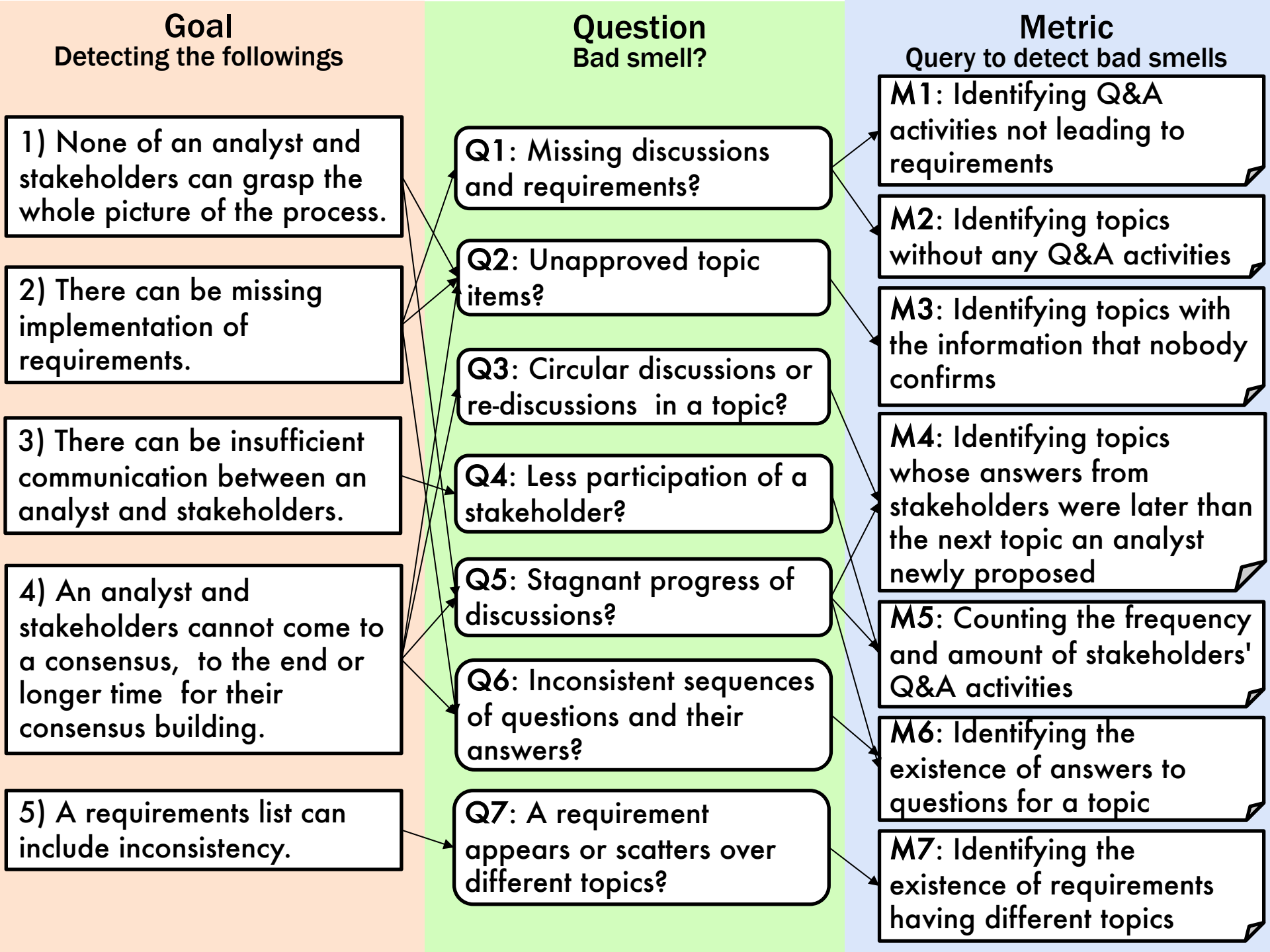


Version Control: Diff

```
MATCH (k) - [:version{ver_num:20200626}] - (l:req)
WHERE NOT (k) -> [:version{ver_num:20200608}] -> (l)
RETURN k, l
```

Newly added requirements
between Jun 26 and 28





Queries Designed

- **11 queries**
 - 7 for smell detection
 - 4 for version control
- **False positives (M1, M4, M7)**
 - Weak threshold ($\Delta=3$)
 - Word fluctuation

Metric	
Query to detect bad smells	
	M1: Identifying Q&A activities not leading to requirements
	M2: Identifying topics without any Q&A activities
	M3: Identifying topics with the information that nobody confirms
	M4: Identifying topics whose answers from stakeholders were later than the next topic an analyst newly proposed
	M5: Counting the frequency and amount of stakeholders' Q&A activities
	M6: Identifying the existence of answers to questions for a topic
	M7: Identifying the existence of requirements having different topics

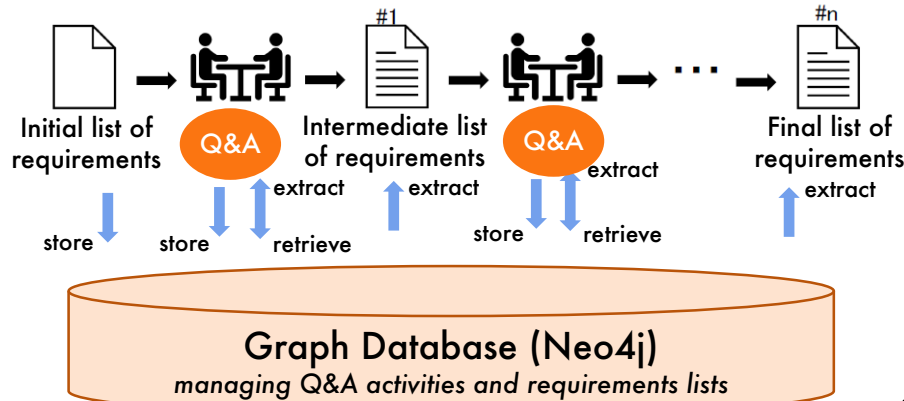
Future Work

- **Evaluation**
- **User interface**
- **Analyzing dialogues with NLP techniques**
- **Construction of System-level graph**

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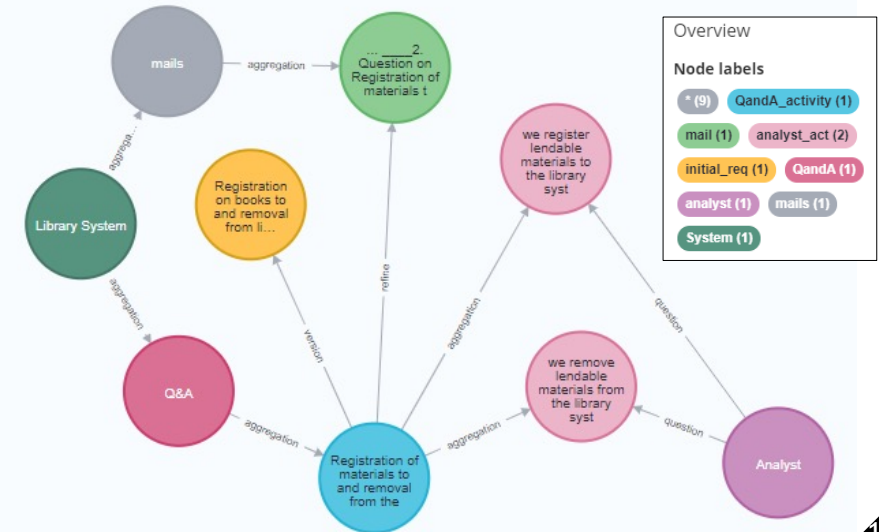
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Date: May 6, 2020 15:40 (Q&A #4)

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Goal Detecting the followings

- 1) None of an analyst and stakeholders can grasp the whole picture of the process.
- 2) There can be missing implementation of requirements.
- 3) There can be insufficient communication between an analyst and stakeholders.
- 4) An analyst and stakeholders cannot come to a consensus, to the end or longer time for their consensus building.
- 5) A requirements list can include inconsistency.

Question Bad smell?

- Q1: Missing discussions and requirements?
- Q2: Unapproved topic items?
- Q3: Circular discussions or re-discussions in a topic?
- Q4: Less participation of a stakeholder?
- Q5: Stagnant progress of discussions?
- Q6: Inconsistent sequences of questions and their answers?
- Q7: A requirement appears or scatters over different topics?

Metric Query to detect bad smells

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