Connected Mobility Ecosystem Explorer – Concept and Agile Development

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Overview

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1. **Motivation**
2. **Research Questions**
3. **Development**
4. **Evaluation**
5. **Further Research**

Motivation

ZD.B ZENTRUM DIGITALISIERUNG. BAYERN

Thematic platform
Connected Mobility

TUM LLCM

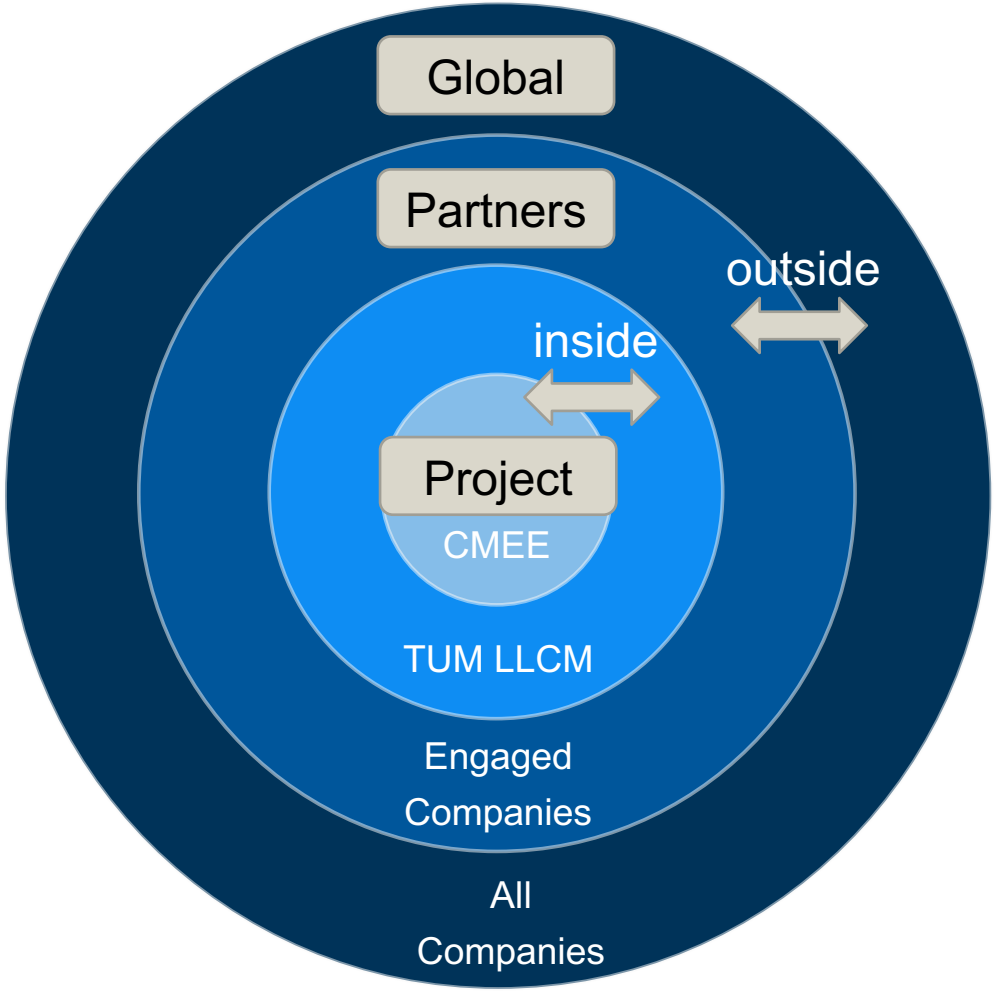
BMW Group

SIEMENS

CAR2GO

moovel

Onion Model



Adapted from: *Exponential Organizations - Salim Ismail, Diversion Books, 2014*

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Research Questions

1. How can existing knowledge about the connected mobility ecosystem be aggregated and documented in a reusable fashion?

2. Which types of relationships exist between connected mobility ecosystem members and how can these be documented?

3. How can the acquired knowledge from 1. and 2. be visualized?

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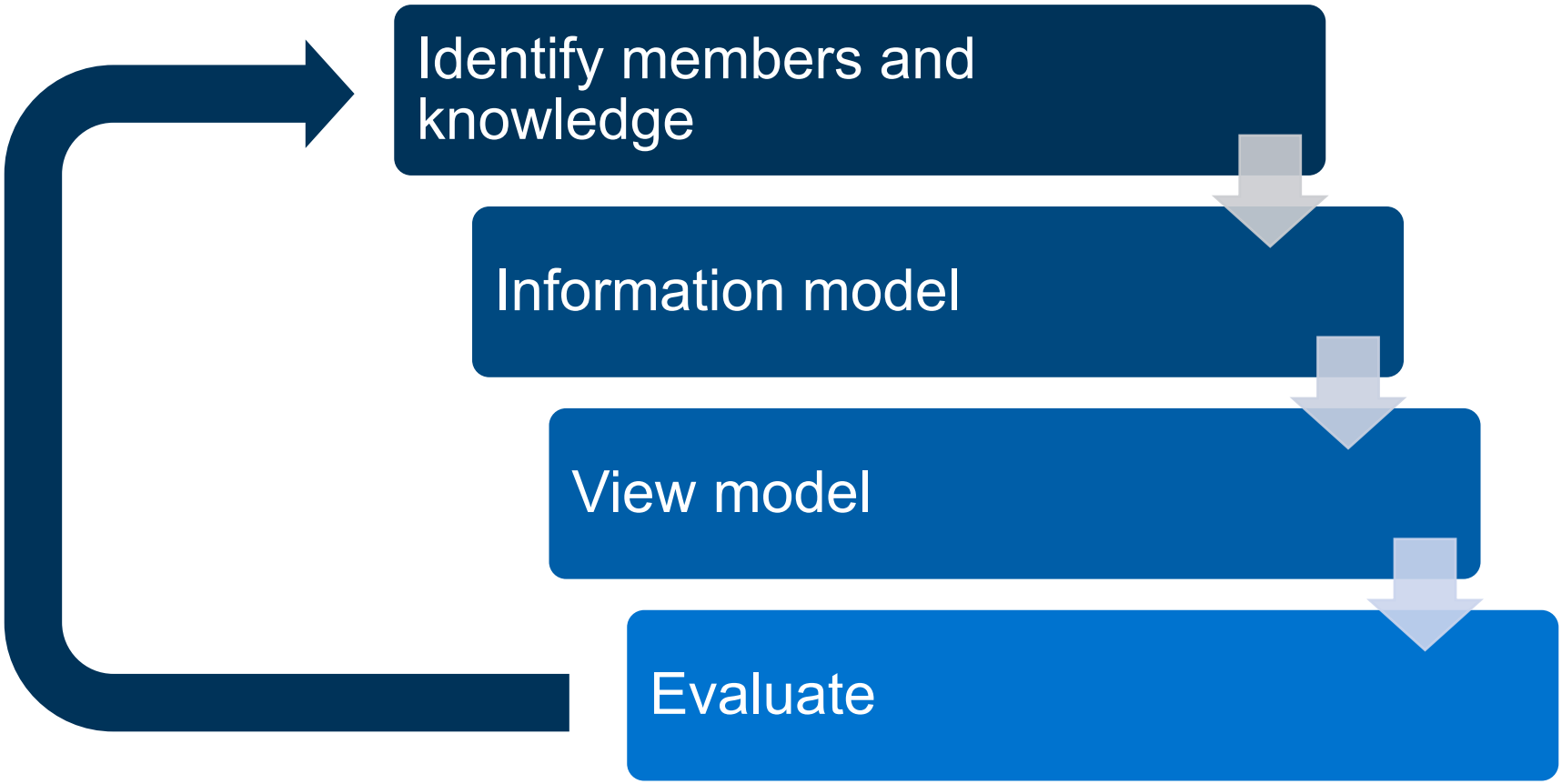
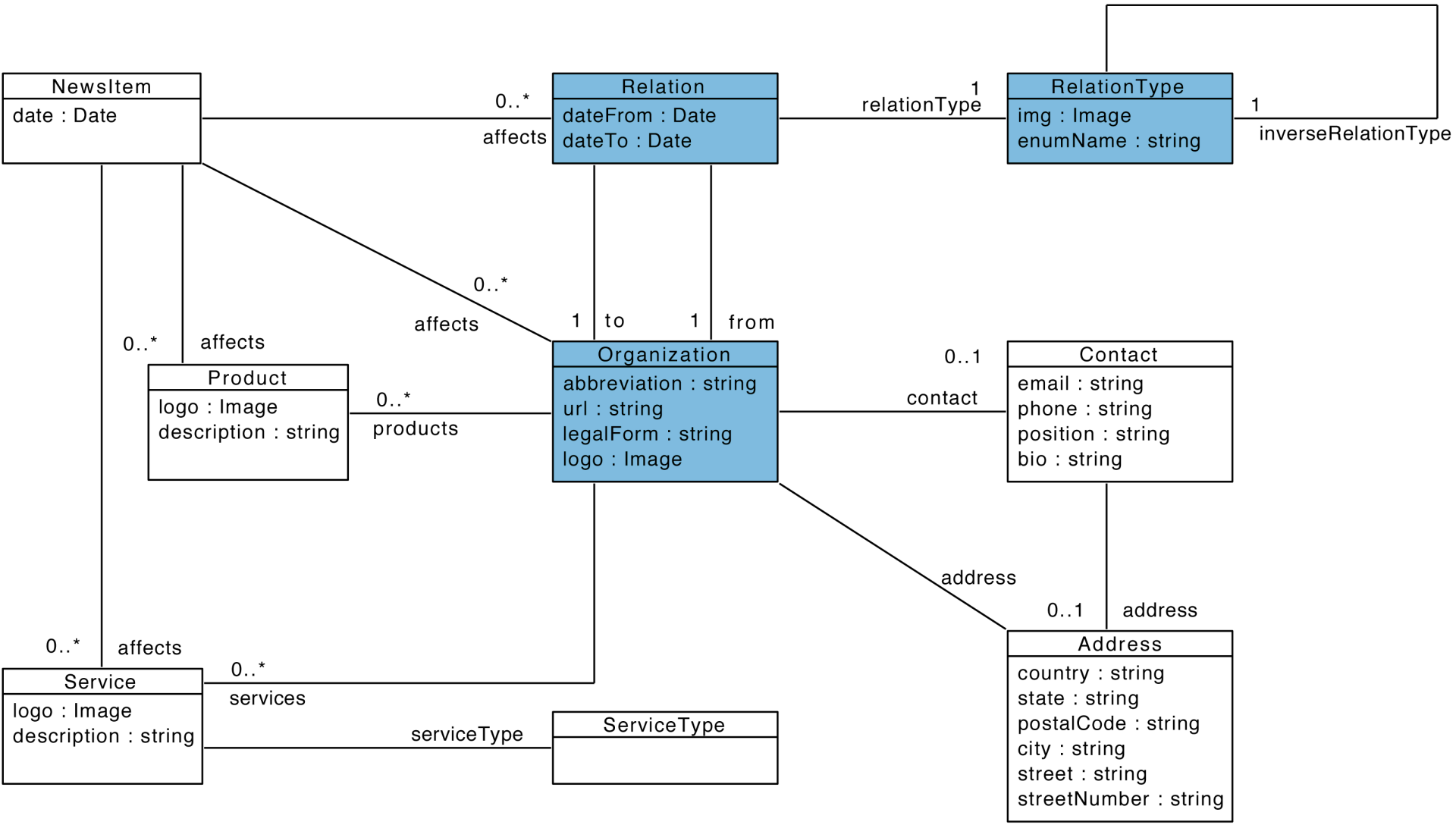
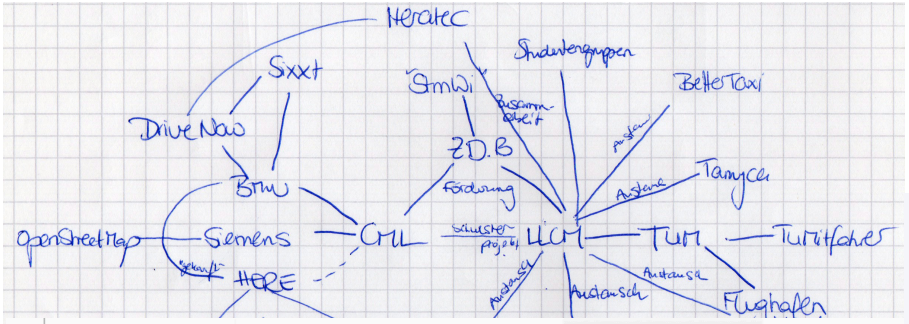
Development: Approach



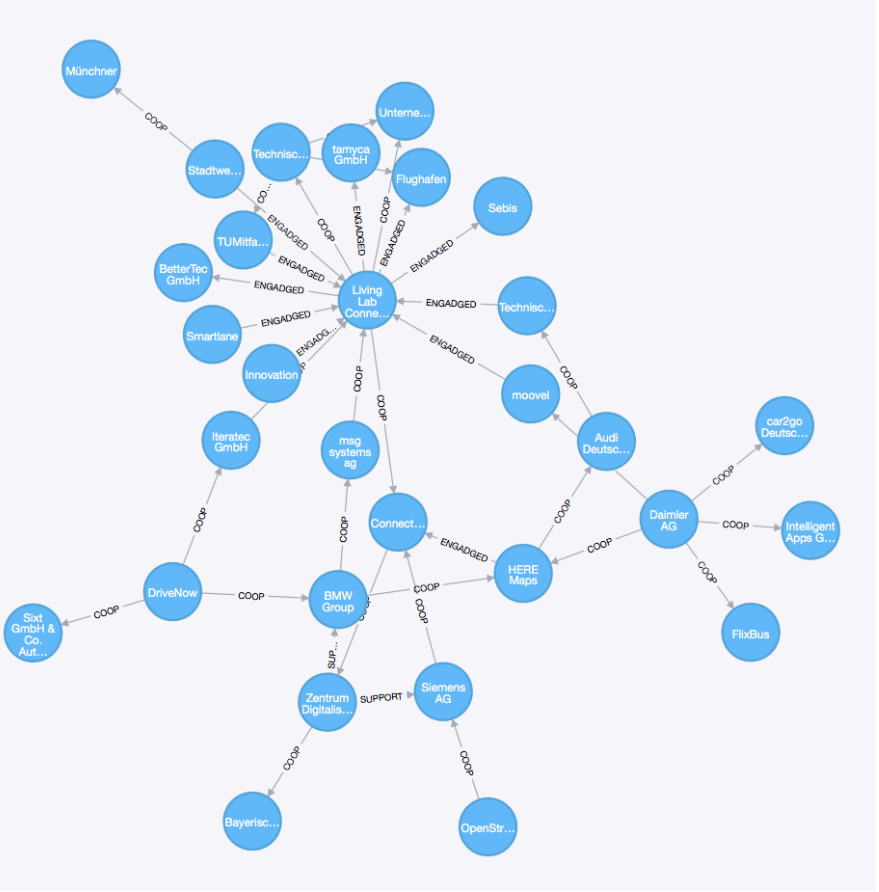
Modeling: Domain Model



Development: Iterations



	A	B	C	D
1	Type	Subject	Name	Logo
2	Public Institution	Public Institutions	Landeshauptstadt München	
3	Public Institution	Public Institutions	Zentrum Digitalisierung.Bayern	
4	Public Institution	Public Institutions	UnternehmerTUM	
5	Organisations/Initiatives	Network	Capgemini - German Innovation Lab	
6	Established Player	Automotive	BMW Group	
7	Established Player	Conglomerate Railwail vehicles	Siemens AG	
8	Platform Provider	Platform Provider	SmartLane	
9	Supplier	Consulting & Software Supplier	msg systems	
10	Supplier	Software Supplier	iteratec	
11	Mobility Service Provider	Mobility interface	Moovel	
12	Mobility Service Provider	Private CarSharing	Tamyca	
13	Mobility Service Provider	(Individual) RideSharing	BetterTaxi	



Development: Iterations

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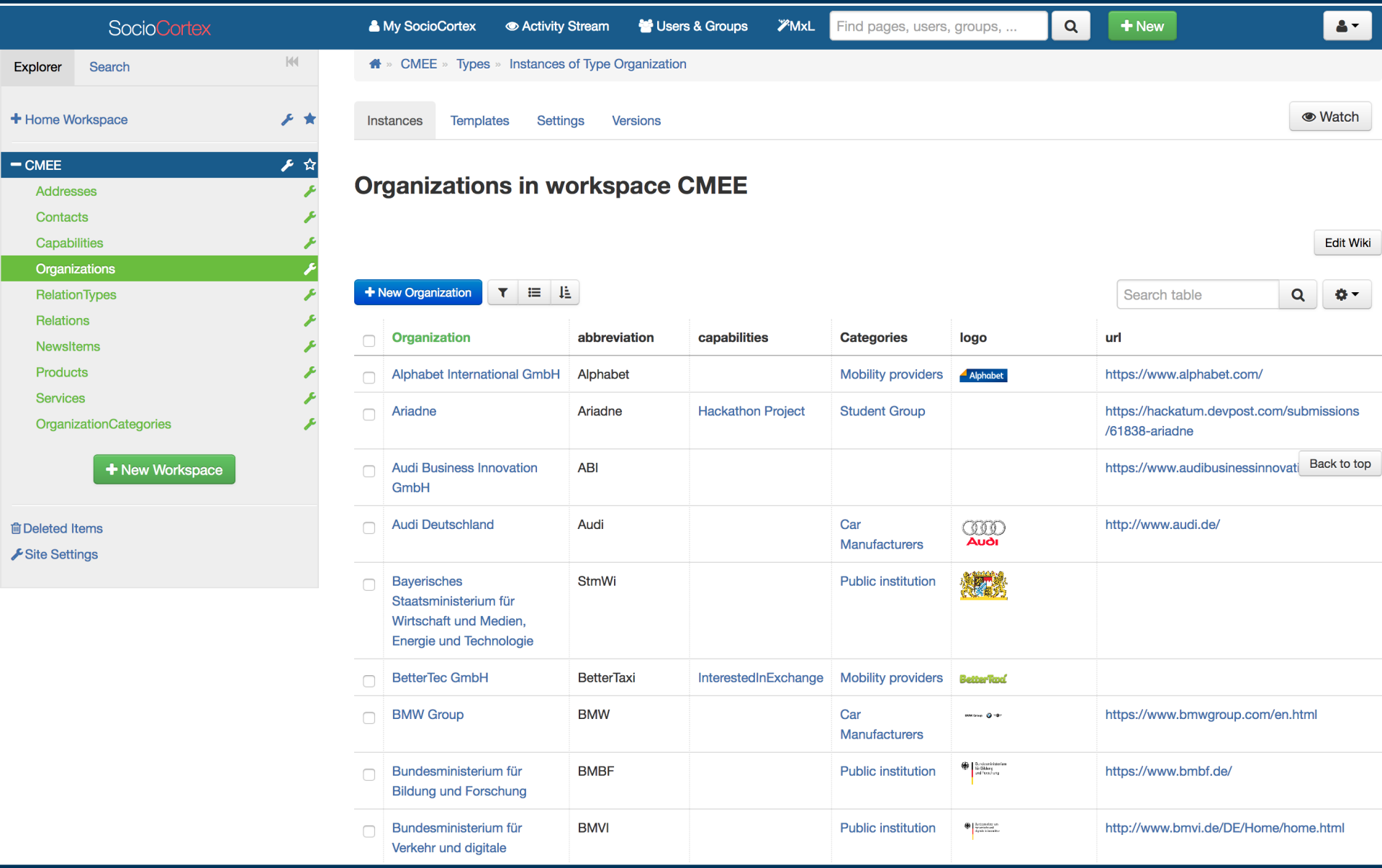
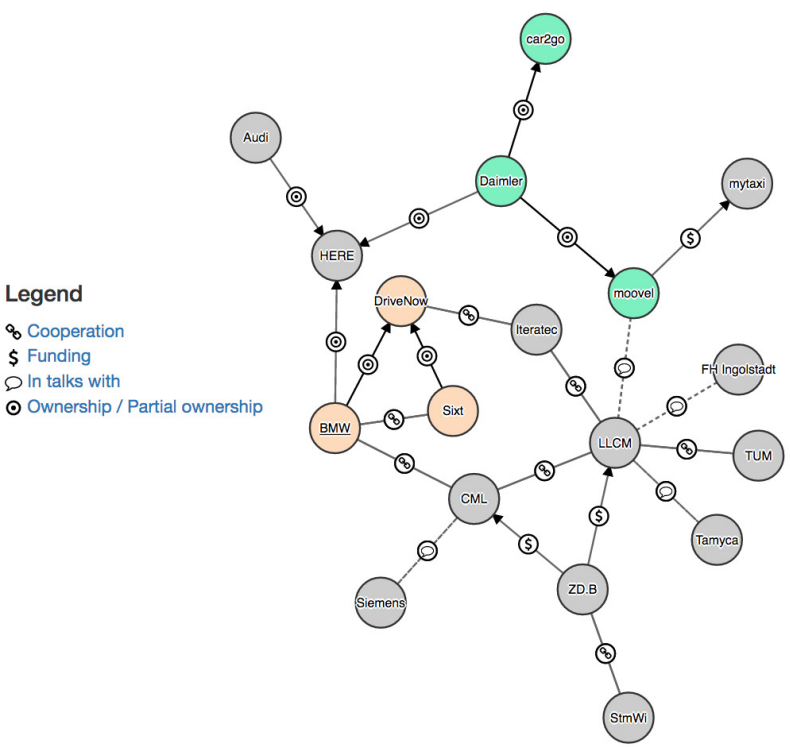
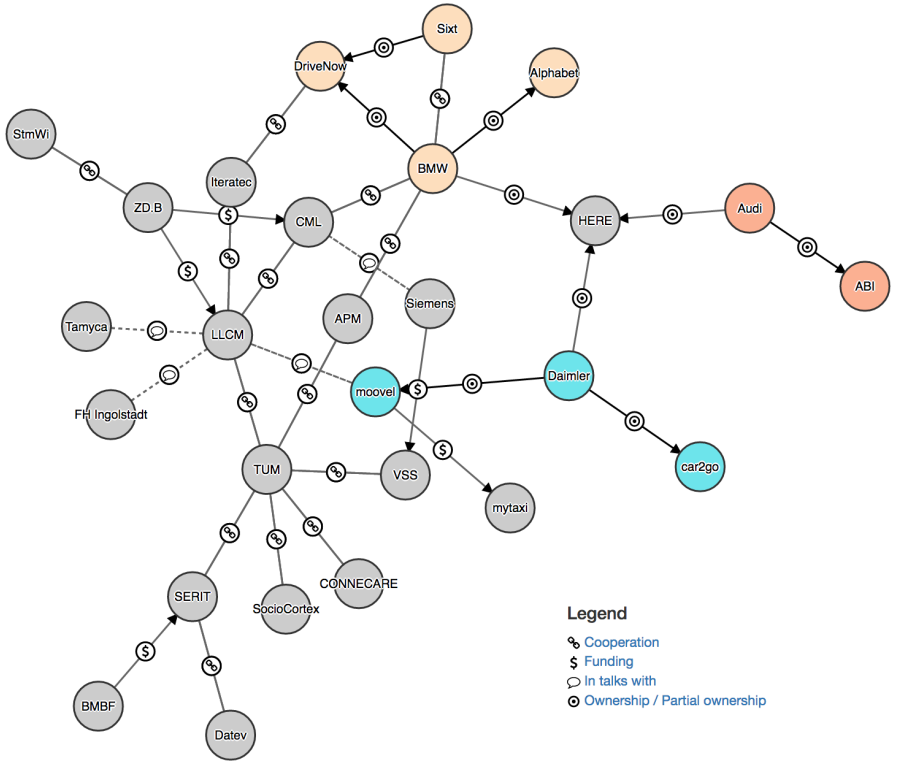


Organization	abbreviation	capabilities	Categories	logo	url
Alphabet International GmbH	Alphabet		Mobility providers	Alphabet	https://www.alphabet.com/
Ariadne	Ariadne	Hackathon Project	Student Group		https://hackatum.devpost.com/submissions/61838-ariadne
Audi Business Innovation GmbH	ABI				https://www.audibusinessinnovati
Audi Deutschland	Audi		Car Manufacturers	Audi	http://www.audi.de/
Bayerisches Staatsministerium für Wirtschaft und Medien, Energie und Technologie	StmWi		Public institution		
BetterTec GmbH	BetterTaxi	InterestedInExchange	Mobility providers	BetterTaxi	
BMW Group	BMW		Car Manufacturers		https://www.bmwgroup.com/en.html
Bundesministerium für Bildung und Forschung	BMBF		Public institution		https://www.bmbf.de/
Bundesministerium für Verkehr und digitale	BMVI		Public institution		http://www.bmvi.de/DE/Home/home.html

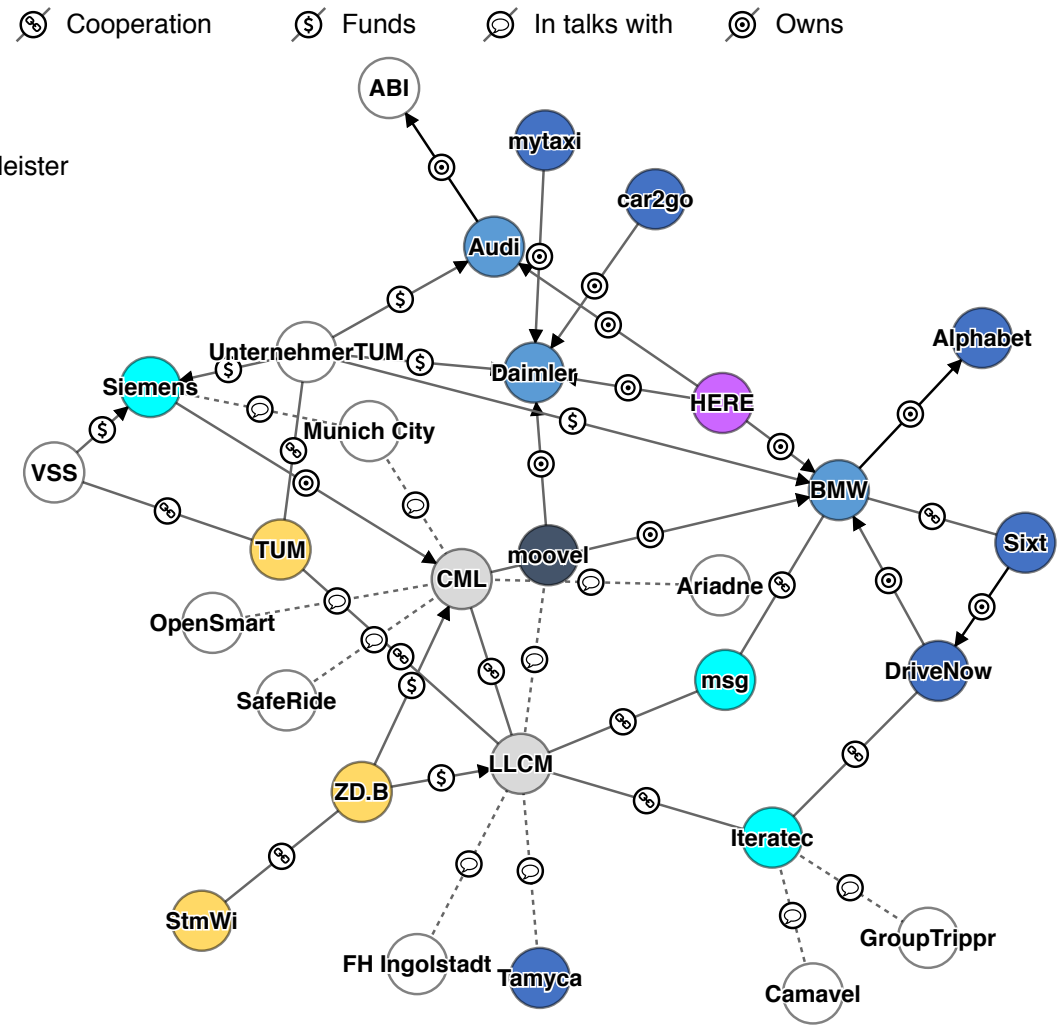
Development: Iterations



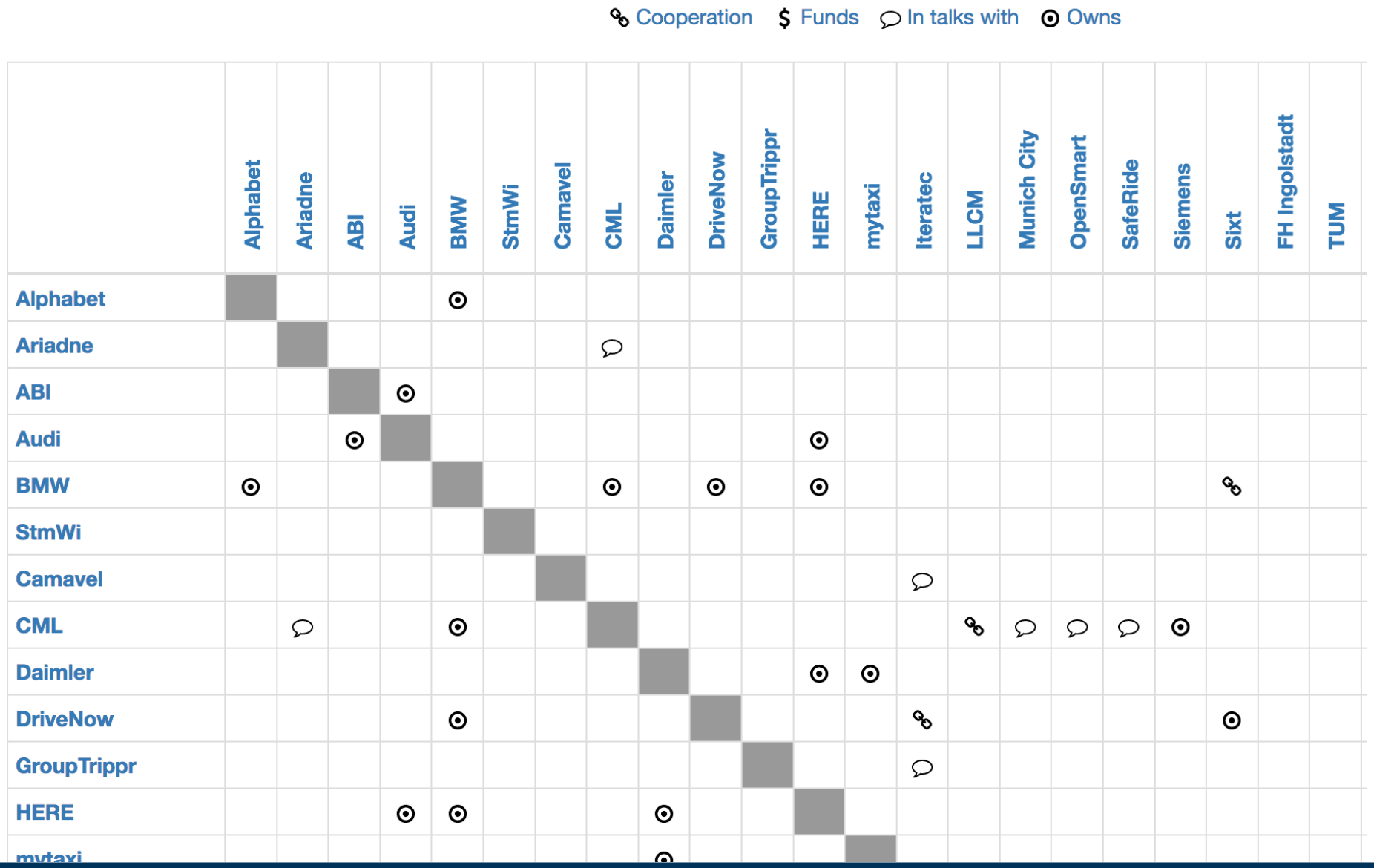


Development: Iterations

- Smart City/Mobility Projekte
- Automobilhersteller
- Mobilitätsdienstleister
- Mobilitätsinformationsdienstleister
- Mobilitätssoftware/Infrastrukturdienstleister
- Mobilitätsplatformen
- Öffentliche Einrichtung
- Öffentliche Verkehrsmittel
- Öffentliche Verkehrsdatenquellen
- Kartenanbieter



Development: Iterations



DEMO

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Evaluation: Semi-structured Interviews with Experts

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- 15–30 minute interviews with $n = 10$ experts
- Interview guideline
- Example scenario
- 4 questions

Questionnaire

Scenario

You are leading a research group that wants to rent out private vehicles, in the times that they are not being used (i.e. during the week while the owners commute by public transportation). Your investors want to see a prototype working in the real world, and it is your job to find companies which allow you to collaborate and realize this goal/desire. One of your first tasks is to analyze and contact potential partners. These could be competitors offering similar products, companies offering advice/parts or independent contractors.

One of your staff/friends/employees/partners has prepared data for you to make your decision. It contains:

- Companies
  - Key figures: Size, branch(es), revenue
  - A contact (person) per company
- Relationships: whether links exist between companies
  - Cooperations
  - Ownerships
  - Funding
  - Communications

Scale

#	English	Deutsch
1	Strongly disaggree	Trifft nicht zu
2	Disaggree	Trifft eher nicht zu
3	Neither agree nor disagree	Teils-teils
4	Agree	Trifft eher zu
5	Strongly agree	Trifft zu

Questions

1. The companies (and their data) are useful for your task in the way presented. (1-5)
   Die Firmen und wie sie dargestellt werden sind nützlich für ihre Aufgabe. (1-5)
2. The relationships are useful for your task in the way presented. (1-5)
   Die Beziehungen sind nützlich für ihre Aufgabe. (1-5)
3. The combination of companies and relationships are useful for your task. (1-5)
   Die Kombination aus Firmen und Beziehungen sind nützlich für ihre Aufgabe. (1-5)
4. For a relationship between organizations to exist, please order the following factors by influence:

#	English	Deutsch
1	People	Menschen
2	Contracts	Verträge
3	Departments	Abteilungen
4	Company (policy)	Firmen (politik)
5	Top Management	Führungskräfte / Top Manager / Vernetzungskräfte

1. (For those physically present) A student has created two visualizations of data, compare the two for clarity, relevant information and effectiveness.
2. Personal information (will not be published)
   - Name
   - E-Mail
   - Job Title
   - Company

Follow up

Since this is very brief, if any ideas come up in the next couple of days, please feel free to contact me.

Evaluation: Use-cases, Questions, Hypotheses

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Small Startup. Private car rentals, while owners don't need them.
Next step: convince investors with small-scale working prototype

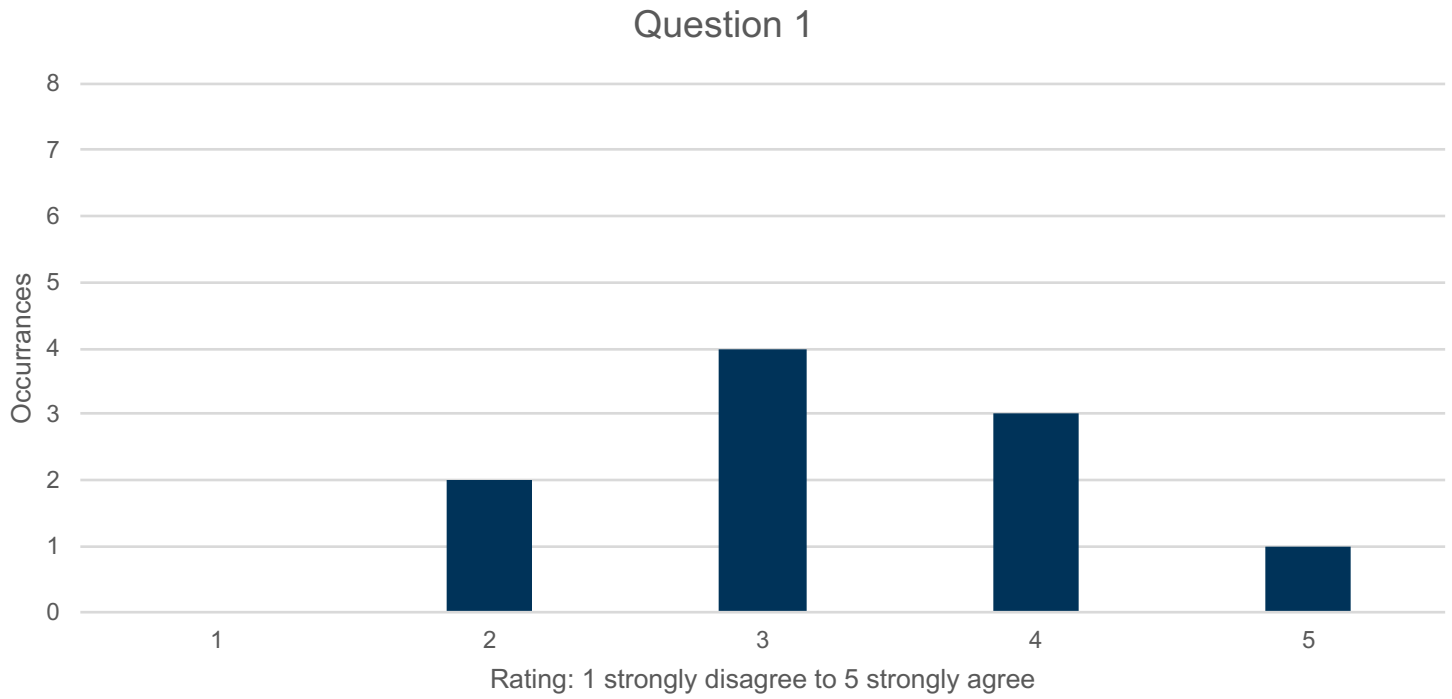
Expertise required in:

- Automotive
- Hardware
- Software
- Billing / Finance
- Analytics
- Legal
- Insurance

Harry G, 21.09.2015, "Start-Up Gschaftler"

Evaluation
Question 1

The organizations are useful for your task in the way presented.

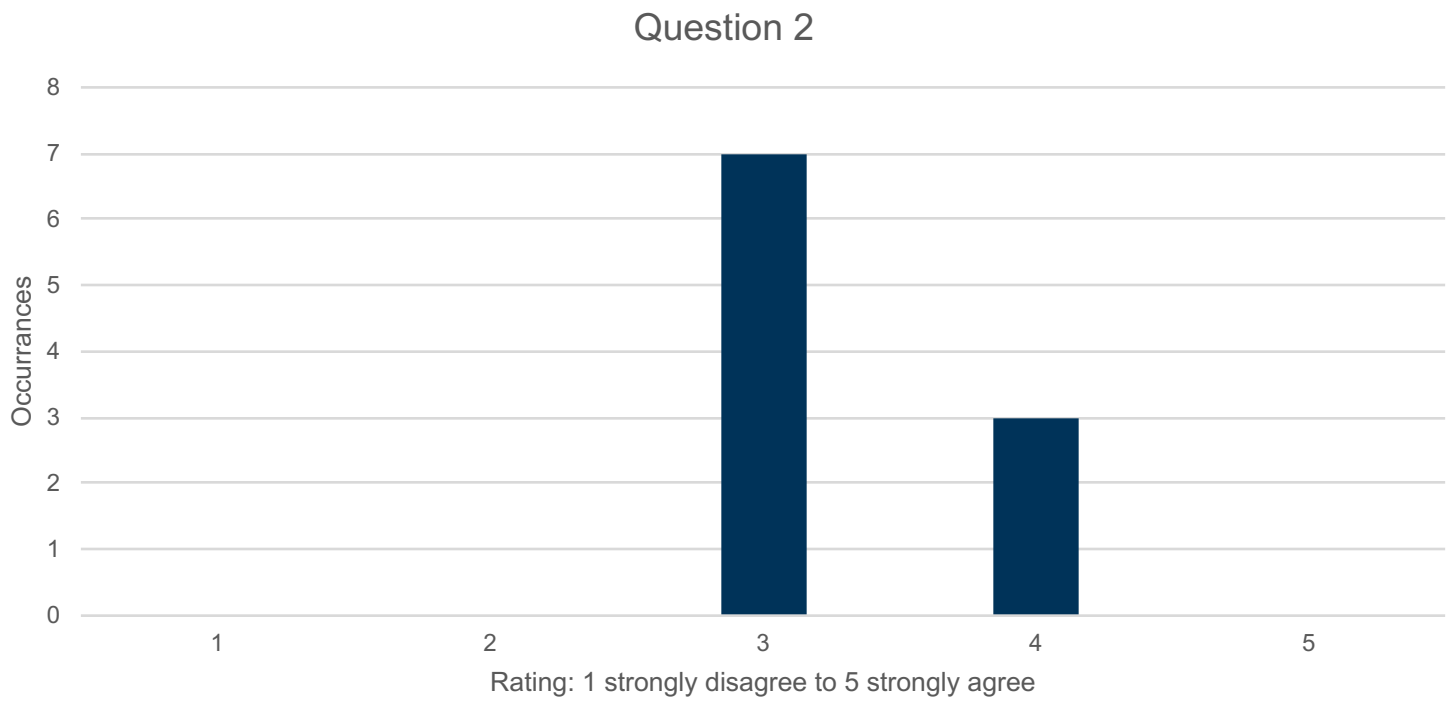


$$\mu = 3.3; \sigma^2 = 0.9; c_v = 0.29$$

Result: indifferent

Evaluation
Question 2

The relationships are useful for your task in the way presented.

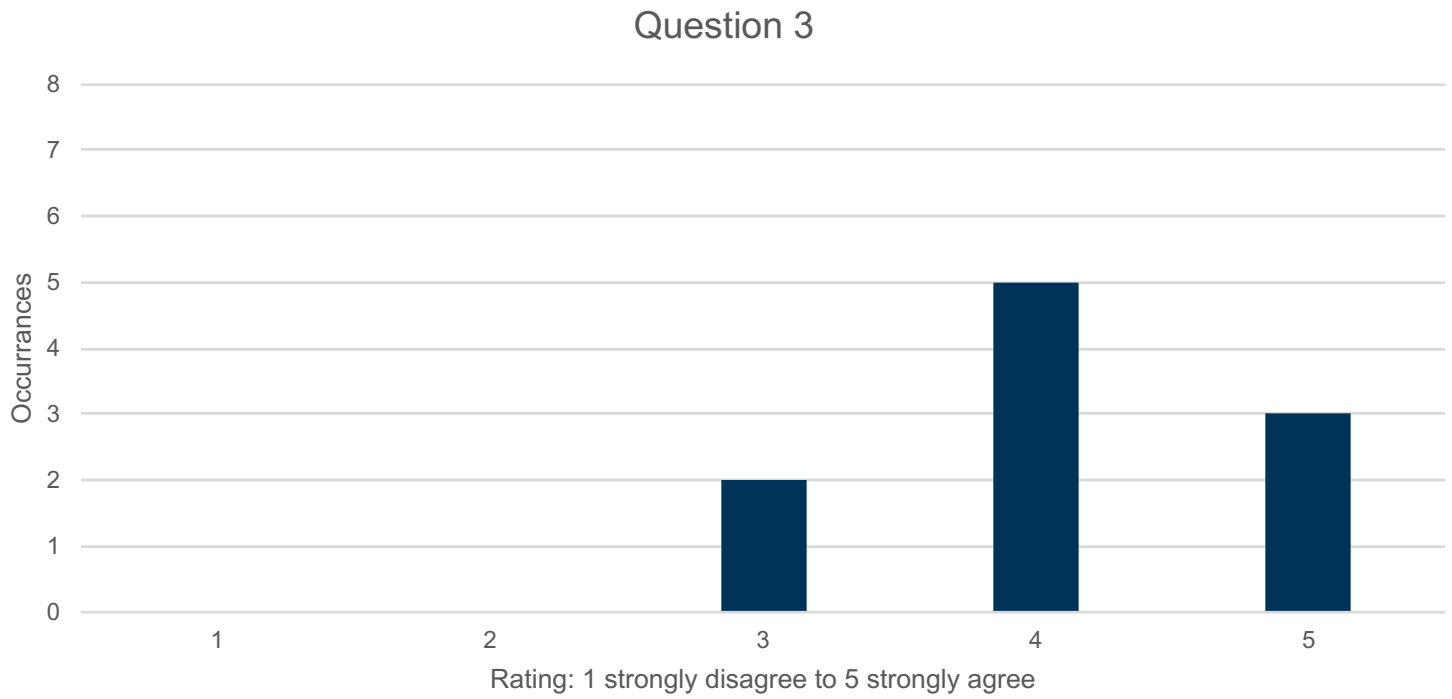


$$\mu = 3.3; \sigma^2 = 0.23; c_v = 0.15$$

Result: indifferent

Evaluation
Question 3

The combination of companies and relationships are useful for your task.



$$\mu = 4.1; \sigma^2 = 0.54; c_v = 0.18$$

Result: useful

Evaluation

Question 4

For a relationship between organizations to exist, please order the following factors by influence:

- People
- Contracts
- Departments
- Company
- Top Management

1. Company
2. Top Management
3. Departments
4. Contracts
5. People

Result: People not most important

Size and maturity have significant impact on the order of factors

Evaluation: Qualitative Results and Limitations

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Qualitative Results

- Knowledge management: a familiar and common problem
- Each organization/relationship: unique, hard to classify
- Interaction with visualization: important
- Additional knowledge desired:
  - Subcontractors / Suppliers
  - Money flow

Limitations

- Small sample size
- Predisposition
- Response bias

Recap: Research Questions

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Further Research

- BMW will host instance
- Further research at chair
- Declarative View model

Thank you

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References

1. S. Ismail. *Exponential organizations: why new organizations are ten times better, faster, and cheaper than yours (and what to do about it)*. New York, New York: Diversion Books, Oct. 2014. ISBN: 1626814236.
2. H. McRae, 05.05.2015, *Facebook, Airbnb, Uber, and the unstoppable rise of the content non-generators*, http://www.independent.co.uk/news/business/comment/hamish-mcrae/facebook-airbnb-uber-and-the-unstoppable-rise-of-the-content-non-generators-10227207.html, online, accessed 30.11.2016
3. Harry G, 21.09.2015, *Start-Up Gschaftler*, https://youtu.be/SicZhZeYJD0, online, accessed 30.11.2016