Visualising the effects of ontology changes and studying their understanding with ChImp

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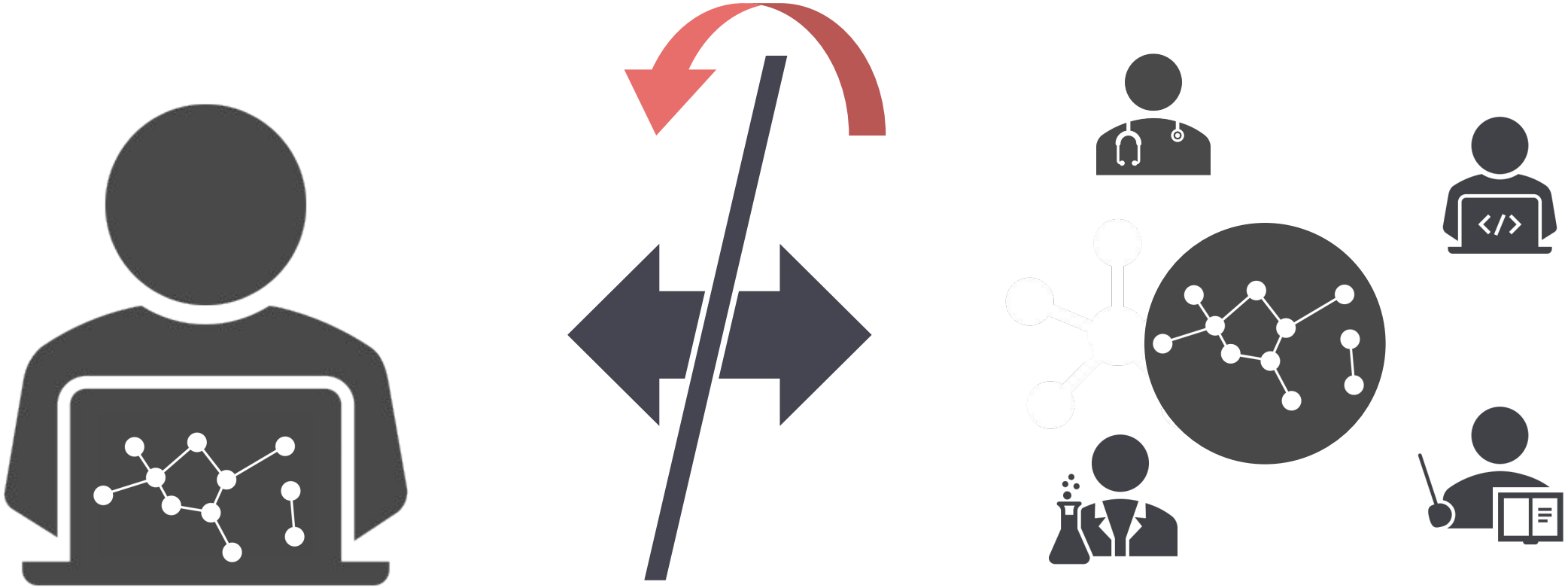
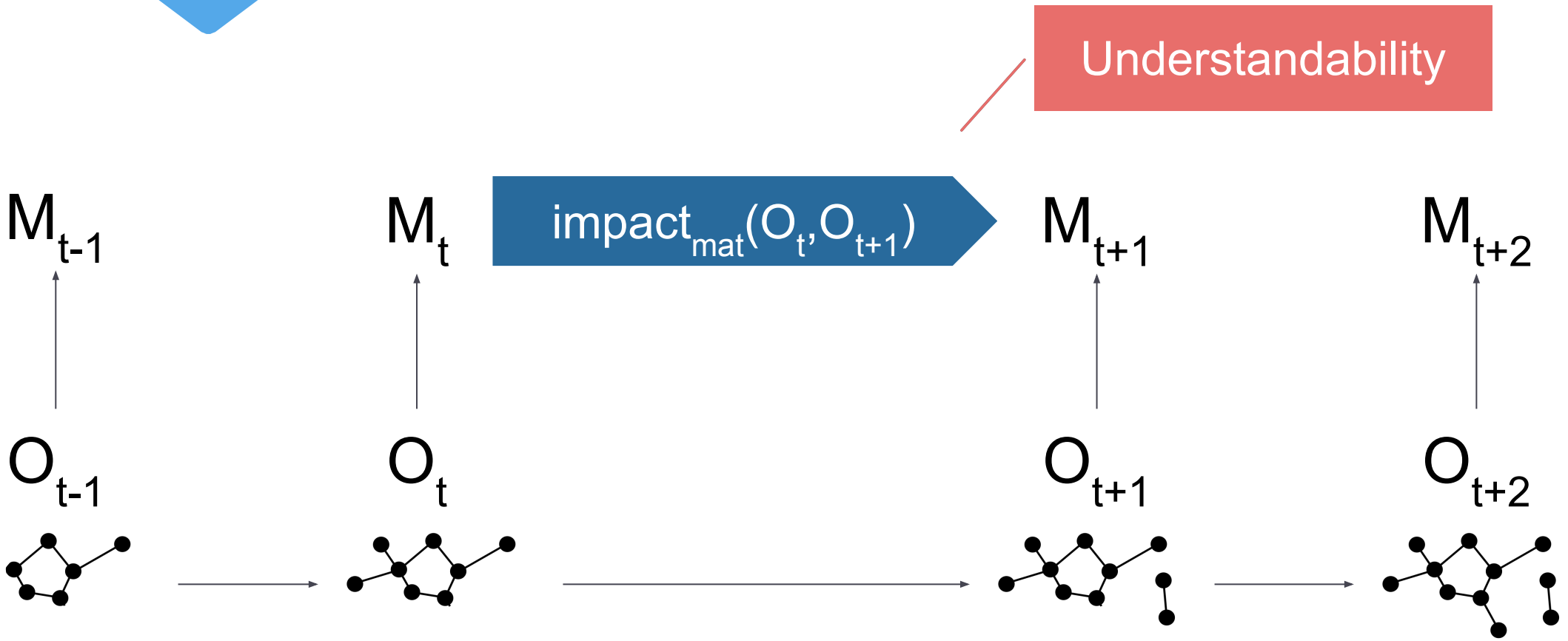
Ontologies are used in many tasks/applications.



As ontologies evolve, results of tasks change too.



Research pipeline

Definition of impact measures

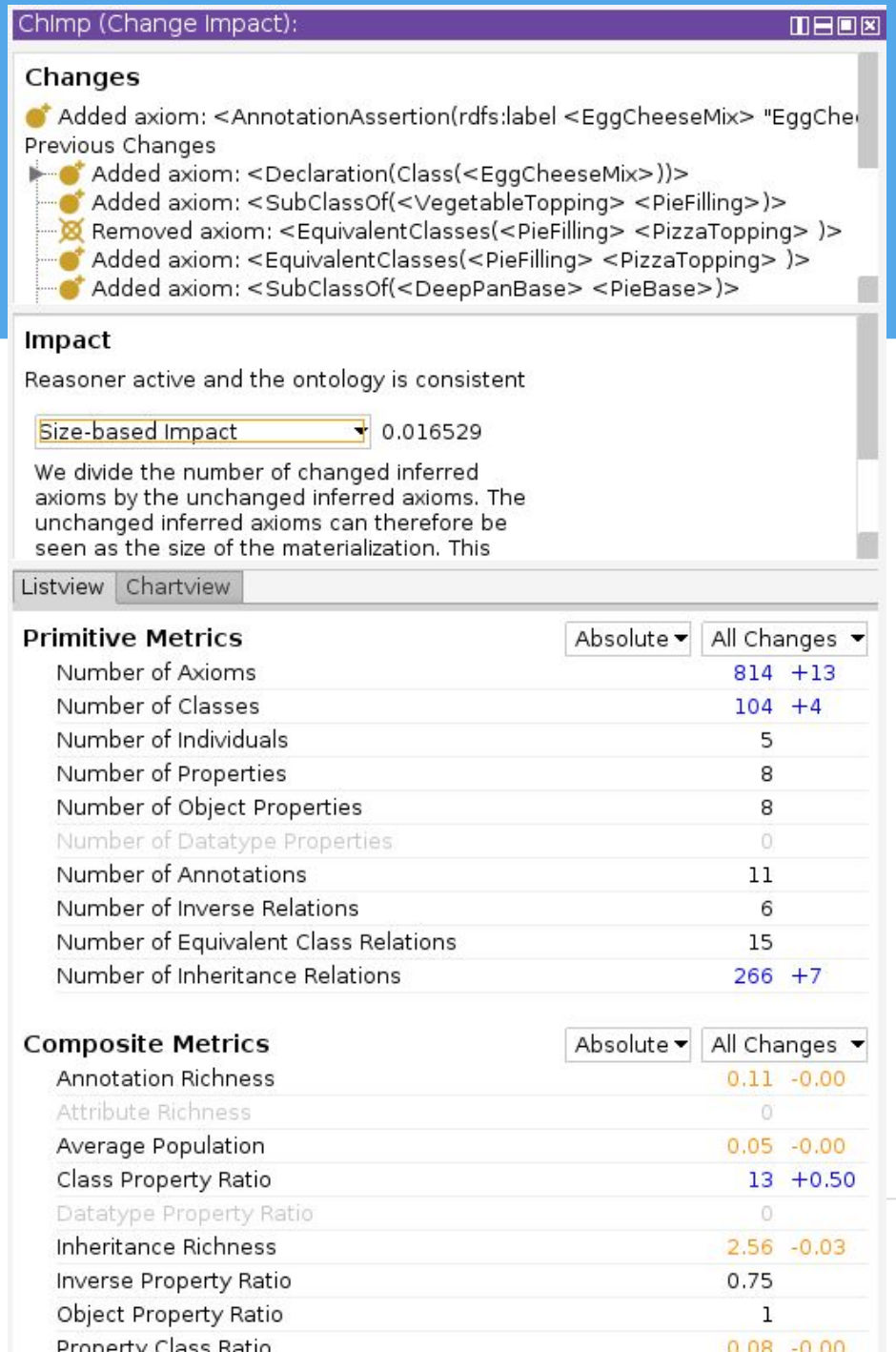
→ quantitative analysis with 9 OBO ontologies.

Online questionnaire with mockups

9 requirements implemented as Protege plugin.

Online study with 2 hands-on tasks.

[1] Pernisch, Dell'Aglio, & Bernstein. (2021). Beware of the hierarchy - An analysis of ontology evolution and the materialisation impact for biomedical ontologies. *Journal of Web Semantics*, 100658.



ChImp in action

– a selection of requirements

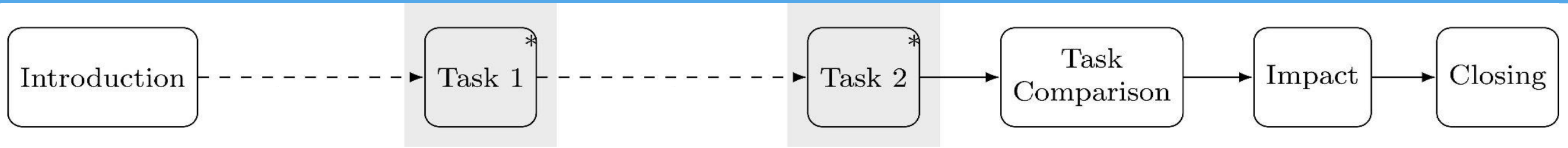
[R1] ChImp should list the applied **changes**.

[R2] ChImp should inform the user about the **consistency** of the loaded ontology.

[R3] ChImp should show primitive and composite measures in a table visualizing the **new value and its difference** to the old value based on the applied changes.

[R5-7] ChImp should provide **export** functionality.

User Study

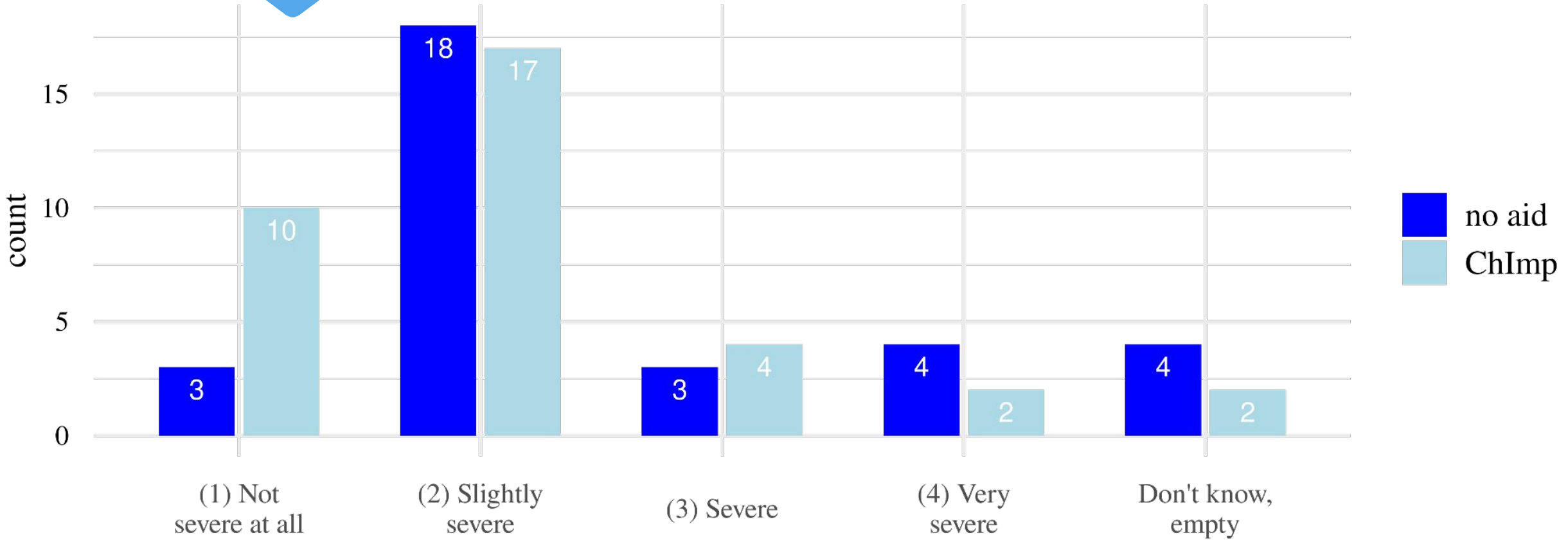


Participants

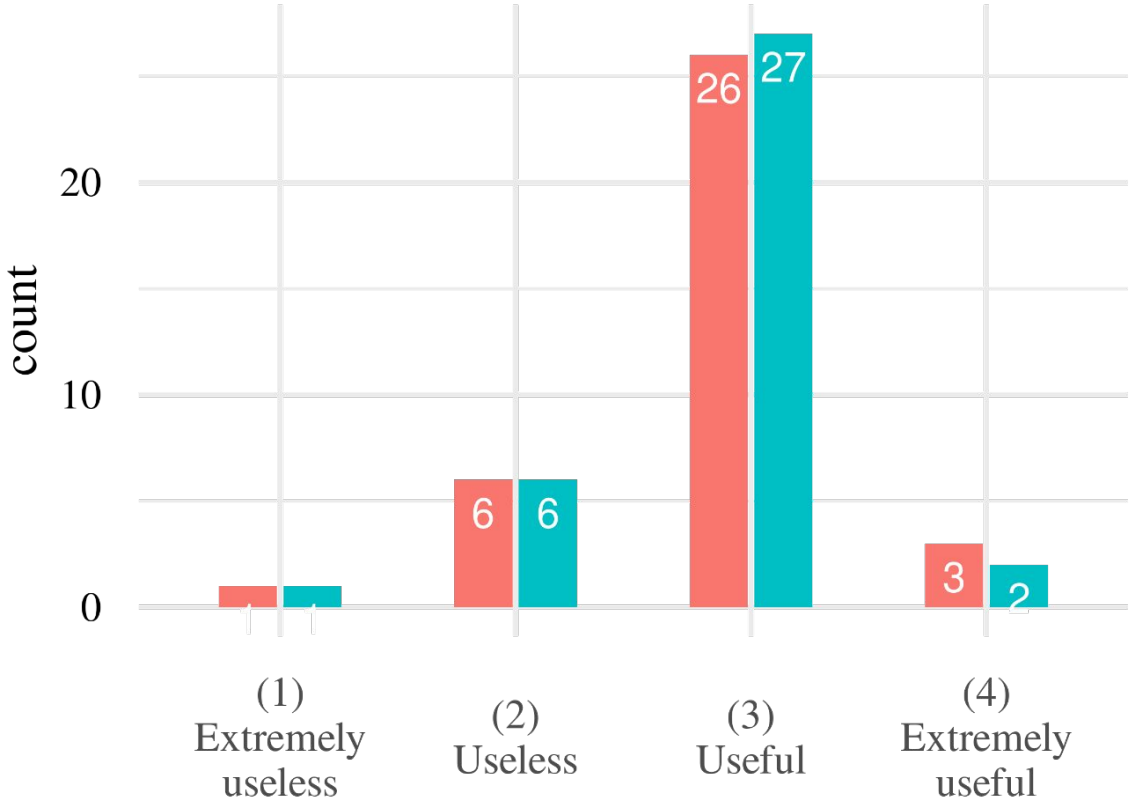
	Intro	Task 1	Task 2	Comparison	Impact	Closing
Recorded	67	53	37	37	37	37
Usable	62	36	25	25	36	36

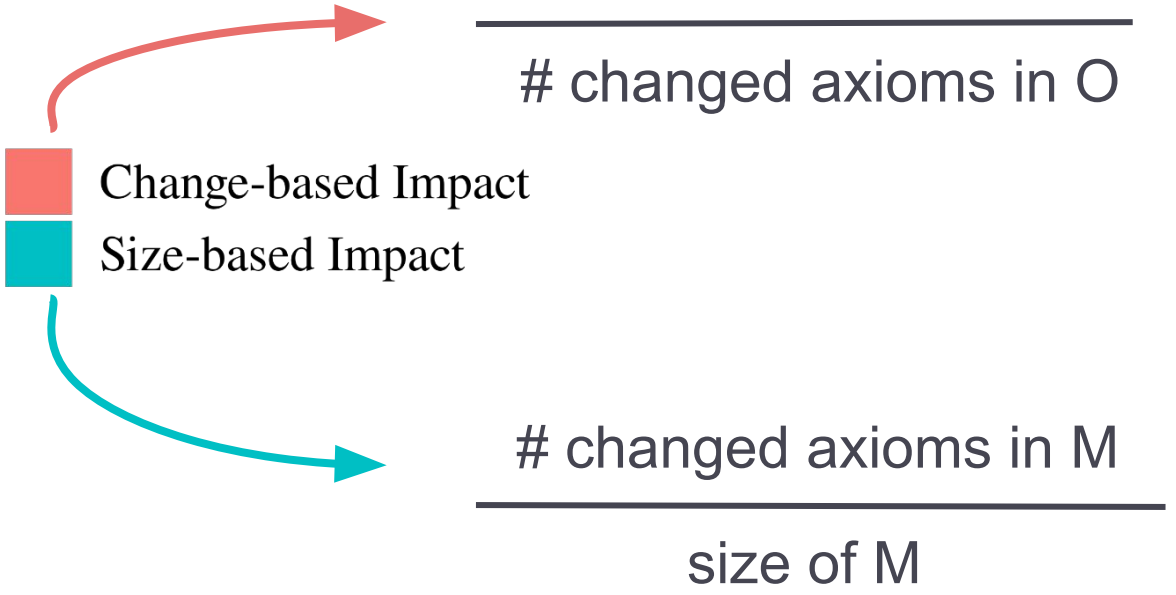
	Total	G1	G2	G3	G4
Task 1	36	5	13	7	11
Task 2	25	4	7	6	8

Do ontology engineers understand the effect of changes better when using ChImp than without?

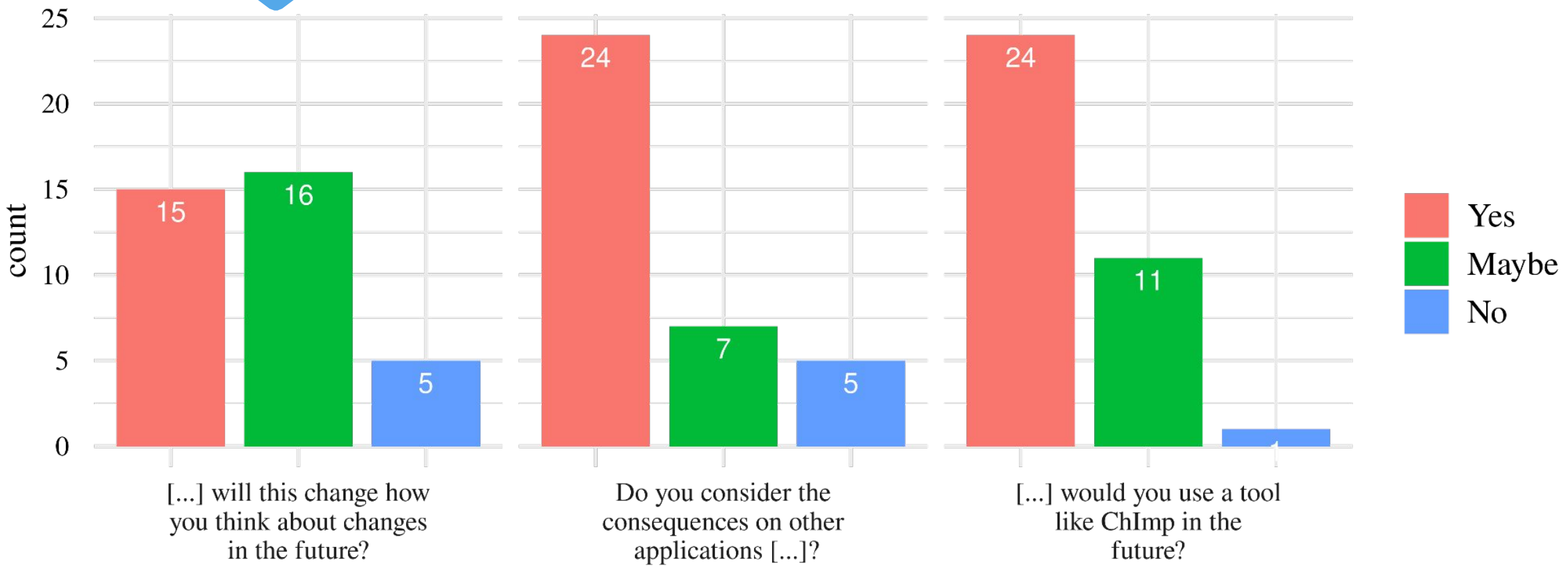


Are the materialization impact measures useful for ontology engineers?



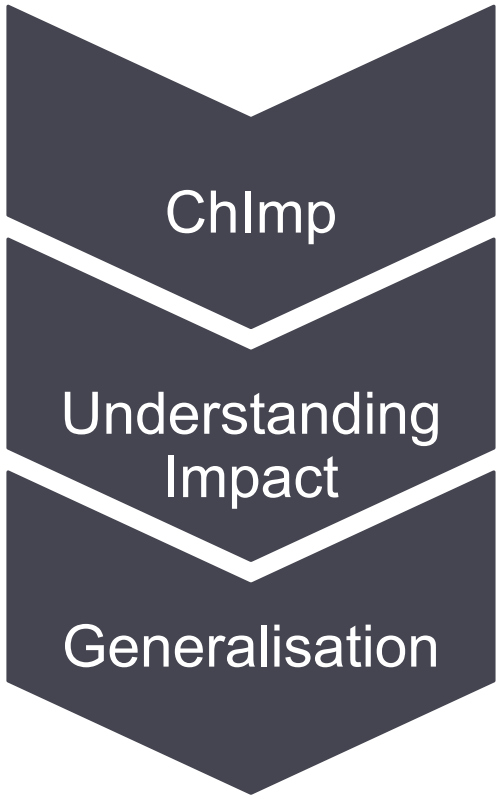


Other Findings



Summary

Impact of ontology evolution on downstream operations.



- ➔ Requirements elicited through an online questionnaire.
- ➔ Implementation as a Protege Plugin to inform about applied changes.

- ➔ Hands-on study with expert to study awareness of impact.
- ➔ ChImp is a useful tool that participants want to continue to use.

- ➔ Better informed ontology engineers.
- ➔ In the future also better informed ontology users.

Pernisch et al. (2022). Visualising the effects of ontology changes and studying their understanding with ChImp. *Journal of Web Semantics*. https://doi.org/10.1016/j.websem.2022.100715.

Thank you for your attention.

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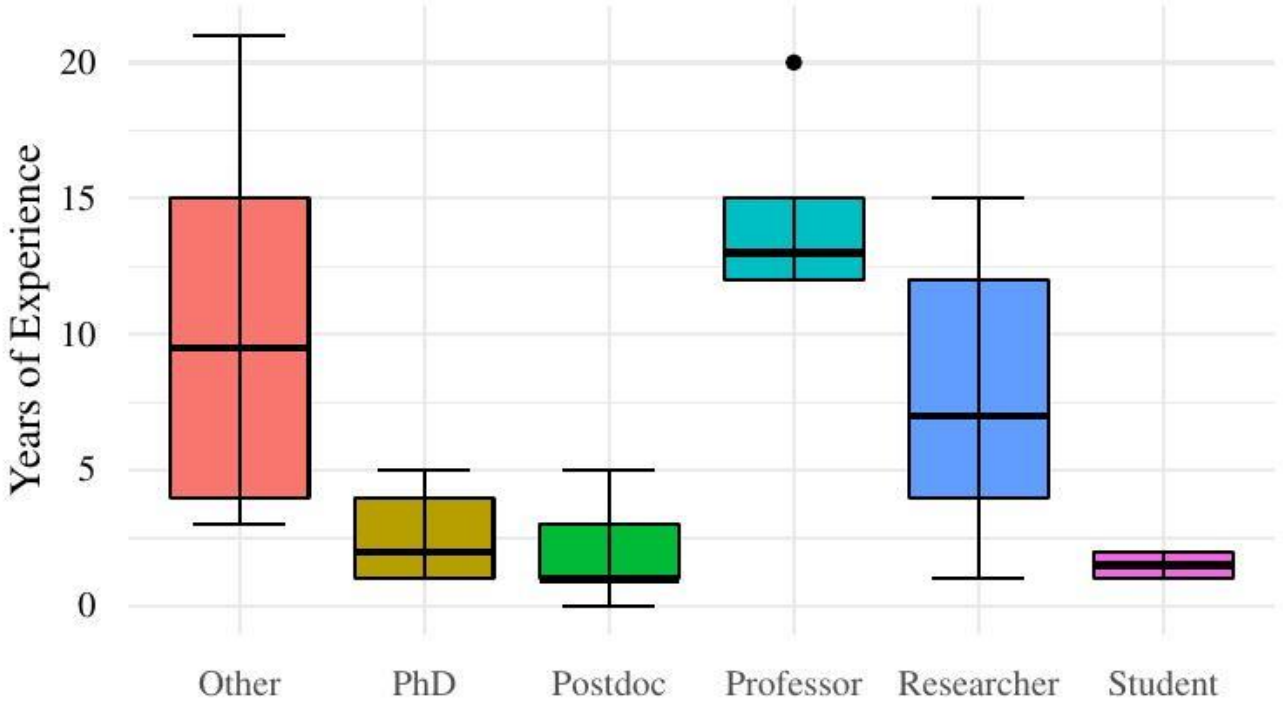
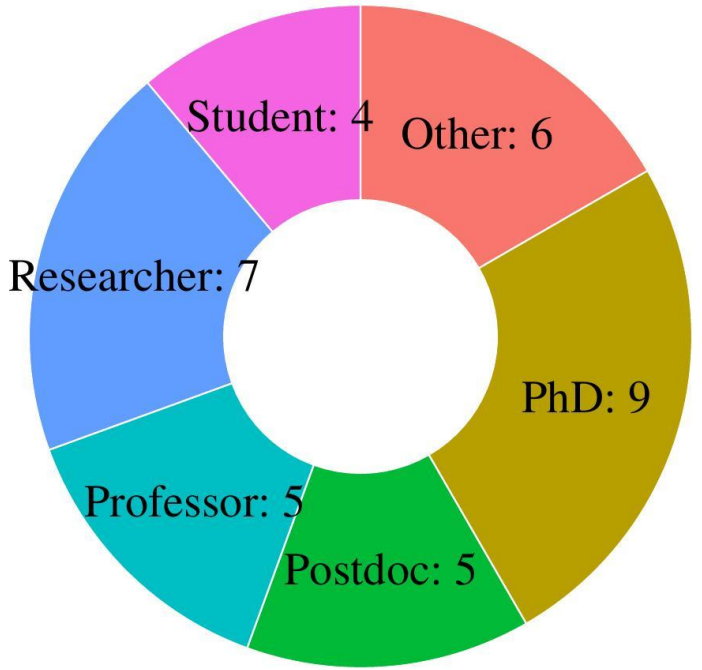
Pernisch et al. (2022). Visualising the effects of ontology changes and studying their understanding with ChImp. *Journal of Web Semantics*. https://doi.org/10.1016/j.websem.2022.100715.

Participants' Demographics

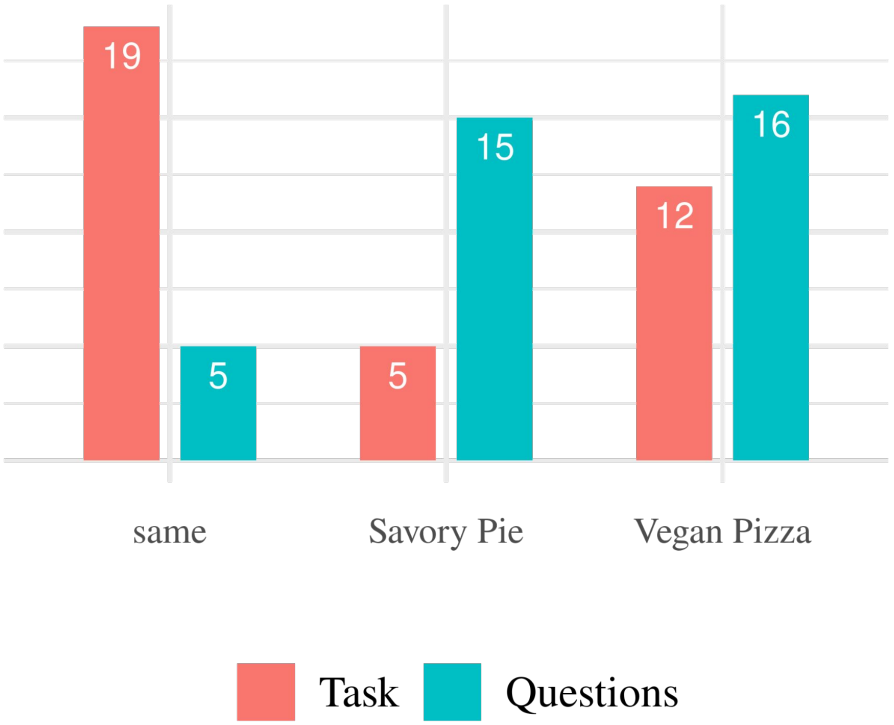


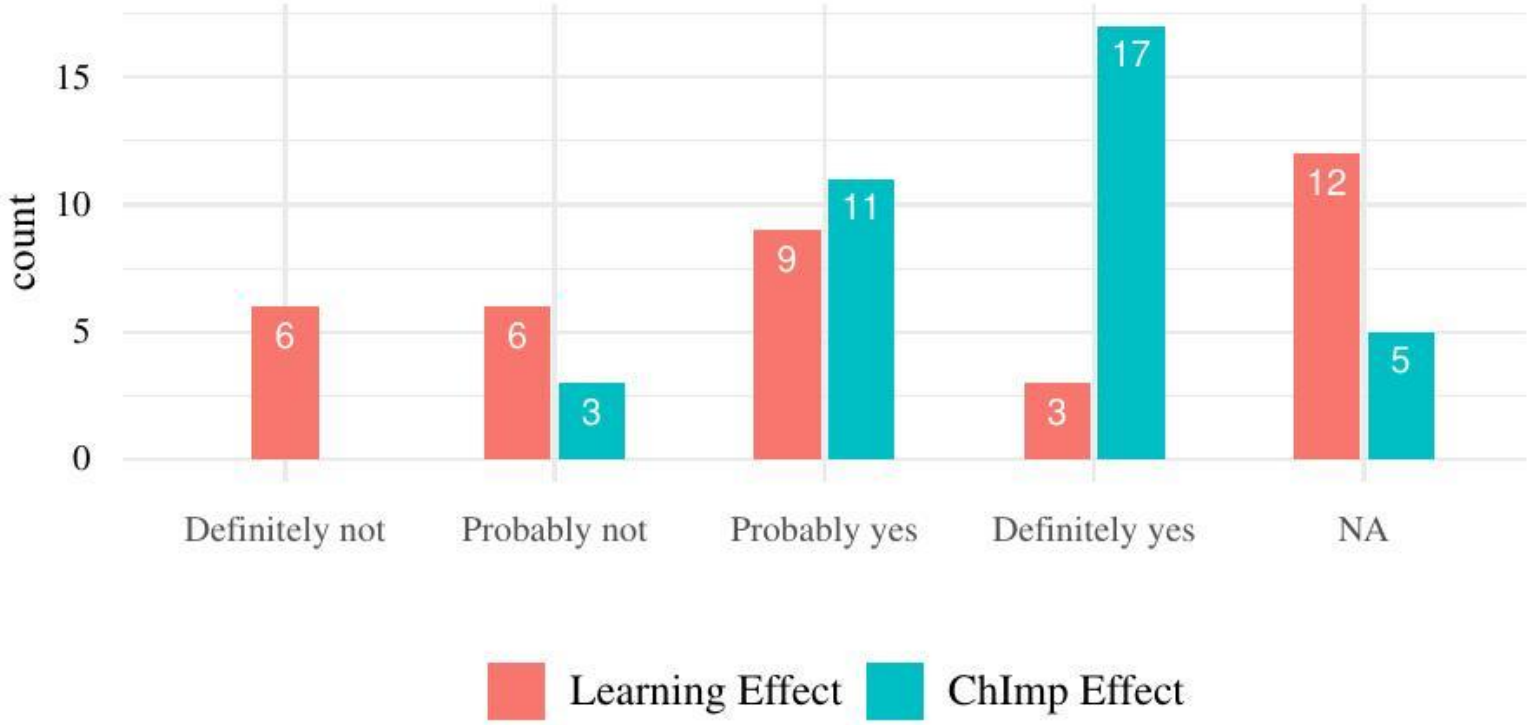


What does severe impact on the ontology and on the materialisation mean to ontology engineers?

Impact on	Onto.	Mat.
Reasoning as impact (consistency of ontology)	9	
Number of changed axioms	7	16
Explicitly mentioned: Impact on structure	8	
Explicitly mentioned: Our impact measures		5
Errors, change in underlying definitions of concepts, or other	9	

Self-assessment





Previous Work

Investigations of specific operations and ontologies.

Examples:

- Gene Ontology + Functional Enrichment Analysis
  Groß et al. (2012). Impact of Ontology Evolution on Functional Analyses. *Bioinformatics* (Oxford, England). 28. 2671-7. 10.1093/bioinformatics/bts498.
- National Cancer Institute Thesaurus + (change based) Reasoning
  Gonçalves et al. (2011). Analysing the evolution of the NCI Thesaurus. *Proceedings of the IEEE Symposium on Computer-Based Medical Systems*. 1-6. 10.1109/CBMS.2011.5999163.
- Gottron and Gottron: Dynamic Linked Data Observatory + Indexing
  Gottron & Gottron. (2014). Perplexity of index models over evolving linked data. *In European Semantic Web Conference.* 161-175. *10.1007/978-3-319-07443-6_12*

→ Materialisation