Requirements for and Evaluation of User Support for Large-Scale Ontology Alignment

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LiU

expanding reality

Conclusions

- Requirements for user support for Large-Scale OA

- Literature study
  - Infrastructure and Algorithms category supported to different level or not at all;
  - Explanation category the least supported from the user interface categories.

- User interface evaluations
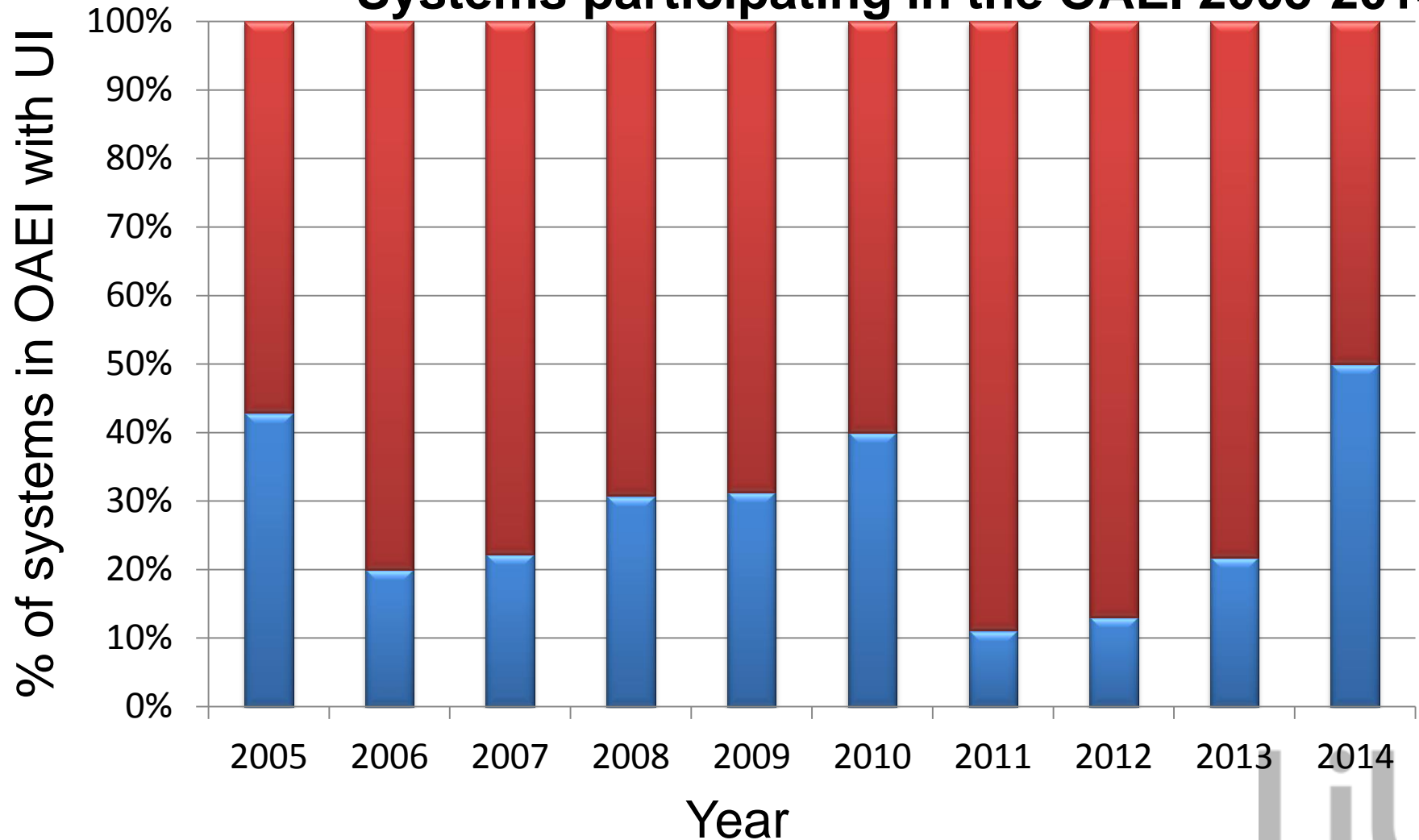 - Seemingly *trivial* issues like search and ontology visualization play a crucial role.

Motivation

Systems participating in the OAEI 2005-2014
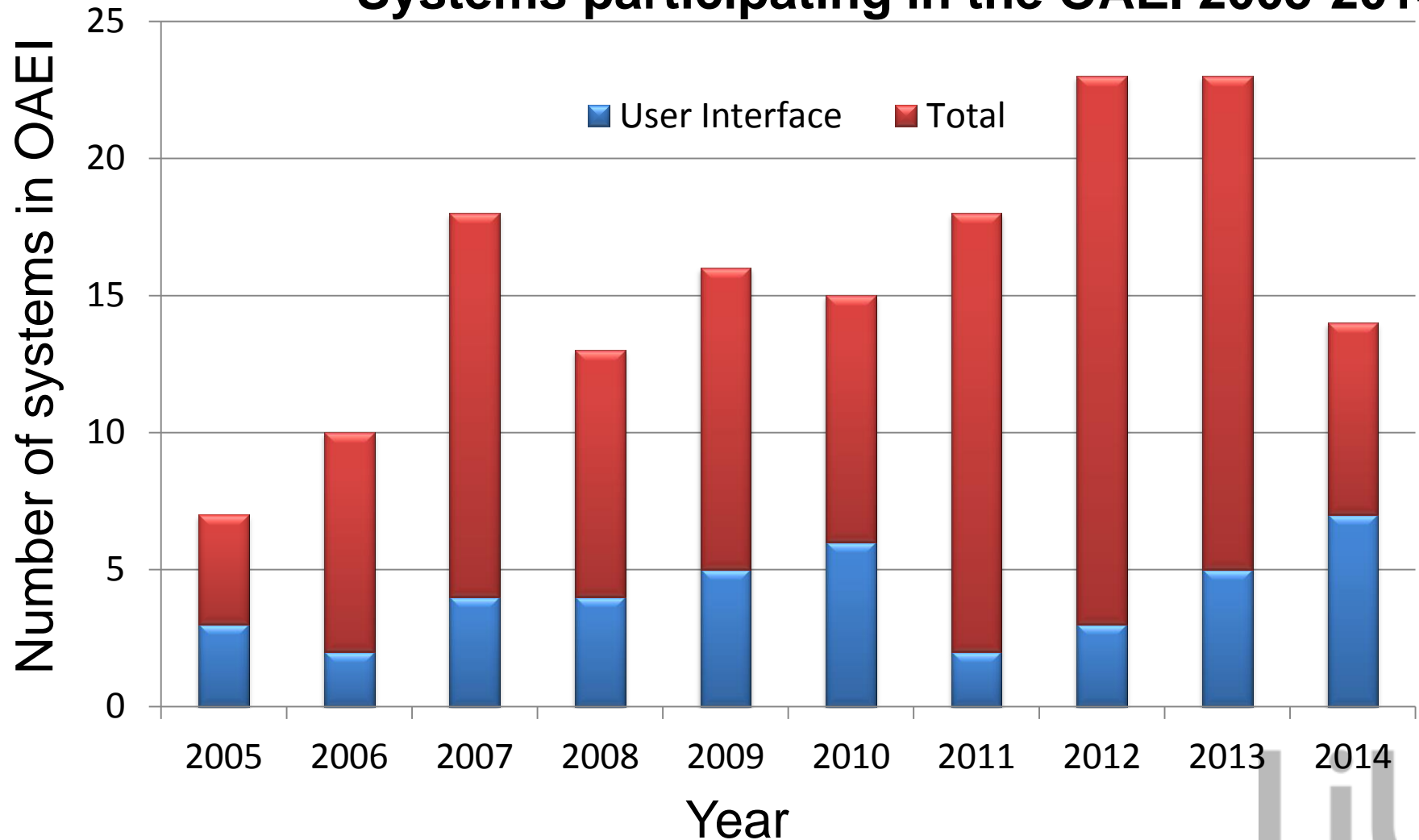
Motivation


Systems participating in the OAEI 2005-2014

Motivation

- Challenges in Ontology Matching*:
  - explanation of matching results
  - fostering user involvement
  - social and collaborative matching
  - alignment management: infrastructure and support

* Ontology Matching: State of the Art and Future Challenges, Shvaiko P, and Euzenat J, IEEE Transactions on Knowledge and Data Engineering
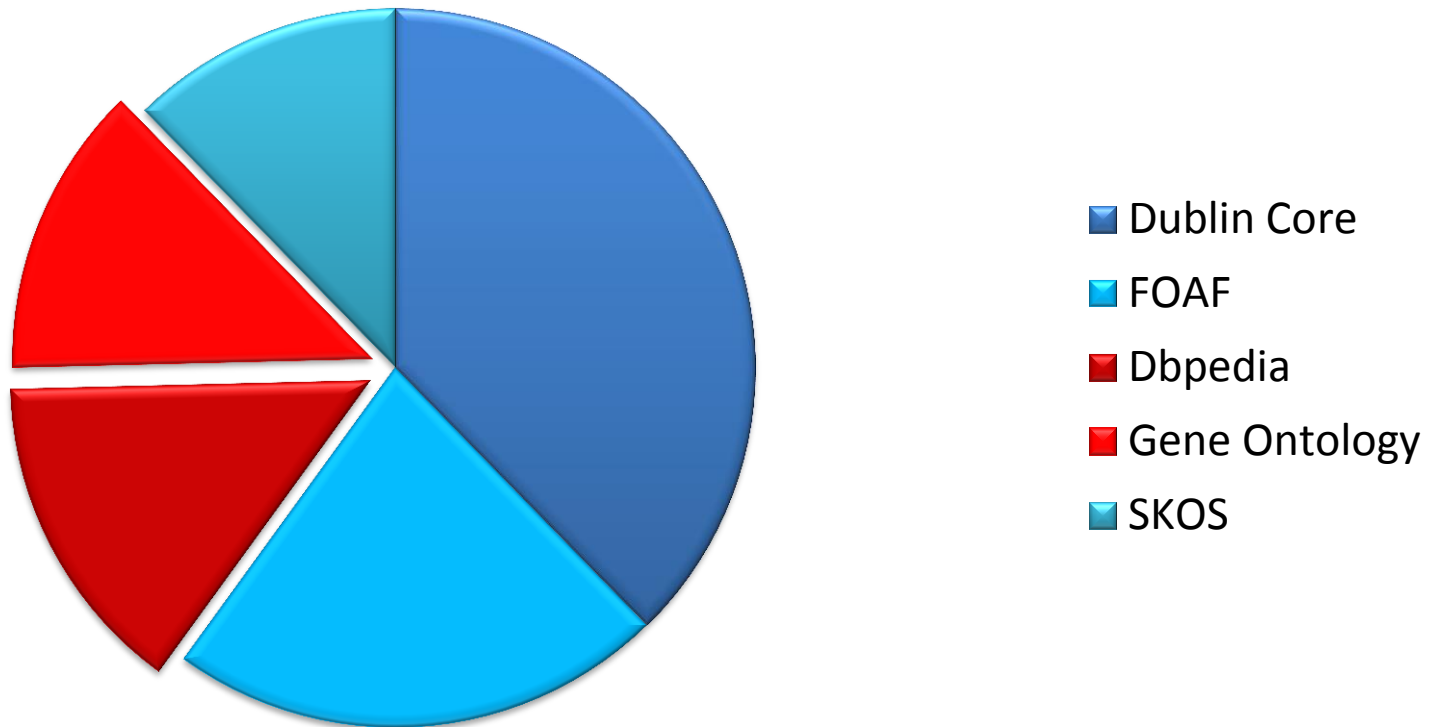
Motivation
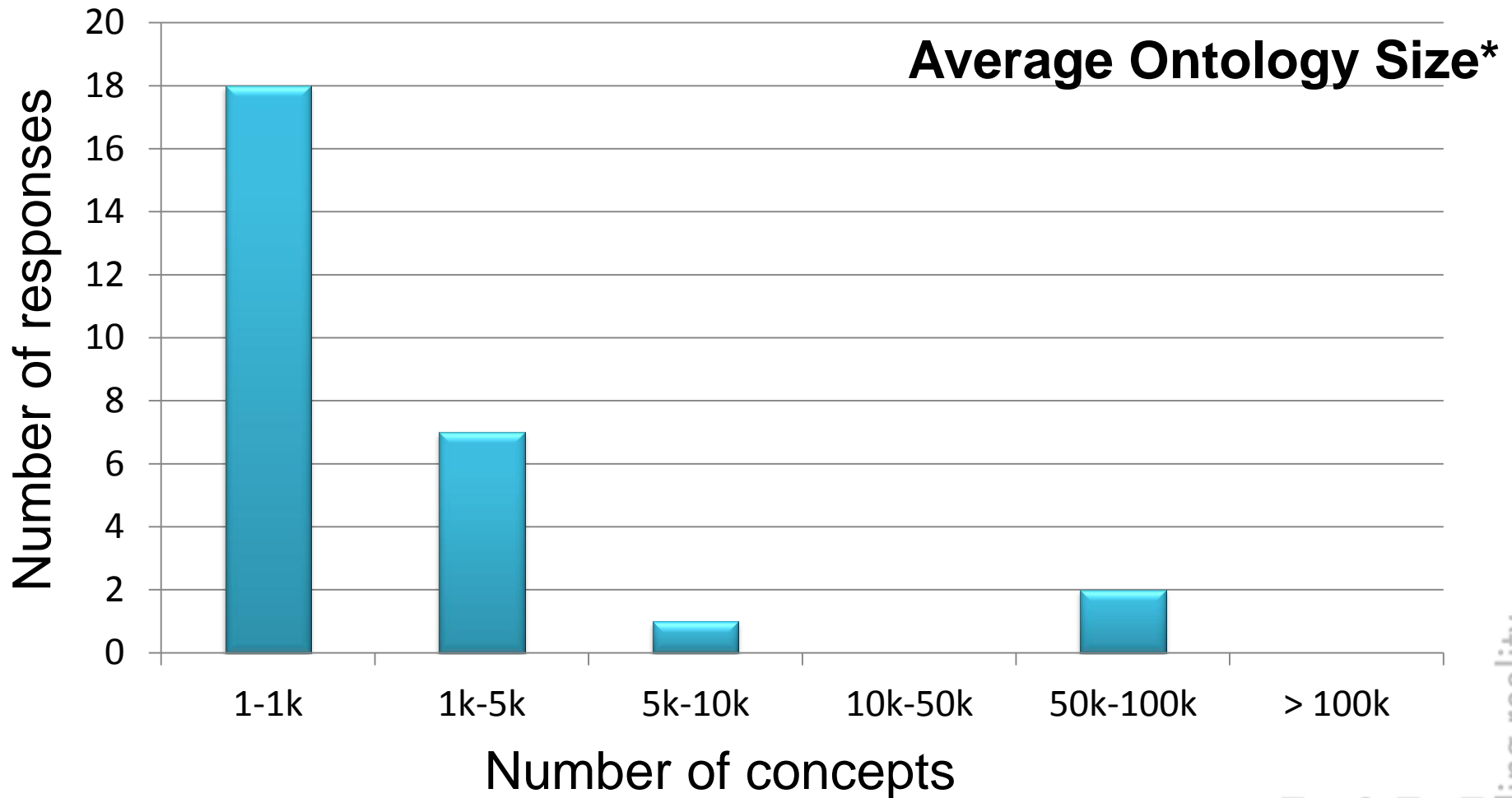
* Ontology mapping - a user survey, Falconer S M, Noy N F, Storey M A, Ontology Matching - 2007

Motivation

The five most commonly used ontologies*

- ■ Dublin Core
- ■ FOAF
- ■ Dbpedia
- ■ Gene Ontology
- ■ SKOS

* Using Ontologies – Understanding the User Experience, Warren P, Mulholland P, Collins T, Motta E, EKAW 2014

Motivation

- OAEI:
  - 2005 – anatomy
  - 2006 – food
  - 2007 – environment, library
  - 2008 – very large crosslingual resources, fao
  - 2012 – largebio
- OAEI Interactive track 2013

Outline

- ## Large-Scale Requirements
  - User Interface*
  - Infrastructure and Algorithms
  - Requirements Coverage

- ## Usability Evaluation
  - Heuristic Evaluation
  - Observational Study
  - System Usability Scale questionnaire (SUS)

- ## Discussion

* A cognitive support framework for ontology mapping, Falconer S M, Storey M A, 2007, LNCS vol. 4825

User Interface Requirements

Interaction
2.1 Explore ontologies
2.2 Explore/verify potential mappings
2.3 Explore/remove verified mappings
2.4 Perform searching and filtering
2.5 Create/manipulate mappings

Analysis and Decision Making
1.1 Discover mappings
1.2 Make mapping decisions
1.3 Inspect definition of term
1.4 Inspect context of term

Analysis and Generation
3.1 Generate mappings
3.2 Execute mappings
3.3 Save state
3.4 Resolve conflicts

Representation
4.1 Ontologies
4.2 Potential mappings
4.3 Verified mappings

4.4 Candidate-heavy regions
4.5 Possible starting points
4.6 Progress
4.7 Reason for suggestion

A cognitive support framework for ontology mapping, Falconer S M, Storey M A, 2007, LNCS vol. 4825

User Interface Requirements

Categories
M Manipulation
I Inspection
E Explanation

Interaction
2.1 **I** Explore ontologies
2.2 **I + M** Explore/verify potential mappings
2.3 **I + M** Explore/remove verified mappings
2.4 **I** Perform searching and filtering
2.5 **M** Create/manipulate mappings

Analysis and Decision Making
1.1 **I + M** Discover mappings
1.2 **M** Make mapping decisions
1.3 **I** Inspect definition of term
1.4 **I** Inspect context of term

Analysis and Generation
3.1 Generate mappings
3.2 Execute mappings
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Representation
4.1 **I** Ontologies
4.2 **I + E** Potential mappings
4.3 **I + E** Verified mappings
4.4 **I** Candidate-heavy regions
4.5 **E** Possible starting points
4.6 **E** Progress
4.7 **E** Reason for suggestion

A cognitive support framework for ontology mapping, Falconer S M, Storey M A, 2007, LNCS vol. 4825

Infrastructure and Algorithms

- Sessions – interrupt the alignment process
- Partitioning a large task into smaller tasks
- Reduce unnecessary user interventions
- Social and collaborative matching
- Environment
- Recommendations/Ranking
- Debugging step during the alignment process
- Configure the alignment process
- Trial execution of mappings and temporary mappings

			Requirements	AlViz	SAMBO	PROMPT	CogZ	RepOSE	AML	COMA
large-scale	user interface	manipulate	#2.5;1.1 create mapping manually	✓(*)	✓	✓	✓	+	-	✓(*)
			#2.2;1.2 accept/reject suggestion	✓(*)	✓	✓	✓	✓	-	✓(*)
			#2.5 add metadata to mapping	-	✓	✓	✓	-	-	-
			#2.3 move a mapping to list	-	✓	✓	✓	+	-	-
			#5.0 ontology	✓	-	✓	✓	-	-	-
		inspect	#2.2;1.4 mapping suggestions	✓(*)	✓	✓	✓	+	-	✓(*)
			#2.3 mappings	✓(*)	✓	✓	✓	✓	✓	✓(*)
			#4.4 heavy-regions	✓	-	-	✓	-	-	+
			#2.4 filter/search	-/✓	-/✓	-/-	✓/✓	-/-	+/✓	-/✓
			#4.1/2/3;2.1;1.1/3 ontologies	✓	✓	✓	✓	✓	+	✓
	infrastructure & algorithms	explain	#4.2/7;5.8 why/how suggested	+	+	✓	✓	+	+	+
			#4.3 why accepted	-	✓	✓	✓	-	-	-
			#4.5 starting point	+	-	-	+	✓	-	+
			#4.6 process state	✓	+	+	✓	+	-	+
		algorithms	#5.1;3.3 sessions	+	✓	+	+	+	-	✓
			#5.2 clustering	✓	+	-	✓	✓	✓	✓
			#5.3 reduce user interventions	-	+	+	-	-	-	-
			#5.4 collaboration	-	-	-	-	-	-	-
			#5.5 environment	-	+	+	-	-	+	+
			#5.6 recommend/rank	-	✓	+	+	✓	-	✓
			#5.7;3.4 debugging	-	✓	✓	✓	✓	✓	-
			#5.8;4.2/7 matchers configuration	-	✓	+	+	✓	✓	✓
		infrastructure	#5.9.1;3.2 trial execution	-	-	-	-	-	-	-
			#5.9.2;1.1 temporary decisions	✓	+	+	✓	-	-	-

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Usability Evaluation

- ISO 9241-11 standard for usability:

task success,
heuristic
evaluation

Effectiveness

Efficiency

task completion
times

usability

Satisfaction

System Usability
Scale (SUS)
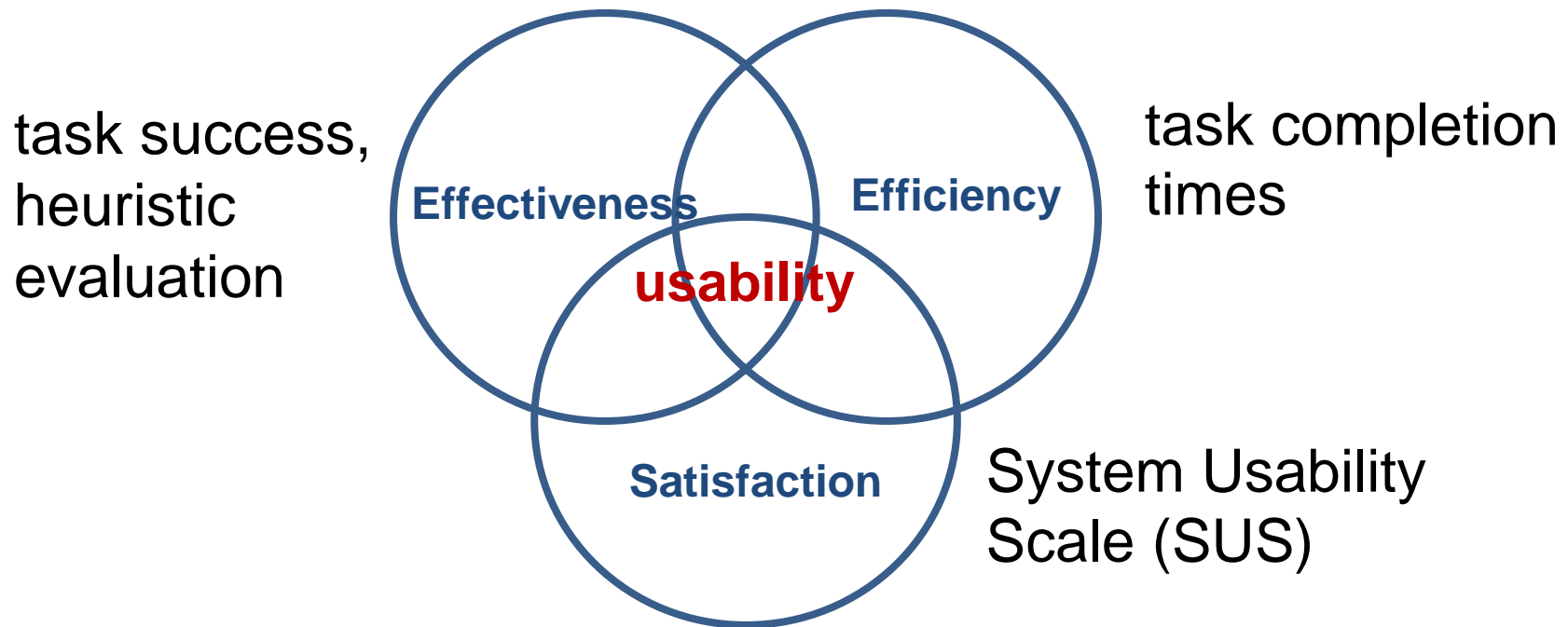
- Three systems – COMA, SAMBO, CogZ

Usability Engineering, Nielsen J, Morgan Kaufmann Publishers Inc., 1993.
Picture: https://planbozchi24.files.wordpress.com/2013/09/he.png

Observational Study

- OAEI 2014 Anatomy track ontologies
- 8 participants
- 11-17 tasks/per system/per hour
- Tasks and Results
  - CogZ supports most;
  - Explanation category the least supported;
  - Improved performance to the last tasks.

System Usability Scale (SUS)
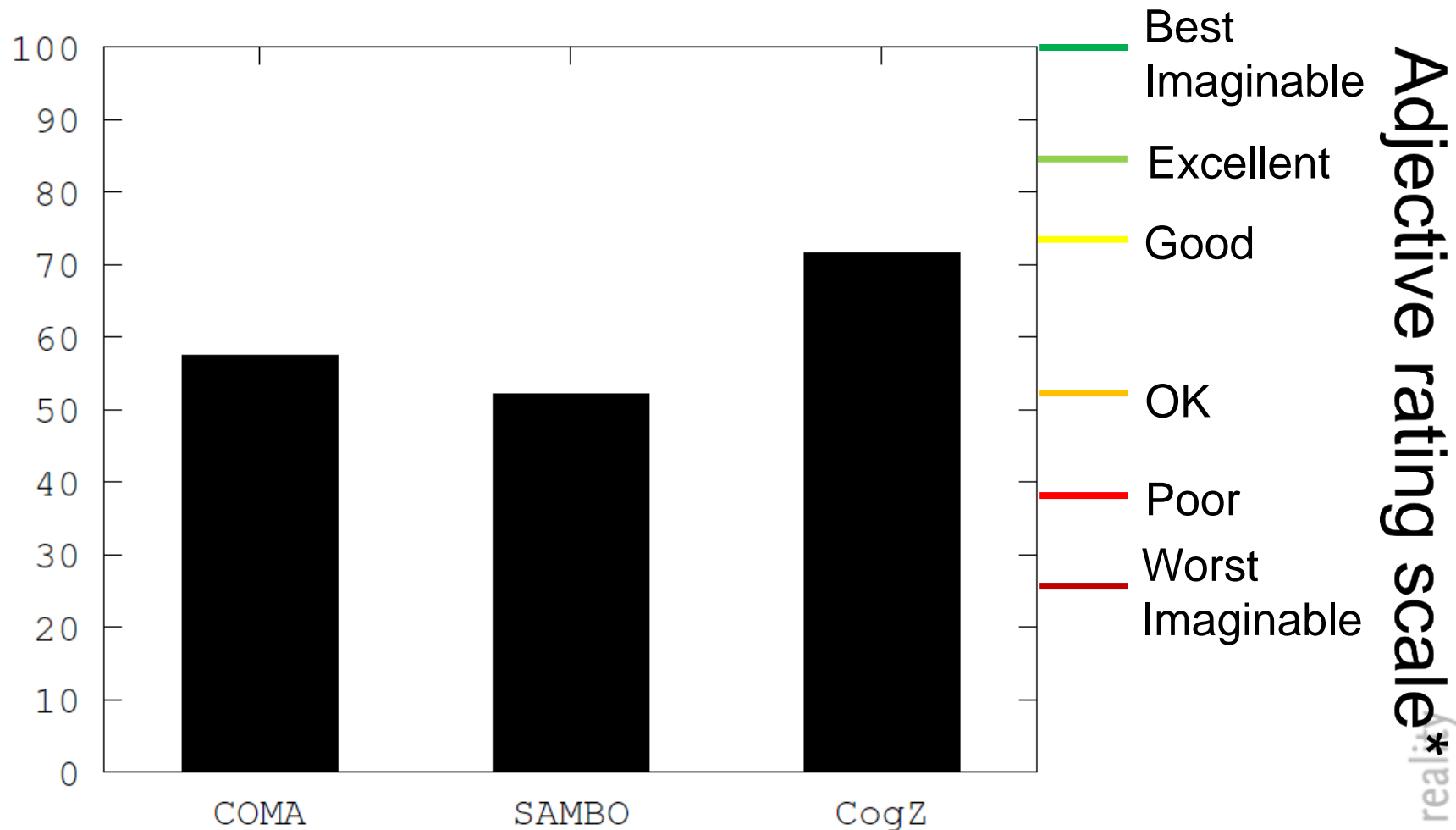
SUS: A quick and dirty usability scale, Brooke J, In Usability Evaluation in Industry, 1996
* Determining What Individual SUS Scores Mean: Adding an Adjective Rating Scale,
Bangor A, Kortum P T, Miller J T, J. of Usability Studies, 2009

Discussion

- Tree representation
  - Visualization
  - Multiple inheritance
- Search
- Terminology

Instead of Conclusions

Instead of Conclusions

Workshop on Visualizations and User Interfaces for Ontologies and Linked Data

VOILA! 2015

voila2015.visualdataweb.org
submission deadline: July 1