Conceptual Modelling in Wikis

A Reference Architecture and a Tool

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Introduction

- Wiki increasingly adopted for **collecting**, **sharing**, and **managing** knowledge;
- Publishing of the unstructured wiki content in a **structured form**:
  - **DBpedia, Semantic MediaWiki, …**
- Recent works on developing wiki-based tools for collaborative construction and visualization of **conceptual models:**
  - **SMW+, MoKi, OntoWiki, AceWiki, IkeWiki, …**
- Crafting a wiki for a conceptual modeling language is still a challenging task: **a reference architecture** is needed!

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Introduction

- A wiki-based architecture for conceptual modeling **should address** the following aspects:

  Generality aspects: *The reference architecture must aim at understanding* ***how the features of wikis*** *can be used to* ***represent the building blocks of a general conceptual modeling language****, before tailoring them to the needs of a particular one*;

  Collaboration aspects: *The reference architecture must aim at understanding* ***how the features of wikis*** *can be used to* ***support an active and well-balanced collaboration*** *between domain experts and knowledge engineers in modeling.*

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Our Contribution

- A **reference architecture** for wiki-based conceptual modeling tools, having the following distinctive characteristics:
  1. the **use of wiki pages** to mimic the basic building blocks of conceptual modeling languages;
  2. the organization of wiki pages in an **unstructured part** (for unstructured content) and a **structured part** (for structured content); and
  3. a **multi-mode access to the pages** to facilitate the usage both by domain experts and knowledge engineers.

- An **implementation** of the architecture in **MoKi**, a wiki for modeling ontologies and business processes.

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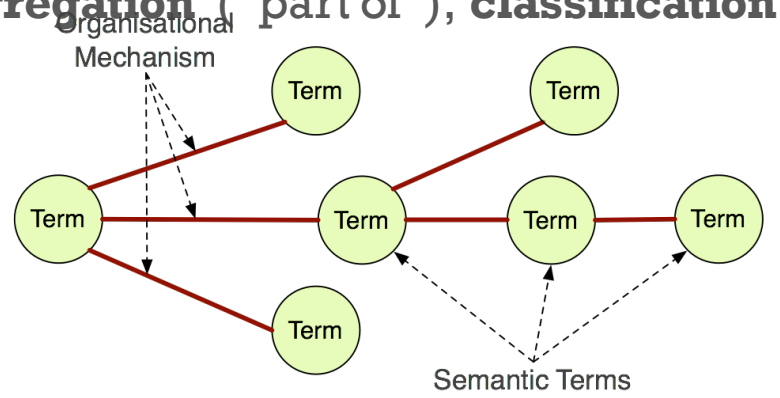
Outline

- Conceptual Modeling (CM)
- A reference architecture for CM wikis
- MoKi: an implementation of the proposed architecture
- Some real-world usages of MoKi
- MoKi Evaluation Results and Lesson Learned
- Conclusions & Future Work

Conceptual Modeling Languages

- **Conceptual Model**: A description of knowledge organized in **nodes** that represent concepts, and **associations** that represent relationships between them (e.g. *ontologies*, *business processes*).
- **Conceptual Modeling Language**: a language to build conceptual models (e.g. *OWL*, *BPMN*). Building blocks of the language:
  - **Semantic terms**: these are the concepts built into the conceptual model (e.g. entities, activities, agents, …);
  - **Organisational mechanisms**: these are primitive mechanisms for structuring the model along different dimensions, e.g. **generalization** (“*isA*”), **aggregation** (“part of”), **classification** (“instanceOf”), …



An architecture for collaborative conceptual modeling in wikis

1. **One element** ⟺ **One page**
   - each element of the model is represented by a page in the wiki;

Concept “Mountain” ⟺

Mountain

A **mountain** is a large landform that stretches above the surrounding land in a limited area usually in the form of a peak. A mountain is generally steeper than a **hill**.

The highest mountain on earth is the Mount Everest

   - special pages for browsing / editing of the overall organization of the conceptual model according to a specific organizational mechanism

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An architecture for collaborative conceptual modeling in wikis

2. **Unstructured** and **structured** descriptions
   - each page contains both structured and unstructured content;

Mountain

A **mountain** is a large landform that stretches above the surrounding land in a limited area usually in the form of a peak. A mountain is generally steeper than a **hill**.

The highest mountain on earth is the Mount Everest

(unstructured content)

$$\sqsubseteq Landform$$

$$\sqsubseteq \neg Hill \sqcap \neg Plain$$

$$\sqsubseteq \forall madeOf(Earth \sqcup Rock)$$

$$\sqsubseteq \exists height. \geq_{2500}$$

$$Mountain(Mt.Everest)$$

$$Mountain(Mt.Kilimanjaro)$$

(structured content)

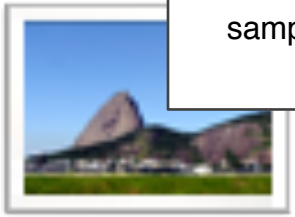
An architecture for collaborative conceptual modeling in wikis

3. **Different views** to access the model:
   - different views to support different modeling actors;

Mountain

A **mountain** is a large landform
stretches above the surrounding
a limited area usually in the form
peak. A mountain is generally ste
than a **hill**.

The highest mountain on earth is the Mount Everest



(unstructured view)

Mountain

is a	landform
different from	hill, plain
made of	earth
made of	rock
height	at least 2,500m
samples	Mt. Everest Mt. Kilimanjaro

(semi - structured view)

Mountain

$\sqsubseteq Landform$

$\sqsubseteq \neg Hill \sqcap \neg Plain$

$\sqsubseteq \forall madeOf(Earth \sqcup Rock)$

$\sqsubseteq \exists height. \geq_{2500}$

$Mountain(Mt.Everest)$

$Mountain(Mt.Kilimanjaro)$

(fully - structured view)

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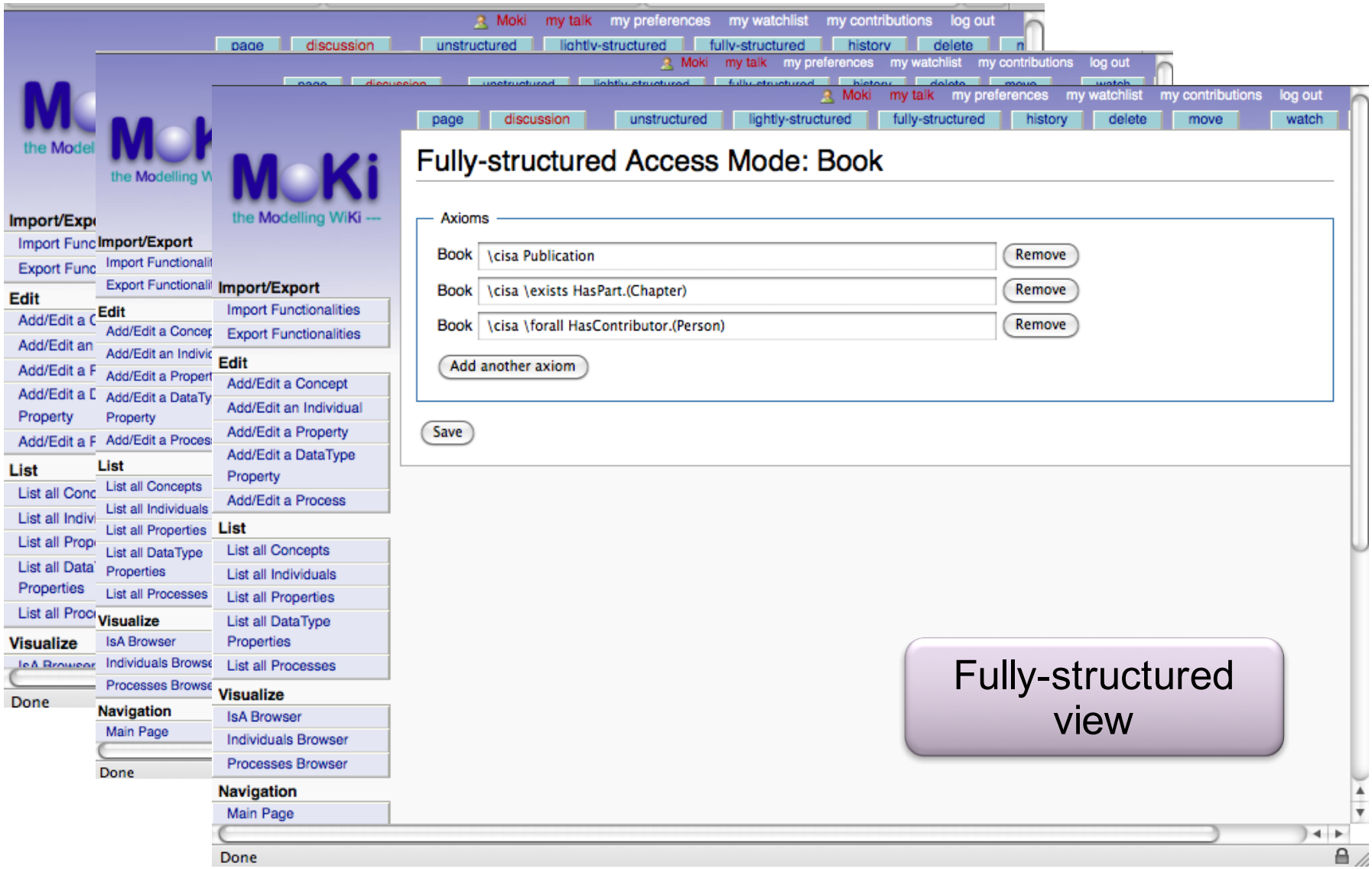
MoKi
the Modelling WiKi ---

- Is a **conceptual modeling wiki**;
- Supports the **integrated modeling** of BPMN Processes and OWL Ontologies;
- Provides modeling support both for domain experts and knowledge engineers, fostering the **collaboration** between them;

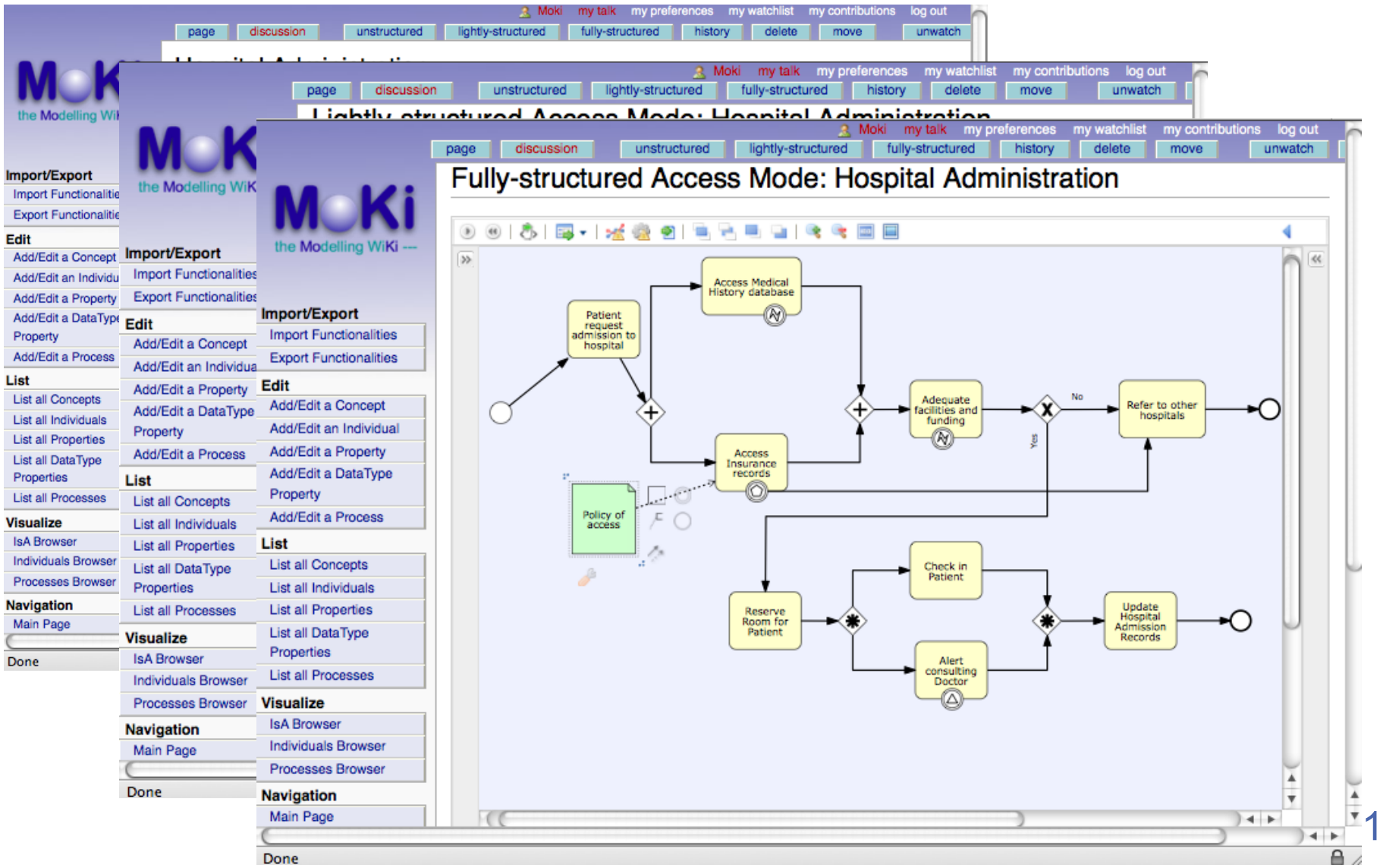
- Based on the MediaWiki framework (Wikipedia);
- Released **Open Source** in July 2010 (version 1.2 – GPL2);

- **MoKi WebSite**: http://moki.fbk.eu
  - On-line demos, code download, documentation, news, support…

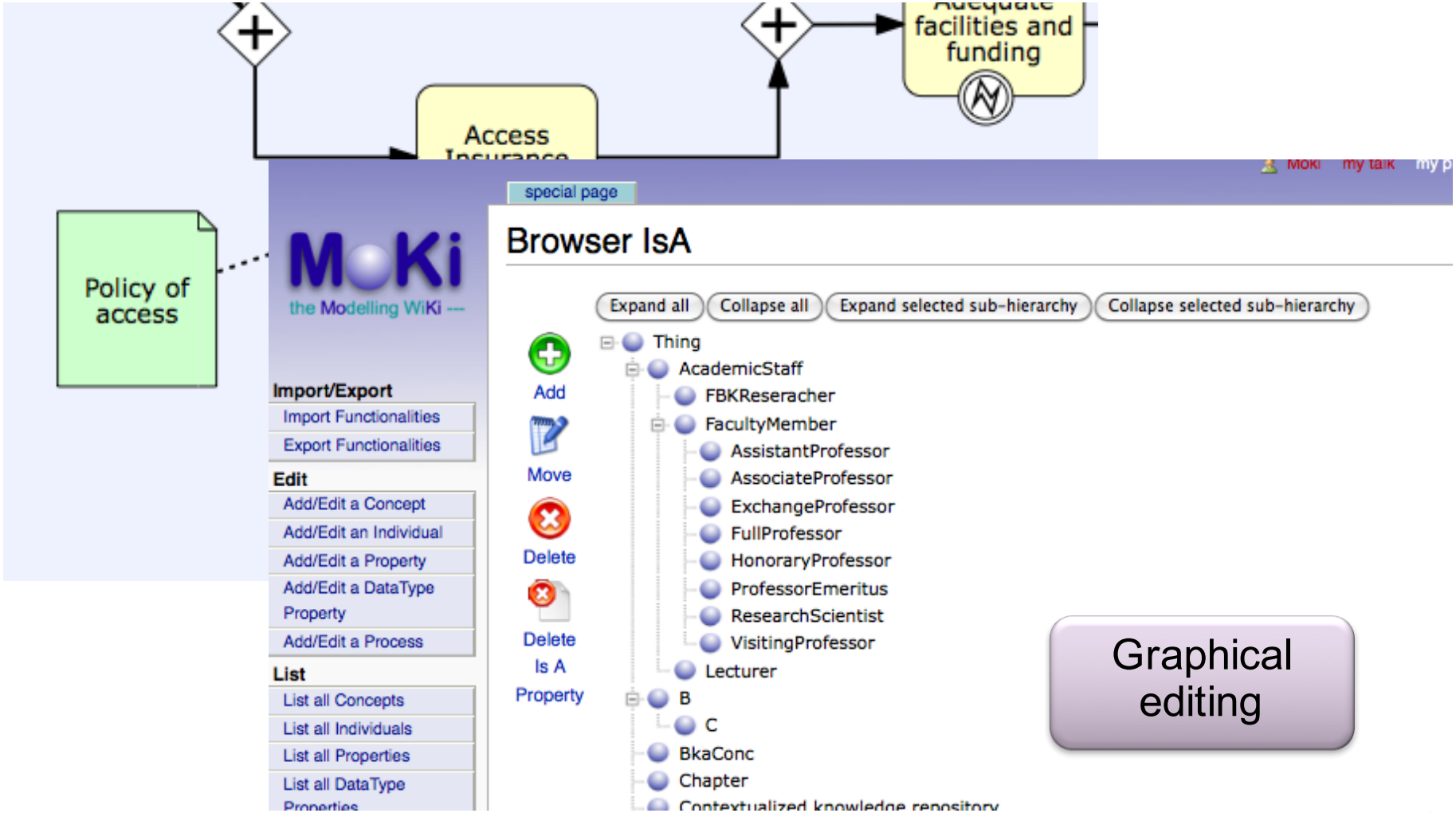
Different views for different roles



Different views for different roles



Further features



Further features: key concepts extraction

Concepts extracted (Ordered by Relevance)	Relevance	100% matching	Substring of a Concept	Exists a Concept substring of this Term	Synonym 100% matching	Synonym Substring of a Concept	Exists a Concept substring of this Synonym
▼activity	1.00000	X				(2)	(4)
▶Kx Corpus Synonyms							
▼Wordnet							
▼Synset_Num:n#00261466							
Wordnet Semfield: Factotum							
Sumo Entry: IntentionalProcess							
Wordnet Definition: any specific activity or pursuit; "they avoided all recreational activity"							
Is a: act, human action, human activity							
▶Synset_Num:n#10090167							
▶Synset_Num:n#09713396							
▶Synset_Num:n#10421664							
▶Synset_Num:n#09670326							
▶Synset_Num:n#07828926							
▶Synset_Num:n#03655835							
▶attribute	0.88020				(1)	(1)	
sequence flow	0.71714	X					
▶business process modeling notation	0.70216			X		(1)	(1)
▶task	0.49418	X					
▶mapping	0.48253						
▶flow	0.47920		X				
▶message	0.43927	X					
▶sub process	0.41265	X					(3)
▶gateway	0.39268	X					
▶pool	0.30116	X					

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Some Usages of MoKi

the Modelling WiKi ---

aposdle learn @ work	• IP FP6 EU Project [03/2006 – 02/2010] • **Modeling of tasks/processes in an enterprise and of the topics related to that task (*competencies*)** • Used by: 4 SMEs, 3 Universities, …
PESCaDO	• STREP FP7 EU project [01/2010 – 12/2012] • **Build/revise an environmental ontology**
Organic.Edunet	• eContentplus EU Project [09/2007 – 08/2010] • **Build an ontology of organic agriculture and agroecology** • Used to foster collaboration between domain experts (FAO) and knowledge engineers
PRODE PROGETTO DEMATERIALIZZAZIONE	• Italian national project [01/2010 – 12/2012] • **Modeling of documental flows for analysis/revision and dematerialization** • Used by employees in 7 Italian regions
OncoCure	• Fondazione Caritro, Trento [2007 – 2008] • **Modeling breast cancer clinical protocols encoded in Asbru.**
eOnco	• FBK Joint Research Project [2009 - 2013] • **Modeling of nurse activities in an oncology ward.**

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Evaluation & Lessons learned

- Evaluation (involving PA employees)
  - Application log analysis + user questionnaires;
- Evaluation Results (excerpt):
  - The users perceived the tool as **more than easy to use**;
  - The users **positively perceived the overall usefulness** of the tool for the collaborative modeling of documents and processes.
- Lessons Learned:
  - Wikis can be a powerful way to **lower the entrance barrier** for inexperienced users to modeling tools and sharing of knowledge;
  - Collaboration **happens** and is **helpful**;
  - Need to **guide domain experts** by providing schemata of representations; e.g., what characterizes a document?

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Conclusions. What you have seen…

- What you have seen…
  - A **reference architecture** for conceptual modeling wikis;
  - **MoKi**: a wiki-based conceptual modeling tool fully implementing the reference architecture;
  - An excerpt of some of the **real-world** usages of MoKi;
  - **Positive** end-user evaluation results.

- … and what we are working on:
  - Extraction of relations and DL axioms from a text corpus;
  - Handling of multilingual ontologies (w. Organic.Lingua EU project);
  - Dynamic generation of the forms to be used by Domain Experts;
  - Handling of namespaces / modular ontologies;
  - …

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Thank You! Questions?

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MoKi

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