Using Semantic Web Technologies for Project Team Building

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Motivation

- “Craziness is doing the same thing and expecting a different result.”
  ~ Tom DeMarco

- “In the spider-web of facts, many a truth is strangled.”
  ~ Paul Eldridge
Introduction

- **To solve** a real-world (technical) **problem** a project is usually performed
- Bright, **skilled individuals** are needed
  - An individual alone is not able to perform the task
  - More good individuals → better results
  - More individuals → increase the complexity of cooperation → worse results
- How do we solve this?
  - A **team** of cleverly selected individuals, who will combine their personal technical skills with their teamwork skills → **team-building approach** !!!

Team-building support...

- Team building is an **effort**…
  - …a team studies its own process of working together
  - …a team acts to create a climate that encourages and values the contribution of members
  - …members’ energies are directed toward problem solving, task effectiveness, maximizing the use of all members resources
  - …to achieve the team’s purpose!
- Our aim is to **provide** a (technical and organizational) **framework** that enables and supports project team-building
...using semantic web

- We propose a project team-building approach
  - Individuals’ personal skills
  - Requirements of the project
- Adopting semantic web technologies
  - Describing personal skills record with an ontology
  - Describing projects and project requirements with an ontology
  - Storing semantically annotated data about individuals and projects
  - Reasoning on the ontologies and other data for proposing team members based on the project requirements

Semantic web - definitions

- The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation. -- Tim Berners-Lee, James Hendler, Ora Lassila

- The Semantic Web is a project that intends to create a universal medium for information exchange by giving meaning (semantics), in a manner understandable by machines, to the content of documents on the Web… -- Wikipedia

- The Semantic Web is an extension of the current Web that will allow you to find, share, and combine information more easily. It relies on machine-readable information and metadata expressed in RDF. -- W3C
If we want the computer systems (software) to automatically perform functions, for which the meaning of data is necessary, then the meaning of the data should be clearly represented → semantics.

The meaning can be clearly described only by linking concepts to other, already known concepts → web.

Applications (automatically) perform functions on web data → (intelligent) web services.

The meaning of data (semantics) + web + intelligent web services ⇒ semantic web !!!

The vision of semantic web is to use the web in a manner, much more intuitive, straight-forward and efficient for a human.

To accomplish this vision a lot of technologies need to be addressed and many highly-complex problems solved.

From its core, semantic web is appropriate for supporting knowledge management.
Limitations of KM tools

- Information searching is mainly based on keyword searches → irrelevant results
- Manual extraction of relevant information from textual and other representation → inefficient
- Unreliable and time-consuming maintenance of large repositories of weakly structured data → lower quality

SemWeb portal (1/2)

- SemWeb technologies should offer solutions to these problems
- Semantic portal serves as an entry point
- Portal enables users
  - to find relevant sources
  - to use knowledge sources for solving problems
SemWeb portal (2/2)

- Architecture provides a mean to manage both members’ and projects’ profiles
- Inference engine uses these profiles to propose possible members for a project
- System’s inferring capabilities can be improved by managing the skills matching database → reveal the hidden skills

It should not be a nuisance!

- How to use it, so that it doesn’t disturb the project activities and waste the team members’ energy?
- At the beginning: input the project requirements → expect the team proposal
- At the end (and preferably during the project): input assessments and other data to be used for another project
The key-role of ontology

- Ontology is used to provide a framework for storing data about members’ profiles and projects
  - formal and informal education, experiences, practical skills, performed projects, communication skills, …
  - project type, knowledge requirements, relation with other projects, …

Example: select a team member

- Task: “Select persons for a project team based on project requirements!”
- Team members can be selected in two ways:
  - using the information about education of a person (which knowledge requirements are covered by some education)
  - using the information about work areas mastered by a person (a work area covers several project areas and a project area implies several knowledge requirements)

- Inferring is based on the ontology and the data stored about personal profiles and projects!
Inferring ontology reasoning agents

```
(defrule selectPersonBasedOnRequirements
  (IS_DONE_BY ?project ?projectTeam)
  (REQUIRES ?project ?knowledgeReq)
  (or
    (and
      (HAS ?person ?education)
      (SATISFIES ?education ?knowledgeReq)
    )
    (and
      (MASTERS ?person ?workArea)
      (COVERS ?workArea ?projectArea)
      (IMPLIES ?projectArea ?knowledgeReq)
    )
  )
  ==> (assert (HAS_MEMBER ?projectTeam ?person))
```

Technologies used...

- Team-building system prototype is implemented mainly in Java using open source JENA semantic web development library
- Database, web server, ...
- For the inferring part of the prototype a CLIPS language has been chosen
  - it provides a powerful inferring possibilities
  - it is easy to integrate it within Java applications
Conclusions

- An approach to project team building based on semantically annotated distributed profiles, connected with intelligent service and ontology in the background → for now, it works well for simpler cases
- The semantic web technologies turned out to be very appropriate for this kind of task
- The highest obstacle for becoming of an everyday use is not the technology itself, but lack of a set of easy-to-use tools for collecting and managing data