Gi2MO: Interoperability, Linking and Filtering in Idea Management Systems

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Abstract. This thesis proposes how to apply the Semantic Web technologies for the Idea Management Systems to deliver a solution to knowledge management and information overflow problems. Firstly, the aim is to present a model that introduces rich metadata annotations and their usage in the domain of Idea Management Systems. Furthermore, the thesis shall investigate how to link innovation data with information from other systems and use it to categorize and filter out the most valuable elements. In addition, the thesis presents a Generic Idea and Innovation Management Ontology (Gi2MO) and aims to back its creation with a set of case studies followed by evaluations that prove how Semantic Web can work as tool to create new opportunities and leverage the contemporary Idea Management legacy systems into the next level.

Keywords: structured data; ontology; appliance; knowledge management; idea management

1 Research Problem

Idea management is a rising industry sector that delivers software for collecting and organising input from people regarding innovations for products or services. Furthermore, the goal of Idea Management Systems is to build tools for assessment of the collected ideas and selection of the best ones to implement. To fulfil those goals and make the entire process repeatable Idea Management Systems define a number of user roles and produce dedicated interaction interfaces.

Since the origins of their creation Idea Management Systems have improved significantly by gaining in importance but also complexity. In turn, this has brought new challenging problems. Currently, the issues mentioned most often refer to quick and efficient assessment of user submitted data in situations of sudden peaks of information. The issues related to this are how to organize ideas, describe them and utilize idea descriptions and reviews to prepare analyses that aid in idea selection while constantly maintaining and stimulating an innovative community.

In that context, the main research question set before this thesis is whether the Semantic Web technologies can be used to solve the above problems and

to evaluate with experiments what kind of different techniques for knowledge management are most suitable in this particular environment.

On the road to answering its main research question the thesis focuses on the information overflow problem and proposes that the solution, ironically, comes through increasing the volume of data even more. One of the claims of the thesis is that applying Semantic Web technologies and rich metadata annotations to the assets of Idea Management Systems is the first step to interconnect those systems with other corporate systems and utilities as well as the global Web. Therefore, newly created connections can be used to pull additional data inside the Idea Management System and use this knowledge to automatically asses individual ideas and provide better aggregation, filtering and idea selection facilities. The thesis shall attempt to explore both connections inside the Idea Management Systems as well as possible synergies between Idea Management data and other Enterprise Systems.

In relation to Semantic Web domain the thesis shall not focus on improving or innovating in any particular technology but on the appliance of Semantic Web in the idea management domain. It shall investigate how in practice all that has been researched and investigated for years can be applied in a single domain to achieve very clear goals. However, by doing so, the case study it meant to deliver valuable input and progress not only to leverage the contemporary Idea Management Systems but to provide interesting input for the ongoing Semantic Web research as well. Therefore, in addition, the thesis aims to show how the problems of idea management and the necessity for certain solutions in this domain can develop into being the mother of invention for the Semantic Web.

2 State of the art

In comparison to other areas, the research done so far idea management and innovation management is not particularly mature. This is especially due to the fact that Idea Management Systems are still not as well established as other enterprise systems. For instance, while Supply Chain Management or Customer Relationship Management are considered as necessities in large enterprises, innovation management practices are still seen as something that can bring value but is not absolutely crucial. Furthermore, most of the works do not focus on the data characteristics produced in the idea management process but on the social and motivational mechanisms that drive the creation of ideas (e.g. collaborative methods that could aid idea ranking [5]). Nevertheless, some research lines and most of the contemporary industrial developments attempt to improve or extend the current models. The most interesting attempts, related to the area of this thesis, are by Adamides et al. [4] who aims to solve the data overflow problem by approaching innovation management as a problem solving case and Conn et al. [6] that analyses usage of metrics for innovation assessment. Nevertheless both of those attempts do not refer to Semantic Web technologies in such extent as our research. The thematically closest work comes from Theseus project and proposes the creation of an Idea Ontology [7]. However, contrary to what this thesis

attempts, the Idea Ontology related research does not go into details of how producing structured metadata could aid Idea Management nor does it propose any data linking solutions or infrastructures to solve the problems information overflow and knowledge management.

3   Proposed Approach

The entry point for the thesis is introduce an ontology for describing data in the Idea Management Systems and further use it in a series of experiments that will attempt to investigate both relations to the internal enterprise environments and the open innovation communities. In both of the areas we will extend the contemporary idea management in a number of directions and push it's boundaries in terms of data assessment and knowledge management. The goal of such approach is twofold. Firstly, as proclaimed before, the accomplishment of the steps detailed below will add to collecting and linking metadata for proposing a solution to the ultimate problem of efficient filtering and selecting ideas. However, secondly, the thesis aims to be a study of creation of an ontology for a dedicated system and each of the enumerated steps aims to evaluate the proposed schema. The consequent stages should result in constant progressive updates for the ontology and idea management data model based on particular research achievements on a given step. The taken approach can be detailed with the following milestones:

Definition of Idea Life Cycle. The current state of Idea Management Systems is mostly driven by the industry, therefore most of the analyses of the state of the art and attempts to define and standarise what is an Idea Management System and Idea Management Process are very subjective and usually only emphasise selected products. The preliminary research shall aim to deliver a classification of all practices present in the Idea Management Systems and their impact on the data infrastructure that can be abstracted into a generic data model.

Development of Idea Management Ontology. On top of the constructed generic data model, an ontology shall be proposed that will describe the data constructs and flows inside the Idea Management Platform.

Data interlinking study. After the ontology is constructed the next step shall be to determine which data from other enterprise systems can be useful to idea management propose means to link them and use in practice.

Development of use case scenarios for Idea Management Ontology in context of cross system data interlinking. The previous work shall be extended by positioning Idea Management in context of specific use cases that will serve as evaluation.

Extraction of community metrics for ideas. Typically the content submitted by users to the Idea Management System is very limited. Therefore this step shall involve research on the usage of natural language processing and sentiment analysis to obtain additional idea metrics and export them in a

form a new metadata. In opposition to previous step, on the following stage the thesis shall aim to investigate not only consuming linked data but also producing it.

Idea characteristics analysis. The continuation of the previous step, however, in this milestone, the submitted user content is going to be analysed in reference to concepts of a particular domain in which the Idea Management System is deployed. This shall involve the use of domain ontologies to describe particular topic and later categorize ideas based on their descriptions.

Connections with Social Web and collaborative environments. Similar like most of the contemporary web technologies, the Idea Management facilities often are connected to the Social Web. This study shall compliment the earlier described enterprise linked data and attempt to take advantage of public information sources for the benefit of idea management.

4 Results

The research on development of the discussed thesis has started at the beginning of 2010. A number of goals have been achieved so far, most important being:

- study of idea management practices and formalization of idea life cycle together with dependencies (accepted and awaiting publication in International Journal of Web-Based Communities)
- ontology structure and scalability experiments (e.g. into how many triples an idea translates and how does is impact scalability and efficiency) [8]
- study of enterprise data interlinking: what are the options, how to create the metadata infrastructure in relation to Idea Management Systems etc., how to take advantage of enterprise linked data [1]
- a constantly updated ontology with each iteration linked to particular experiments with metadata so that it is possible to see how selected actions impact the ontology building process (currently Gi2MO version 4 [2])

All of the above and other research related to the thesis are aggregated in a single project created specially for the needs of this thesis [3].

5 Conclusions and Future Work

The work conducted so far and the interest raised in both Semantic Web community and the idea management industry has confirmed the accuracy of the thesis topic. Although the Gi2MO project is still a fairly young initiative is has already established some both research and industrial partners that support it's creation and share the interest in delivering Semantic Web solutions.

Nevertheless, there is a still large number of uncovered issues and elements that need attention. The most important ones that are foreseen in terms of the nearest future work are:

- practical solution on how to detect and establish the relationships between ideas (so far we proposed only how to model them and utilize)
- Gi2MO is part of two major funded research projects where it will focus on particular use case scenarios. This will aim to deliver functional implementations and studies that show how semantically enhanced idea management can work in practice.
- so far we presented a rather light model for describing idea management data in a very generic way. Our aim for future work is to align this model with domain models for specific themes of idea management deployments. Thus, taking advantage of domain knowledge to filter and categorize ideas.

Acknowledgements

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