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First Steps in Ontology Development: Knowledge Portal for Software Testers

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Abstract. Nowadays, knowledge portals make an important contribution to enabling organizational knowledge management by providing users interactive and personalized interface which facilitates efficient access to various types of information. However, navigation through mass of information represented on the web is not expedient and effective, as well as the development and maintenance. The emerging ontology-based approach serves as a semantic backbone for knowledge constructing, accessing and representing can be used to filling up these short coming. In this paper we attempt to build knowledge portal for software testing service by using ontology-based technique and web page development technology. Further more, we want to summarize a set of approaches of ontology-based knowledge portal development which can be used for different areas.

Keywords: Knowledge portals, Ontology-based approach, Software testing.

1 Introduction

Today, knowledge portals make an important contribution to enabling enterprise knowledge management by providing users with a consolidated, personalized user interface that allows e-client access to various types of (structured and unstructured) information. Various technologies are used to designing and implementing to achieve this goal. Traditionally, we use content-based approach to construct the web portal, which allows combining different portal components side by side in a single portal webpage.

However, like other information system existing today, a major challenge of it is to provide right information at right time. Navigation through mass of information represented on the web is still not expedient and effective, as well as the development and maintenance [1]. People always waste plenty of time for searching exact information or knowledge they want. The same situation applies to the designer, who is weighed down with construction of architecture of web pages in different areas or domain that have not any distinct relationship or logical links.

The emerging ontology-based approach serves as a semantic backbone for knowledge constructing, accessing and representing and can be used to filling up these short comings. Ontology has been established for knowledge sharing and is used as a means for conceptually structuring domains of interest [2]. As knowledge portals are focused on particular domains, ontology appears to be ideally suited to support knowledge sharing and re-use between knowledge portal providers and the users of the portal. Ontology focuses on knowledge extracting and structuring, which are considered to be the foundation of knowledge representing.

To explain this idea some of the advantages of ontology in respect to other extracting and structuring approaches are noted according to the reference [3],[4],[5]:

- Providing the unique, unambiguous definitions of expressions.
- Using a comprehensive set of elements.
- Using concepts such as classes and instance for structuring.
- Using relationship hierarchies or others.
- Using attributes, functions (i.e. specific relations) and axioms.
- Being machine readable and computable.
- Providing an inference base to implement inferences and logical deduction.
- Avoiding semantical conflicts of e.g. naming, value ranges, abstraction levels, structures, type of visualization.

2 Background

Nowadays, top managers and IT analysts are continually challenged by the need to analyze massive volumes and varieties of multilingual and multimedia data. Company staff and employees require support and guidelines for knowledge sharing about information analysis, theories, methodologies and tools. Knowledge management (KM) is one of the powerful approaches to solve these problems [6].

One of the really important aspects in company's success is its team. And team handling, employees' education, corporate culture integration are more and more paid attention to.

Our work proposes a new approach to the education of new specialists in the area of software testing that would help them to integrate into the work process of the company faster and more effectively. The main idea is to use ontological approach while developing the system. That would permit to economize both human and financial resources of the company.

Using ontologies in building educational systems is not really a new concept as they have often been used to represent different concepts to be taught in a course [7][8]. Moreover, in recent years, there has been a growing interest in the development and use of domain ontologies, strongly motivated by the Semantic Web initiative [9].

Pedagogical and psychological construction and delivery of contents rather than the actual content are actually major key issues. The use of visual paradigm enables students to process and understand greater volume of information and visual form influences both analyzing and synthesizing procedures in ontology

development process [10]. This is why we've decided to make first a concept map - visual representation of the top level of ontology is a powerful mind tool in data structuring process [11].

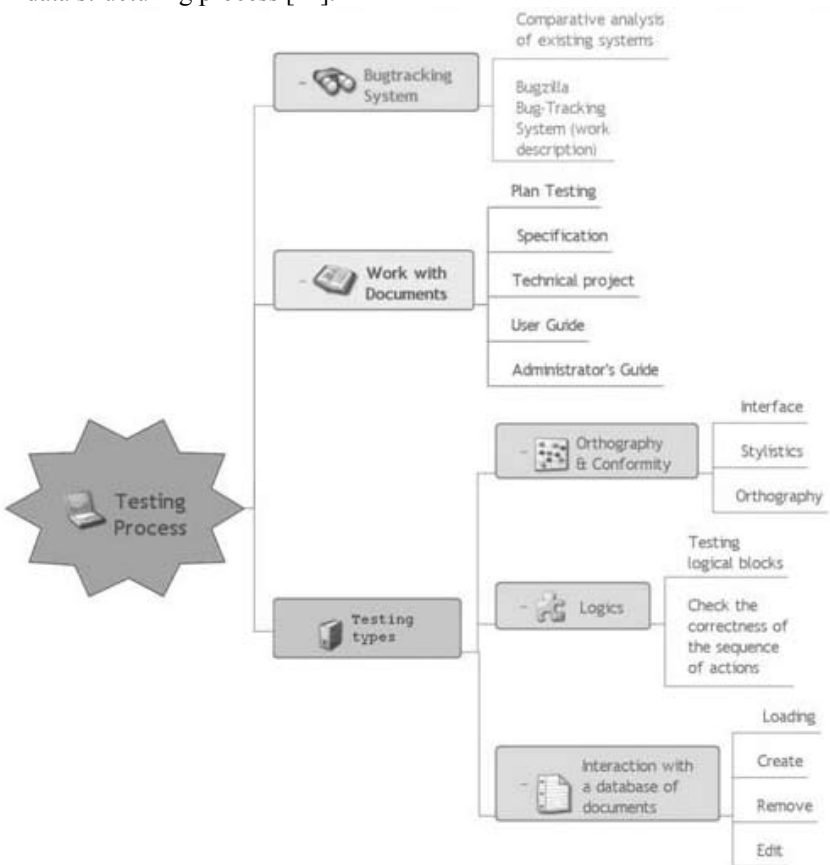

Fig. 1. Testing Process mind map.

Usually, companies train their recently hired specialists by either organizing special courses and master-classes or assigning the newbie a curator. That approach is rather effective but there are several flows:

- Leading specialists are prone to have time management problems while trying to combine both their direct work obligations and couching.
- Information transferred is not strictly formalized ("I forgot to mention, that…")
- Some of really good specialists simply do not have teaching abilities needed.

So, there are the main topics of the presented mind map:

- Bugtracking system help. The most necessary part of work in any testing is tracing and fixing different errors. That's why it is needed to approach a choice of such system responsibly, leaning against functionality, cost

and other characteristics of existing systems. In this section the short analysis of the most popular systems of error trapping will be carried out.

- Project introduction. To start testing it is needed to familiarize with the documents accompanying the project. Such as a requirement specification, a technical project, a user manual, a manual of the manager, etc. In this section it will be shown what basic moments of documentation it is necessary to pay attention on and what is "the superfluous" information for a tester - that will help to save a considerable part of time on reading documents.
- Testing types. This topic include information about common concepts, methods, algorithms and mail guide on testing itself. There are three sub branches:
    - The rules of testing spelling, an interface and stylistics.
    - Testing of the project from a position of logically correctly executable operations.
    - Check of the work with documents, including loading on a server, unloading from a server and interaction with the user.

The section "testing" will be organized as follows - all of the documents on the given subject domain will contain the information, available for everyone, and the data (with references to the source), that is a data base of the main concepts, methods and algorithms. And also will include the knowledge of the experts received as a result of an experience.

It means that all the information on a concretely interesting question (consisting of the common information and knowledge from experience) will be in one document which will be the direct and clear answer to the question without a superfluous and unnecessary data.

Like that, knowledge is dissociated from the people and so it's easier to overcome issues relied to knowledge reuse and employee turnover. Moreover, the easiness of access to the information is also a good thing – a person can get answer to his/her question without having to distract others (or being too shy to ask).

3. Construction of Ontology

3. 1 Information Gathering and Analyzing for Pre-Construction

For ontology construction in this paper we propose some software to implement it. Protégé is an open-source tool developed at Stanford Medical Informatics[12]. The system is domain-independent and has been successfully used for many other application areas as well.

The current version of Protégé (3.4) is highly extensible and customizable. At its core is a frame based knowledge model with support for metaclasses. Other languages such as OWL can be defined on top of this core frame model.

In section 2 we have finish the purpose and goals identification. The second step is devoted to gathering all the information relevant to the described domain. To achieve this, we collected the terms of two sides which are from the point of

view of student and university expecting to cover all the possibility that would be used or occurred. The terms and concepts are used to build up a glossary which is needed in future ontology construction.

After creating all essential objects and concepts, the next one is build practical ontology, creating their relationship, property and constrain. We begin to use Protégé to process this step.

3.2 Ontology Construction by Using Protégé

Using the Protégé 3.4 we have built meta concept and its branch or directory:

Then we fill up these classes with the subclass and object which we have described previously.

Since all entities have been defined, we turn to building the relationship and property. As we know, one of most advantages of ontology engineering compared with other technology is that it will not only describe the isolated object but also build up the relationship and property between them which allows people to understand and facilitate designing in practical situation[13].

After that, we can define properties and add them to the class and object to construct their relationship and constrain. In the "OWL" work bench "class editor", we can create these things using properties and functions . As the ontology of international student service has been built, the process goes to the next stage, applying the ontology-based KP construction.

3.3 Working with portal

Fig.2 illustrates work process: the user can search for the necessary information in two ways.

The first - pseudo-natural - for the asked question (with keywords) is written the document from the knowledge base and it is given as a result of the search. The second - visualized search - the user, leaning on the made ontology, can find the necessary document with a "picture" of the ontology sections. Analysts and experts, in the meantime, have an access to the Database not only for reading, but also for changing the current and out-of-date knowledge on the new ones, thereby, supporting system in the refreshed state all time.

As it's seen in this picture, the raw information is stored and provided by database. Using ontology construction it's possible to build a framework for all information, laddering, categorizing and specifying are implemented to integrate its description and after that to embed ontology directly into the querying machine/pages to enable with the web page techniques, such as XML and JSP. Then ontology can be linked to the raw information and then published it on the web.

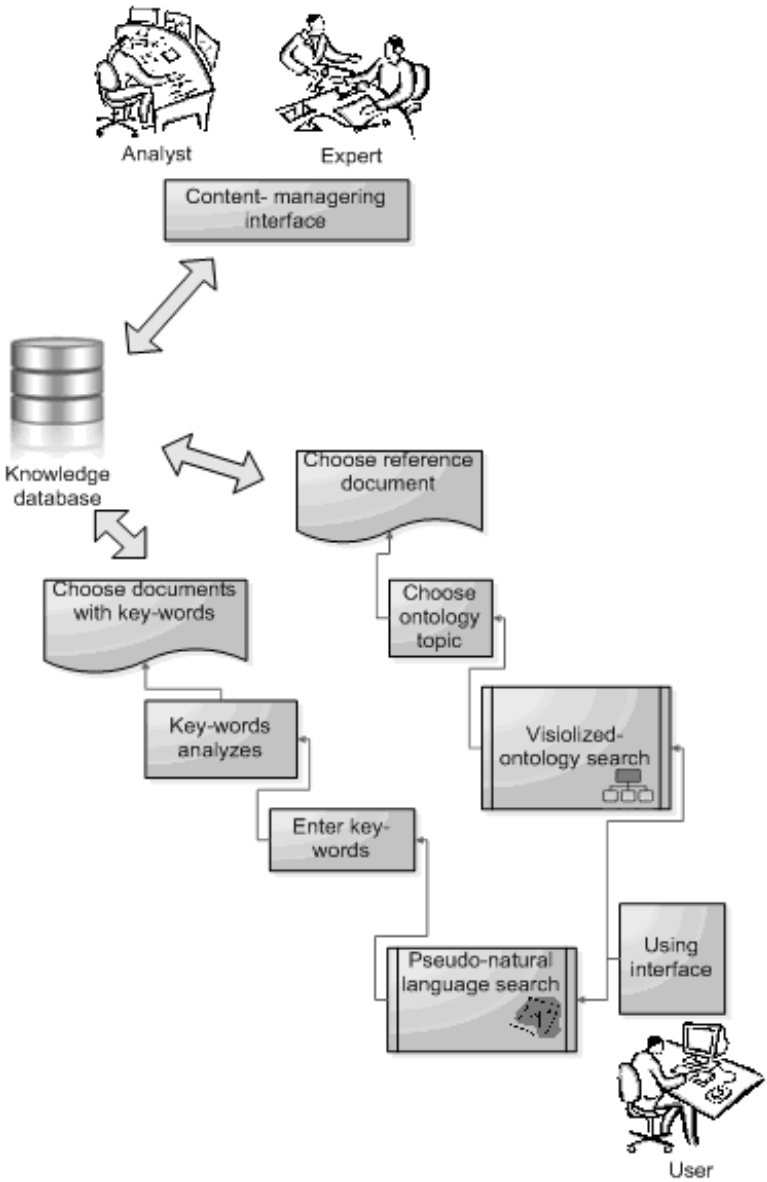

Fig. 2. Working with knowledge database.

4 Conclusion

The knowledge portal is a user-centered environment through which a user can gain access to information and tools from a single internet location. To achieve this goal, we demonstrated the strategy for designing a learning system in the area of software testing by using ontology technique which serves as a semantic backbone for KP construction. The main parts of this process may be regarded as following (see Fig 5):

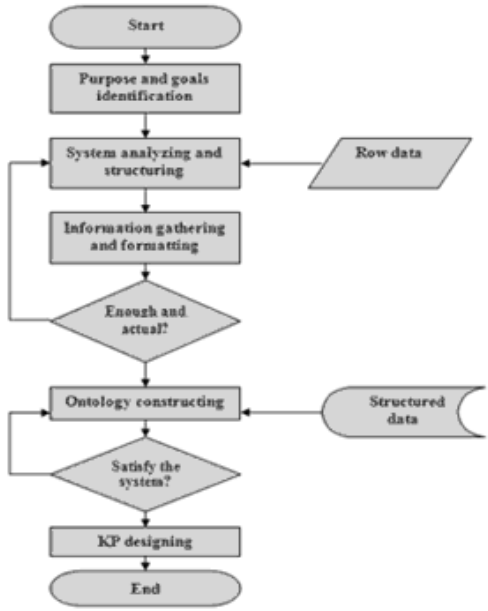

Fig. 3. The Process of Construction of Ontology-based.

- Purpose and goals identification.
- System analyzing and structuring.
- Information gathering and formatting.
- Ontology construction.
- KP designing embedded ontology-based technique and framework.

The future work is inference engine implementation as well as KP establishing and refining in reality.

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