Introduction to the JSS special issue of Web 2.0 engineering: new practices and emerging challenges

1. Introduction

The number and complexity of Web applications and the amount of information they offer has been continuously growing in the context of the Web 2.0. Importantly, Web 2.0 applications need Web engineering design methods to provide mechanisms to accelerate and improve their development and maintenance. To this aim methods or tools based on recent techniques of model-driven engineering discipline (e.g., MDA [OMG 2003], ADM [Newcomb 2005], Architecture-Centric MDA, Aspect-Oriented Development, etc.) should be provided for developing such applications (such as social computing, Rich Internet Applications, Service-Oriented Architecture, etc.).

Moreover, some new issues need to be addressed, due to the increased level of sophistication of the modern Web applications, commonly referred to as Web 2.0 applications. These applications foster the user involvement in the production of contents, annotations, and evaluations. Therefore, one of the main issues of the Web 2.0 is the high level of interaction of the user with the Web application. For this reason, the development of Web 2.0 applications should be focused on the user, thus requirements engineering techniques should be considered in this context. In addition, requirements engineering is a complex activity which success depends on the stakeholders' participation. Thus, the techniques proposed in the requirements engineering field need a more participative environment to support effective collaboration among stakeholders for developing Web 2.0 applications.

Also, as a result of the user interaction, a huge amount of user-generated content is populating the Web. The need to manage them in an efficient manner lies behind a set of new topics that are gaining momentum in the Web scenario. Among them, the selection of trustworthy contents from the Web, such as content credibility and author reputation outstands. Another increasingly important topic in this new environment is the development of *mashups* through the integration of contents and functions that are provided by third parties that open their APIs toward developers and end users. Regarding this new generation of applications while several efforts have been so far devoted to the production of authoring environments and development tools, and to the definition of corresponding enabling technologies, there is a lack of proposals for the definition of key quality principles and evaluation methods for the component development, selection, and integration.

The goal of this special issue is to provide an overview of research in the field of Web 2.0 engineering. The call for papers was very successful and attracted 23 submissions. All submitted papers went though a rigorous multiple-staged review process, and finally 6 high-quality papers were selected for publication.

2. Overview of the issue

The papers of the special issue cover a variety of topics in the field of Web 2.0 engineering have grouped the papers in three categories based on key aspects considered in them: model-driven engineering (MDE), requirements engineering and quality of Web applications.

2.1. Model-Driven Engineering

Web caching is a crucial issue in engineering Web 2.0 applications, since they are more unpredictable and customizable than traditional web applications. In the paper *Performance Improvement of Web Caching in Web 2.0 via Knowledge Discovery (by Carlos Guerrero et al.)*, a classification algorithm (based on decision trees) is presented in order to cache parts of web documents to reduce the user-perceived latency in web caches.

José M. Conejero et al. presents a part of the systematic method to modernize legacy Web applications into RIAs called MIGRARIA. This method proposes a process that consists of a reverse engineering phase to obtain a model specification from the legacy and a forward engineering to combine RIA patterns with the obtained model to fulfill the new appearing modernization requirements. This work is focused on the forward process that uses a set of traceability matrices that align requirements and RIA patterns with the RIA features involved in them. Finally, this phase provides a traceability matrix where the most suitable RIA patterns for each new requirement are suggested.

Marios Belk et al. analyze the relationship between clustering techniques based on a set of navigation metrics and clustering techniques based on ratios of psychometric tests. The goal is to identify and cluster groups of users with similar navigation patterns in relation to their cognitive style. These metrics have been evaluated with two user studies over Web 2.0 environments.

José Luis Herrero et al. propose a model-driven architecture to support development of web applications from the design to the implementation. The authors define a new UML profile introducing new concepts that are relevant for the web domain and then put it at work in a new architectural framework that supports web application development and deployment. This comprehensive approach grants cost and complexity reduction due to the incorporation of a model-driven architecture into the web application development process. The application components grant high performance and reusability.

2.2 Requirements Engineering

Conciliation of requirements in projects with different groups of user, such as Web development project, is an essential task for maximizing user satisfaction. Urbieta et al. present a model-based approach for finding conflicts between requirements, which implies a reduction in the global development costs. The authors focus on performing an empirical evaluation of their approach with the NDT (Navigational Development Techniques) Methodology.

2.3 Quality of Web Applications

Tihomir Orehovački et al. provide a contribution for the definition of a comprehensive methodology for the evaluation of Web 2.0 applications. Authors conduct two empirical studies to assess the perceived and estimated quality of Web 2.0 applications and to understand the distance between this two types of evaluation. Results show that the measures gathered

by using subjective and objective methods are similar. Thus, the choice of the evaluation tool does not impact on the results of the quality in use assessment.

3. Some Web 2.0 Engineering Challenges

Front-end design is a complex and multidisciplinary task, where many perspectives and expertise intersect. This is especially true for Web 2.0 interfaces that feature complex behaviors and mixes of technologies. The HTML 5 initiative has the positive aim of establishing a unified set of concepts and a common technological platform for the development of a broad spectrum of interaction front-ends. However, so far this has not been accompanied by an established standard for the modeling and design phase at the Platform Independent Model (PIM) level that can be used to express the interaction design decisions independently of the implementation platform.

The recent IFML standard [OMG 2013] adopted by the OMG in March 2013 aims at covering this gap. The standard builds on a wide set of experiences collected along several years of research and industrial experiences in the Web engineering field and is now acclaimed as a long-awaited contribution (see e.g. [Rossi 2013]). This is a major contribution to the field per sè, as it enables a common and unambiguous understanding on Web interface models, as well as broader adoption of Web modeling approaches in industry. However, this is only the first step toward a common approach to complex Web interface modeling. Refinements, extensions and evolutions will start now and continuously improve the standard.

Another important issue that will be a new challenge for Web developers is how to satisfy the different necessities of final users when they are either unknown or the requirements cannot be directly elicited from them [Garrigos et al, 2010]. When engineering Web 2.0 applications, we found a feature that can ameliorate this scenario: user is a prosumer, so produces and uses information. In this way, we can think on requirements that evolve through time to adjust Web 2.0 applications to the expectations of users. Therefore, research must put effort in developing some collaborative mechanisms for eliciting, negotiating, analyzing and specifying requirements in an evolving manner, in such a way that requirements come from the crowd. i.e., RIAs need "crowdengineering" requirements. Finally, in such scenario, in order to facilitate developers in creating applications that satisfy the collected requirements, Web Engineering methods should further empowered by taking into account quality principles and by integrating sound quality assessment technique. Tools that support developers in creating Web 2.0 applications able to satisfy the users' needs guaranteeing the required level of technical, data and presentation quality are needed.

Acknowledgments

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