

1. PUBLISHABLE SUMMARY

Summary description of the project objectives

The EFRASYS project aims at providing methodological support to empirically evaluate existing and new technologies (methods, techniques and tools) proposed within the Service-Oriented Requirements Engineering (SORE) area.

Description of the work performed since the beginning of the project

Service Oriented Computing (SOC) has given rise to the need for adapting existing methods and techniques for eliciting and modelling requirements, or producing new ones. There is a severe lack of theoretical foundations and empirical evidence in the evaluation of SORE methods.

In the first period of the project (2010-2011) we tried to obtain a better understanding of the nature of the existing methods in SORE [1], by carrying out a systematic review. As their extent of suitability depends on contextual conditions in which they are applied, we also identified and analysed a set of relevant characteristics for the Home-Care domain that were incorporated as an important dimension of the suitability evaluation method proposed [8]. On the other hand, by means of a mapping study [2], experiments and case studies were identified as the most used by the researchers for evaluating RE methods. From an empirically methodological perspective, we conducted a review of the quality of experiments conducted in Software Engineering [3], by analysing the use appropriate of theories (e.g. justify hypotheses, explain results obtained in the experiments). A study of existing experimental infrastructures and testbeds within the FIRE community was carried out and a preliminary feasibility analysis on the exploitation of these infrastructures for empirically investigating the adaptability and usability of context aware platforms in Home Care domain was also conducted in collaboration with two researchers from Paluno software technology research institute.

In the second period of the project (2011-2012), we tried to bridge the gap between the user-centric requirements engineering and the advancements of cognitive sciences, with respect to the quality requirements and their respective measurement methods. An adjustment of a checklist for designing and reporting case studies and experiments was carried out. This adjustment was based on results obtained from a family of empirical evaluations that focused on the comprehensibility of terminology used, perceived usefulness and ease of use [4][5]. An algorithm for supporting the goals-based requirements management in dynamic systems were also defined and tested [6].

Description of the main results achieved so far

The EFRASYS project has revealed that despite the recent efforts in describing the non-functional requirements of services through approaches like semantic annotations and policy attachments, there is still a lot to do in enhancing the description of quality aspects of services. Furthermore, our study reveals that negligible effort is given to the description of consumer oriented services.

Considering the main characteristics of the Home-Care domain (e.g. multi-user, collaborative, distributed), an evaluation method for analysing the suitability of the existing SORE methods was proposed. With the purpose of validating this evaluation method, it was applied to several services identification methods [7]. The first results obtained allowed us to optimize the proposed process, and identify some limitations such as the subjectiveness of the evaluation method, due to its high dependency on the Domain expertise level. However, once the method is configured for a specific domain (e.g. prioritization of quality requirements), the evaluation is able to be carried out

automatically. The EFRASYS framework is based on a mixed approach that combines theoretical evaluation techniques based on metrics with empirical evaluation techniques (i.e. usable checklist proposed for conducting case studies and experiments). With respect to the quality goals management, an existing algorithm for the TROPOS framework was optimized using Fuzzy Logic [6], which will achieve better representativeness and management of quality goals. Although a prototype was implemented for illustrating the algorithm proposed in a specific example related to high level specifications of a business model, the algorithm can be used also with the set of quality characteristics identified in the suitability evaluation method.

Expected final results and their potential impact and use

FIRE – Future Internet Research and Experimentation – aims to promote investigation in an experimentally-driven way, by means of several facilities such as the TEFIS platform and the SMARTSANTANDER Infrastructure, which facilitate the investigation and acceptance evaluation of new technologies for internet of services and things in large-scale experimental environments. These infrastructures encourage researchers, developers and practitioners to work within a standardized environment, with appropriate guidelines, methods and techniques in order to carry out large-scale empirical evaluations. EFRASYS contributes to improving the spread of good practices in empirically evaluating SORE methods.

References

- [1] Teka, A. and Condori-Fernandez, N. and Sapkota, B. (2012) A Systematic Literature Review on Service Description Methods. In: 18th International Working Conference on Requirements Engineering: Foundation for Software Quality, REFSQ 2012, 19-22 March 2012, Essen, Germany. pp. 239-255. Lecture Notes in Computer Science 7195. Springer Verlag
- [2] Condori-Fernandez, N. and Daneva, M. and Sikkil, K. and Wieringa, R.J. and Dieste, O. and Pastor, O. (2009) A Systematic Mapping Study on Empirical Evaluation of Software Requirements Specifications Techniques. In: Third International Symposium on Empirical Software Engineering and Measurement, 15-16 Oct 2009, Buena Vista, US. pp. 503-505. IEEE Computer Society. ISBN 978-1-4244-4841-8
- [3] Wieringa, R.J. and Daneva, M. and Condori-Fernandez, N. (2011) The Structure of Design Theories, and an Analysis of their Use in Software Engineering Experiments. In: International Symposium on Empirical Software Engineering and Measurement (ESEM 2011), 22-23 Sep 2011, Banff, Canada. pp. 295-304. IEEE Computer Society. ISSN 1938-6451 ISBN 978-1-4577-2203-5.
- [4] Wieringa R.J., Condori-Fernández, N., and Daneva, M. and Mutschler, B. and Pastor, O. Lessons Learned from Evaluating a Checklist for Reporting Experimental and Observational Research. In: International Symposium on Empirical Software Engineering and Measurement (ESEM 2012).
- [5] Condori-Fernandez, N. and Wieringa, R.J. and Daneva, M. and Mutschler, B. and Pastor, O. (2012) An Experimental Evaluation of a Unified Checklist for Designing and Reporting Empirical Research in Software Engineering. Technical Report TR-CTIT-12-12, Centre for Telematics and Information Technology, University of Twente, Enschede. ISSN 1381-3625
- [6] A. Teka, N. Condori-Fernández, I. Kurtev, D. Quartel, and W. Engelsma. Change Impact Analysis of Indirect Goal Relations: Comparison of NFR and TROPOS Approaches Based on Industrial Case Study. MODRE 2012. IEEE Workshop on Model Driven Requirements Engineering within Requirements Engineering (RE) Chicago, USA.
- [7] Q. Gu, P. Lago. Service Identification Methods: A Systematic Literature Review. Lecture Notes in Computer Science, 2010. Springer Berlin. Editor E. Di Nitto, R. Yahyapour. pp 37-50.
- [8] Condori Fernandez N., Pazos A., Daneva M. Towards Assessing the Suitability of Service Oriented Requirements Engineering Methods to Home-Care Projects. Technical Report. Nov 2012, University of Twente, Enschede. ISSN 1381-3625