RE4SuSy: 3rd International Workshop on Requirements Engineering for Sustainable Systems

Birgit Penzenstadler
University of California, Irvine
Irvine, USA
bpenzens@uci.edu

Martin Mahaux
University of Namur
Namur, Belgium
martin.mahaux@fundp.ac.be

Camille Salinesi
Université Paris 1 - Sorbonne
Paris, France
camille@univ-paris1.fr

***Abstract*—Research has started investigating the support of sustainability within systems and software engineering.Yet there are few workshops that explore the topic, and there is only one so far in requirements engineering: RE4SuSy.**

The International Workshops on Requirements Engineering for Sustainable Systems (RE4SuSy) have been held at REFSQ in 2012 and at RE in 2013. We want to continue this series back in Europe at RE'14.

We plan an interactive workshop that engages with authors well before the deadlines and that produces new results already during the workshop and will promote them throughout the conference. This is also the take-off point for new collaborations between participants.

I. Motivation and objectives

A. Motivation

Researchers have recently started to explore the concept of "sustainability requirements", and how to support the elicitation and documentation of such requirements. They are showing that requirements engineers have indeed a very important role to play in order to ensure that future socio-technical systems are sustainable. For example, requirements have an important impact on the potential premature obsolescence of hardware, on the electricity consumption of software or on the number of servers needed to offer a service. Further, as ubiquitous socio-technical systems alter the way we live, the requirements of those systems have to be carefully written such that those new ways of living are more sustainable.

In the industry, companies not only want to be "ecologically trendy", but also become aware that sustainability requirements will have strategic impacts on business organization and value creation, as with zero paper projects that revolutionize enterprise architectures, or intelligent powergrids that lead to delivering innovative services.

This workshop will provide an interactive stage for researchers to share and exchange about their latest works, to collaboratively define a research agenda in RE for sustainable systems, and also to jumpstart collaboration through the live creation of teams that commit to work together on concrete points of this agenda.

B. Objective

The objective of the workshop is to establish a community of researchers interested in collaborating on the topic of sustainability in requirements engineering. The basis for this is provided by:

- the earlier workshops and their derived research agendas
- various international research collaborations (i.a., with Germany, Spain, Belgium, Brazil, USA, Netherlands) that have started in the past two years

This objective shall be reached by the following actions:

- provide a platform for researchers where they can present their current work and trigger discussion
- revisit and add to the defined research agendas
- identify and link contributions to that agenda where there has already been work done or work is in progress
- trigger discussions in small groups on favored topics of the research agenda
- kickstart new collaborations in between the workshop participants
- spread the word about the workshop and its results at the main conference

How the actions are planned to be realized within the workshop is described in the following section.

II. History of the workshop

Related workshop on sustainability, green software, and software engineering are GREENS[1] (at ICSE'12 and '13), WSRCC[2] (at OOPSLA'09, ICSE'10, CAISE'11), and GIBSE[3] (AOSD'13), but none of them explicitly considers requirements engineering.

The 1st Intl. Workshop on RE4SuSy[4] was held at the International Working Conference on REFSQ[5] in March 2012. We had 8 contributions that were presented at the workshop and 14 attendees. Much of the workshop was dedicated to the collaborative building of a first research agenda for the discipline.

The 2nd Intl. Workshop on RE4SuSy[6] was held at the International Conference on Requirements Engineering in July 2013, with 7 contributions and 17 attendees. The afternoon of the workshop was dedicated to discussion in

[1] http://greens.cs.vu.nl/
[2] http://www.cs.toronto.edu/wsrcc/Previous.html
[3] http://trese.ewi.utwente.nl/workshops/GIBSE/
[4] https://sustainability.wiki.tum.de/RE4SuSy
[5] http://refsq.org
[6] http://www4.in.tum.de/~penzenst/re4susy/2013/

focus groups with an updated research agenda. The protocol is available at http://www4.in.tum.de/~penzenst/re4susy/2013/RE4SuSy13-onlineprotocol.pdf.

III. Workshop contributions and evaluation

A. Contribution types

The *types of contribution* are short papers of 6 pages, posters with a 2-page abstract, and videos of up to 5 minutes (also 2 pages abstract).

We encourage the submission of new and interactive formats (e.g., we had an interactive poster realized with Flash at RE4SuSy'12), but are aware that publication in the standardised conference ways requires a textual version.

B. Evaluation process

The evaluation will be organised exclusively by our program chair, Camille Salinesi. This explicit role distinction will allow the organisers Birgit and Martin to submit their own contributions to RE4SuSy as authors, which is important to strengthen the growing community.

Camille will assign peer reviews by three PC members and moderate the discussion between PC members in case of strongly diverging reviews or borderline assessments. The submission, review process, and communication will be performed via the Easychair system. The contribution ratings will include the option of a conditional accept as we consider it more sustainable to request specific improvements instead of rejections of potentially good contributions.

C. Program committee

The preliminary program committee is a mixture of academia and industry, experienced and young researchers, and the two domains that the workshop combines: requirements engineering and sustainability. All PC members have confirmed.

- Davor Svetinovic, Masdar Institute of Science and Technology, United Arab Emirates
- Wolfgang Lohmann, University of Zürich, Switzerland
- Ruzanna Chitchyan, Leicester University, UK
- Debra Richardson, University of California, Irvine
- Emmanuel Letier, University College London, UK
- Alistair Mavin, Rolls Royce, UK
- Xavier Franch, UPC Barcelona, Spain
- Letícia Duboc, State Univ. of Rio de Janeiro, Brasil
- Jean-Christophe Deprez, CETIC, France
- Christian Manteuffel, Univ. of Groningen, Netherlands
- Patricia Lago, VU University Amsterdam, Netherlands
- Henning Femmer, TUM, Germany
- Timo Johann, University of Hamburg, Germany
- Alexandre Mello Ferreira, Politecnico di Milano, Italy
- Coral Calero, Universidad Castilla La Mancha, Spain

IV. Workshop format and needed services

A. Pre-workshop activities

There are two phases of pre-workshop activities: First, for four weeks before the submission deadline, we will invite authors to upload preliminary abstracts, outlines, or papers for a constructive feedback phase. Other authors and interested PC members can comment on them so the authors can improve their papers before the actual submission.

Second, in a pre-workshop reading phase from the CR deadline until the workshop, we provide the camera-ready version papers in a protected download area for authors and PC members. Apart from encouraging them to read the papers before coming to the workshop, we will assign two discussants to each paper that kick off an online discussion. The discussion will furthermore be facilitated by providing a framework of 3-4 topics that mirror a coarse-grained classification of submitted contribution topics. That way participants are already engaging with the contents before the actual workshop and discussion is facilitated. Consequently, we assign shorter slots for presentation by the authors and can thereby leave more room for discussion.

B. Workshop format

a) Warm-up and intro: The workshop will be kicked off with an *interactive warm-up* exercise to let the participants get into an active workshop mode and make them feel like a group. We will then start with a short introduction by the organisers on the history of the workshop and the agenda for the day, which consists of contribution presentations and discussion in the morning, and interactive sessions in the afternoon.

b) Contribution presentations: The format of last year with lightning talks and assigned discussants has allowed for allocating time to presentations as well as discussion. As we demand a full day this time, we will suggest presentations of 10 to 15 minutes for each contribution plus 10 to 15 minutes of discussion, depending on the number of contributions to be presented. To facilitate discussion, we will make the papers available in advance as password-secured download and assign two *discussants* for each paper. In parallel, we will be taking notes in a shared online document as *living protocol* of the workshop. Presenters of papers will be encouraged to use a poster instead of a slideshow to support their presentation. This will ensure the presentation is more oriented towards the audience and, as we hang all workshop posters to walls, this will enable participants to add ideas and comments to them during breaks, lunchtime, or after the workshop. This might increase the likelihood of identifying new collaboration potential.

c) Intermediate Wrap-up: Before lunch, we will wrap up the presentations with a recapitulation of the discussions in the online protocol and review whether we can include some of these in the afternoon breakout sessions.

d) Research Agenda and BOK: In the afternoon, there will be a short review of the research agenda of 2013 and then an update and/or extension of that research agenda. In a

second step, we will identify contributions that have already been made to a specific topic, thereby providing a very first draft of an emerging body of knowledge.

e) Concepts, Collaboration, and Studies: We will prepare topics for breakout sessions with discussion facilitation (e.g. creativity techniques like the Osborne checklist, roleplay, etc.) but also include topics that arose during discussion at the workshop. The breakout sessions are also used to identify new collaborations amongst attendees. Specific attention will also be given to study design to evaluate concepts early on.

f) Experiments: Furthermore, we will provide authors with the option to perform small experiments with their research work if applicable, i.e., they may try out a specific technique that they presented in the morning with willing participants of the audience. For example, if an author presents a goal modeling technique specifically designed to model sustainability goals, an experiment could be modeling a small case study within half an hour among a group of 5 workshop attendees.

g) Final Wrap-up: In a final come together, we will recollect the major discussion points and contributions of the day on a poster to be presented at the main conference. As last agenda point, we will ask for individual feedback on the organisation of the workshop and what could be improved in a next iteration.

h) Results: The results of the day will therefore be:

- Posters augmented with ideas and discussion notes
- A readily available online protocol of the workshop
- An extended research agenda for RE4SuSy
- A very first draft of a body of knowledge on RE4SuSy
- New research collaborations
- New concepts and study designs
- Small experiments with case studies
- A wrap-up of results in form of a poster to be presented at the main conference (most likely in a designated area along with the poster sessions)
- An emerging community of actively collaborating researchers

C. Post-workshop activities

The post-workshop activities involve spreading the word at the conference and intensifying collaborations that originated during the workshop. "Spreading the word" will be facilitated by a poster in the Posters and Demos session and by providing the results online for download by participants and other interested community members. We will lead a joint effort for all interested contributors for collecting an emerging body of knowledge.

"Intensifying collaborations" is initiated during the workshop in the breakout sessions and their wrap-up presentations. From there on, participants will be encouraged to follow up on the discussions and strengthen the growing community by networking and joining forces on intersecting research topics.

D. Needed Services

- Room with 20 chairs and tables for them as well as a beamer. The preferred setting is a U-shape. The room shall provide enough space so we can move around along the walls during interactive sessions.
- Free walls for the posters of the workshop.
- More free walls where we are allowed to (temporarily) stick many post-its and pieces of papers to collect and organise ideas.
- A student volunteer who helps us set up the interactive session walls and takes photos for documentation would be great.
- We would like to organise a workshop dinner and would welcome suggestions for a nearby restaurant.
- Harmonized feedback forms would be welcome

V. Workshop publication plans

We intend to publish workshop proceedings with the free and public CEUR WS proceedings.

Apart from that, we want to directly keep working with the workshop results. The organising team will write a workshop report and make it available in an adequate publication. The workshop report will be based on the protocol elaborated collectively online during the day and participants are welcome to co-author.

VI. Target audience

Attendees should have a background in sustainability or requirements engineering, but everybody is welcome to join and participate. As the topic is a particularly interdisciplinary one, our call for paper will encourage interdisciplinary contributions, but we know from experience that these are hard to attract. As breakout sessions can be adapted to the size of the audience, we can work with a group size between 5 and 20 participants.

VII. Workshop duration

Re4SuSy 2014 is planned for one full day.

VIII. Short biography of organizers

1) Birgit Penzenstadler (organizer): Birgit Penzenstadler is a postdoc at the University of California, Irvine. She did her PhD in the area of requirements engineering [3] at Technische Universität München (TUM), where she also lead research projects with BMW, Daimler, Siemens, Bosch, Lufthansa, and others. She has organized and moderated events of over 100 participants from different domains at TUM.
Dr Penzenstadler has been investigating on sustainability from a point of view of software engineering during the past 3 years by performing preliminary work for a body of knowledge with a SLR and by providing first concepts of how to support sustainability from within RE [8], [4], [11], [5], [6], [9]. She also included the topic into the curriculum of her faculty [10], [7] and has established industrial cooperations for case studies [1]. She held a seminar series on the topic with seminars at TUM [12] and the Universitat Polytècnica de Catalunya (UPC) in Barcelona as well as guided research with students [13].

2) Martin Mahaux (organizer): Martin Mahaux is currently a PhD student and researcher at the University of Namur (FUNDP), working on "Methodologies for the evaluation of the environmental impact of ICT developments". In this role he published last year at REFSQ one of the first studies on sustainability and RE [2]. Having graduated as a Computer Science Engineer from the University of Louvain (UCL), Martin started his career as an IT consultant. During five years, he enjoyed many positions in the software development life cycle, in particular Requirements Engineering. During that period he developed a training technique for teaching soft skills to RE teams that is based on improvisational theater. This has inspired him to return to the university to start a PhD on the topic of collaboration and creativity in RE. His industry experience and the emphasis on collaboration and creativity provide a solid background for animating workshops. His pioneering work on RE and sustainability are a sign of his knowledgeability on the subject matter of the workshop.

3) Camille Salinesi (program chair): Camille Salinesi is Professor at Université Paris 1 where he is the head of the Centre de Recherche en Informatique, specialized in Information Systems Engineering. He published over a hundred refereed papers in international conferences and scientific journals on various topics such as requirements engineering, strategic alignment, or product lines.

Dr Salinesi was involved in fundamental research projects (FP4 NATURE, FP5 CREWS) and was the leader for collaborations and consultancy works for various companies such as France Telecom, SNCF, Renault, MediaScience, and EDF). Nowadays, he is in particular working with Renault for the specification of the new product line of electrical and hybrid vehicles, dealing with a number of issues such as business alignment between sustainability goals and the product line, and taking into account the sustainability requirements in the design of individual vehicles.

Dr Salinesi was involved in the animation of research through the organisation of a number of international research events. Prof Salinesi belongs to the Program Board of the CAiSE and to the PC of IEEE RE. Prof Salinesi was Organisation Chair at RE'05, Program Chair of REFSQ'01, '02, '03 and '14 and of CAiSE'13, General Chair of REP'99 and REP'00; he belonged to the program board of CAiSE, and to the Program Committee of RE, and several other events.

Fig. 1. "SuSy" reminds us of why we want to develop sustainable systems

REFERENCES

[1] Oliver Feldmann. Sustainability aspects in specifying a car sharing platform, 2012.

[2] Martin Mahaux, Patrick Heymans, and Germain Saval. Discovering Sustainability Requirements: an Experience Report. In *17th REFSQ*, 2011.

[3] Birgit Penzenstadler. *DeSyRe - Decomposition of Systems and their Requirements*. PhD thesis, Technische Universität München, 2011.

[4] Birgit Penzenstadler. Supporting sustainability aspects in software engineering. In *3rd International Conference on Computational Sustainability (CompSust)*, 2012.

[5] Birgit Penzenstadler. Towards a definition of sustainability in and for software engineering. In *28th Annual ACM Symposium on Applied Computing (SAC)*, 2013.

[6] Birgit Penzenstadler. What does sustainability mean in and for software engineering? In *1st International Conference on ICT for Sustainability (ICT4S)*, 2013.

[7] Birgit Penzenstadler and Veronika Bauer. Jumpstart sustainability in seminars: Hands-on experiences in class. In *2nd Intl. Computer Science Education Research Conference (CSERC)*, 2012.

[8] Birgit Penzenstadler, Veronika Bauer, Coral Calero, and Xavier Franch. Sustainability in software engineering: A systematic literature review. In *International Conference on Evaluation and Assessment in Software Engineering (EASE)*, 2012.

[9] Birgit Penzenstadler and Henning Femmer. A generic model for sustainability. Technical report, Technische Universität München, November 2012.

[10] Birgit Penzenstadler and Andreas Fleischmann. Teach sustainability in software engineering? In *24th IEEE Conf. on Software Engineering Education and Training*, 2011.

[11] Birgit Penzenstadler, Bill Tomlinson, and Debra Richardson. Support environmental sustainability by requirements engineering. In *International Workshop on Requirements Engineering for Sustainable Systems*, 2012.

[12] Penzenstadler, B., Fleischmann, A. and Bauer, V. (eds.). Sustainability in software engineering. Technical report, Technische Universität München, 2011.

[13] Alejandra Rodriguez and Birgit Penzenstadler. An assessment technique for sustainability: Applying the imagine approach to software systems. Technical report, Technische Universität München, November 2012.