Requirements Engineering (RE) for Social Good: RE Cares

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As researchers and teachers and practitioners, we "software types" excel at multi-tasking. This, in part, led us to ask the question: Can one attend a software engineering conference *and* do something good for society? We found the answer to be a resounding yes. Interested? Please read on.

There are different ways in which computer scientists and software engineers can give back to the community and participate in 'public good' projects, from donating to the causes they find worthy, to volunteering their time, to championing causes. Yet, unlike the proverbial "doctors and lawyers" who can find straightforward ways of contributing to public good in ways that specifically take advantage of their professional expertise, such opportunities for computing researchers and professionals are not immediate.

But they do not have to be!

We live in a world where "everyone is a software engineer" is not just a slogan, but – to a large degree - is a natural conclusion of an observation that in today's society anyone, regardless of their ability to write code, can be an author of an idea for a brilliant, compelling, or simply useful software product. Yet having an idea, or in many cases, a need for software, is not enough to actually bring the software to realization. The actual software development process is a costly endeavor, and comes with large barriers to entry. In order to succeed, a customer, a person, or a group of people with a need for software must typically have funds and access to software developers. Stakeholders interested in developing software applications serving the greater good often have no easy access to software engineers to work with them and even more often do not have the appropriate funds.

At the International Requirements Engineering (RE) Conference held in 2017 in Lisbon, the Silver Jubilee presentation sparked an active discussion among the conference participants, the academics, and practitioners in the field of Requirements Engineering, about their ability to 'give back' in a professional capacity. At the end, a group of us said "we want to try," and RE Cares was born.

The concept is simple.

 Step one: target a conference. Step two: find a local stakeholder with a need of a software product that falls under the broad definitions of "public good." Step three: organize a requirements engineering, design, and prototype-building hackathon for the stakeholder's application during the conference. Step four: pass the results of the hackathon to the open source community, organize a team to finish development. Step five: deliver to the stakeholder.

As simple as the idea sounds, it is fraught with uncertainty. Can we get the conference to collaborate? Can we find the right stakeholders? Will conference attendees participate? Will we have the critical mass of participants to achieve something useful? How does one go about running a requirements engineering hackathon? How can we keep the torch going after the conference is over? All of these are excellent and valid questions, and all of these were considered. And yet… we *still* decided that we wanted to try.

As RE'2017 gave birth to this idea, we chose RE'2018, scheduled for August 2018 in Banff, Alberta province, Canada as our place to try. The conference name helped give us the name for the event: "RE Cares." With nothing but an idea and a name, we started our undertaking.

Preparation

Early in developing RE Cares, the idea of helping a *local* stakeholder took shape – in a sense, we wanted the largest gathering of requirements engineers in the world to give back to the host region. We wondered, what can we do in Alberta, a province in Canada known for agriculture, oil industry, and two rival NHL teams?

One of our organizers put us in touch with Mutual Aid Alberta, a non-profit organization responsible for organizing the training of Alberta's disaster preparedness personnel, and also responsible for coordinating natural disaster responses in the province. Our stakeholders, Shell Clarke, the CEO of Mutual Aid Alberta, and Chuck Brophy, a systems engineer working with Mutual Aid Alberta on their web portal, have produced a long list of software ideas and software needs that have not been met. With their enthusiastic support, we commenced our preparations for RE Cares.

Starting in early October of 2017, the RE Cares idea was pitched to the organizing committee of RE'2018. By January 2018, we had secured the aforementioned stakeholder in Alberta and had secured a half day workshop slot at REFSQ 2018 in order to "dry run" RE Cares, we called it REFSQ Cares. Monthly telecons with the stakeholder and organizers began in March, transitioned to bi-weekly calls in June, and then weekly calls in the few weeks preceding RE'2018.

Throughout the spring and summer of 2018, we were able to hash out the general direction of the requirements engineering and software development effort. To support efficient disaster response, Mutual Aid Alberta proposed the development of a web-based instant messaging system that would allow incident response commanders to communicate, both formally and informally, with all first responders engaged in the incident response through an established chain of command. We established that existing off-the-shelf messaging systems lacked proper functionality and reliability in the conditions of disaster response, making a specialized software solution a reasonable choice.

In Banff

RE'2018 took place on August 20 – August 24, 2018 in Banff, an idyllic ski resort in the Canadian Rockies, nestled inside a National Park and surrounded by mountain peaks and lakes. Yet the British Columbia forest fires served as the most visible conference backdrop, shrouding the surrounding area, famous for its crystal clear air, with a thick layer of smog, and raising the stakes for the success of RE Cares – committed to helping disaster response personnel deal with the very events we were observing.

RE Cares was introduced into the RE'2018 program as a Tuesday[1] full-day workshop, followed by an official event Wednesday afternoon (in the RE'2018 program), and a series of unofficial

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[1] RE Conferences typically open on Mondays with two days of workshops, followed by three days (Wednesday—Friday) of the conference proper.

events on Wednesday and Thursday[2] culminating with a short report back to the conference on Friday during the closing remarks.

On Tuesday, a group of about 30 conference attendees, consisting of the RE Cares organizers, RE academics and practitioners, students, and stakeholders, met to discuss the software. In the morning meet-and-greet session, we introduced the event, discussed the logistics, and had two key presentations: the organizers gave the stakeholders a short overview of Requirements Engineering as a discipline and of the requirements elicitation process, while the stakeholders introduced the event participants to Mutual Aid Alberta, its role in disaster preparedness training and incident responses, and its software needs. In the follow-up Q&A session with the stakeholders, an informal process of requirements elicitation commenced. The majority of the questions in the session, captured together with their answers in the ever-growing requirements document, revolved around the restrictions on the software functionality (what is included and what is not), the discussions of the roles that the software users will take, and of the challenges that the software users, the first responders working on the sites of the incidents – often without internet and cell phone access, may experience when working with a web-based application.

Tuesday afternoon sessions involved a creativity exercise and demonstrations of two techniques to elicit requirements: task-driven approach and design thinking approach, led by Barbara Paech and Meria Levy, respectively.

The Wednesday afternoon "panel" was the first truly public introduction of RE Cares to the conference. With new people in the audience, the "panel" involved a short presentation by Shell Clarke and Chuck Brophy about their software needs, and a newly invigorated Q&A session, during which new issues were raised (and new requirements documented), together with continuations of discussions that started on Tuesday. Following the panel, a small group of RE Cares participants formed two teams: one team worked with Shell Clarke to design the use cases and the UI for the instant messenger application, while the second team worked with Chuck Brophy to develop the relational database model for the application.

Thursday was reserved for an all-day hackathon during which a number of conference attendees, spearheaded by a group of University of Kentucky students, worked on building software prototypes.

In parallel with RE Cares, a satellite event took place in Israel at the Shenkar College of Engineering and Design. There, three students undertook a four day hackathon and applied design thinking to develop Ranger, an Internet of Things device for detecting forest fires, alerting authorities, and navigating a hiker out of the forest away from the fire. The students developed a design prototype of the device as well as a video explaining the concept and design. The video can be found on the RE cares website[3].

Lessons Learned

No worthwhile undertaking is without its shortcomings (and successes), and RE cares was no exception. Our lessons learned come from two sources – 1) a survey of organizers, stakeholders, and participants and 2) the organizers' own feedback to augment the survey findings. The lessons fall under two categories: process and product.

Process lessons learned: Process can be broken down into before, during, and after the conference. Before the conference, we did not describe our vision for RE Cares and how it

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[2] The organizers of RE'2018 graciously provided us with the use of conference rooms.
[3] https://wsrecares.wixsite.com/recares

would unfold during the RE'2018 conference well. This led to far too many email interactions with the RE'2018 organizers (who were very patient and accommodating). We thus did not request rooms and program slots as early as we should have. We did not get the level of on-site participation of developers at RE'2018 that we had hoped – we learned that we must bring more developers with us (or have firm commitments of the developers and their advisor beforehand). We did a nice job of getting what little funding we needed: the RE'2018 organizers allowed our stakeholders to attend for free and also allowed the students to attend the workshop days for free; the University of Kentucky Industrial Partner Association[4] provided t-shirts for all participants, and Lexmark paid for one of the developers to travel to the conference. During the conference, we lost many of our organizers due to conflicting events/tracks/workshops. Some of this is unavoidable, but had we set our desired schedule very early, our organizers could have requested their papers be in different time slots, etc. There were some who did not like having the sessions video- and audio-taped. We will consider this in the future and decide whether to repeat it. There was confusion over what RE Cares was, when it would be held, etc. (even though the organizers made an announcement at the opening plenary session). We could estimate room needs better: we had plenty of room for two of the sessions, but needed a larger space for our hackathon. We also learned that our hackathon process could be streamlined; we ended up trying to do too much in the time that we had. After the conference, the main lesson that we learned is that the RE Cares'2018 was not yet ended/finalized and it was already time to start on RE Cares'2019 (and possibly RE Cares at REFSQ'2019). We overestimated how many volunteers would assist with coding the app after RE ended. We are still in the process of getting volunteers on board. We underestimated how much interest there would be in the artifacts, we have had many requests for permission to use the artifacts (they are all posted here for now at the RE Cares website).

Product lessons learned: Our stakeholders initially wanted a mobile app (for Android and iOS). In consultations with our organizers and developers, we felt that was unwieldy for the time that we had (less than 8 hour hackathon). Also, knowing that cell service is spotty in the locales prone to wildfires, we felt it prudent to ensure the app would at least run for the organizers back in the Command Center who have ready access to laptops. We thus opted for a web app (knowing that a cell phone user could also bring up the app on their browser). We selected Rails as the framework due to quick startup as well as it falling in the recent experience of our two developers.

Our RE community saw an opportunity to multi-task at RE'2018 and to "do good." Could the undertaking be improved? Yes. Was it a success? Others tell us it was. Will we try it again? Absolutely. Are you interested in assisting us? Or in trying a Cares event at your conference? Please contact us and see if the "software types" of the world can't continue to give a little something back.

Photo 1:

(the heart picture from the lawn)

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[4] http://www.engr.uky.edu/research-faculty/departments/computer-science/about-cs/industry-partners

Photo 2: