CS486C – Senior Capstone Design in Computer Science

Project Description

Project Title: GeekSurvey: a software engineering research tool for recruiting software developers to participate in scientific studies	
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Project Overview:

Software development is a huge business that generates trillions in the US economy, employs millions of people, and has driven the information revolution. As software development continues to grow in size and complexity, research on "Software Engineering" itself – development processes, novel SE tools, and evolving best practices — is vital to optimize software project outcomes.

One major obstacle to doing research in software engineering is recruiting practicing software engineers as participants in such research studies. Software professionals are busy, distributed globally, and have incredibly diverse backgrounds and specialties. This means that, for a software engineering research lab like ours, the most difficult part of performing a research study may actually be simply identifying and recruiting a valid pool of subjects with the desired background or characteristics needed for the study. In scientific conferences on software engineering, it is common to hear how difficult it is to find developers with specific characteristics who are willing to participate in research. Researchers often send direct messages using email addresses found on GitHub profiles; however, these messages are often ignored or considered spam (Figure 1). Researchers are even proposing workshops to discuss the difficulties of recruiting participants (Figure 2).

At the same time, programmers and software development professionals could be paid to participate in research, complementing their income and helping science and technology at the same time. In fact, there are several platforms that allow one to recruit and pay research participants, such as Prolific.co, SSRS Opinion Panel, Amazon Mechanical Turk, Opinion Outpost, Branded Surveys, Survey Junkie Panel, MySoapBox Panel, and ProductReportCard. However, these are targeted to recruiting participants from the

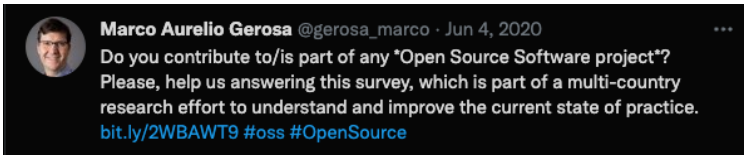

Figure 1: Typical social media appeal for participants. Scientists often bombard social media sites to reach potential participants, creating information overload and bias in the research.

general population for generic studies, and fall short when researchers need to recruit participants with specialized profiles, i.e., in software engineering.

Figure 2: Call for a workshop to discuss the recruiting challenge

As clients for this project, we are professors and researchers in software engineering tools (with particular focus on investigating and optimizing open source development) at NAU and very often encounter this problem in our own research. We also partner with other researchers who share the same needs, can provide input to the project, and who would be extremely grateful for a successful product to help with their research. Without a viable tool to help with the recruiting challenge, we (researchers) often end up with small participants pool and biased samples, weakening the scientific results and reducing the chance of causing an impact in practice. What is needed is a flexible web-based tool that allows SE researchers to easily configure recruiting efforts, deploy various advertisements and instruments to interest potential applicants and gather some preliminary profile information, and launch and manage a recruiting campaign for some research study.

The Envisioned Product: a secure web-based platform for managing SE research project recruiting efforts.

Specifically, we envision a powerful, secure web2.0 web application where SE researchers can create an account, and create "research projects" within that account; a given research project can also have one or more "recruiting drive" modules associated with it, that help with participant recruiting for the project. Once the client has uploaded externally created recruiting materials to the platform, these can be used in configuring the recruiting drives, by specifying forums or existing pools of potential participants and what recruiting materials should be targeted to each. Researchers can launch the configured recruiting drive modules, and monitor their progress along the way, e.g., using a simple graphical "dashboard" and notifications system to keep track of page views, downloads, incoming responses, etc. In general, much of our research methodology involves using surveys, interviews, or lab studies to gain insights into how various aspects of software engineering happen "in the trenches", and to then develop tools to optimize or streamline the processes. Thus, our envisioned recruiting manager tool would also be based around such instruments, presented to targeted groups of potential participants to gather basic profile information relevant to staffing the study. As a study is staffed, researchers can deploy the study-specific surveys and other instruments on some fixed or flexible timeline. When the study concludes, the researchers could use the tool to finish up, by compensating participants for their effort in the study, e.g., gift cards, points on our platform, or participate in raffles).

Some features that we envision are as follows. To communicate our priorities, we have marked with an (*) what we consider as a minimum viable product.

Researcher-related functions

- Account manager
  - Researchers can set up an account for themselves. (*)
- Dashboard
  - Researchers can manage/monitor their studies. (*)
  - They can also access their notifications.
- Study manager
  - When creating a new study, researchers can post a survey link, configure timeslots for interviews/lab studies, or create screening questions. (*)
  - The system will allow linking with survey platforms based on tokens (Limesurvey, Qualtrics) (*)
  - Researchers can define the compensation of the participants and the target number of participants. (*)

    - Each study has a web-accessible "home page" (URL) that shows information about the study and the researchers, and allow participants to sign up. Researchers can disseminate this link in their social media sites and recruitment campaigns. (*)
    - For each study, researchers can create and manage automated recruitments. They can specify criteria that target participants must meet (profile or GitHub/LinkedIn/etc. information) and sampling strategy and the system will send invitations to the registered participants. (*)
    - Researchers have the ability to send (subsets of) participants messages and answer questions from participants.
    - Researchers can evaluate participants, what will contribute to their reputation.
    - Researchers can configure how they will manage study completion (manual, token, redirect link, etc.) (*)
- Payment center
    - Researchers can quote a new study (*)
    - Researchers can fund their account (request invoice, bank transfer, credit card, paypal, gift cards, etc.) (*)

Participant functions

- Account manager
    - Participants can set up an account for themselves, providing basic demographic information and software engineering-specific skills and experience (*)
    - Participants can connect their GitHub/LinkedIn/etc. accounts to allow for data extraction and portfolio building
    - The system sends periodic reminders for updating the profile
- Studies manager
    - Participants can enroll in active studies (*)
    - The system sends alerts when a study matches the profile (*)
    - Participants can access the history of studies in which they participated
    - Participants can send questions to the researchers
    - Participants can flag problems with the studies
    - The system will manage study completion (e.g., token).
    - Participants can evaluate a study they completed
- Payment center
    - Participants can manage the funds received (transfer, donation to charity, etc.) (*)
    - Participants can refer other developers and receive compensations

General features

- The system will offer an administrative interface with access to all studies and profiles (*)
- The system will help detect low quality participation and misuse of the platform
- The system should allow participation via web or smartphones

Product Impact: This platform will help researchers to find software developers who match their criteria to participate in scientific research and software developers will be compensated by their time at the same time that they can contribute to advance the state-of-the-art in software engineering research. Research will considerably benefit from a faster, more diverse, and high quality recruitment.

Knowledge, skills, and expertise required for this project:

- Front-end: Web development (HTML, CSS, JavaScript, responsive design, web design)
- Back-end: Server-side programming, database system

Equipment Requirements:

- There should be no equipment or software required other than a development platform and software/tools freely available online.

Software and other Deliverables:

- A fully-functioning web application, installed and tested on a platform of the client's choice.
- A "system administrators" manual that details step-by-step how the system can be installed on a platform of the client's choice, as well as how to perform basic configuration and maintenance.
- A strong as-built report detailing the design and implementation of the product in a complete, clear and professional manner. This document should provide a strong basis for future development of the product.
- A complete professionally-documented codebase, delivered both as a repository in GitHub, GitLab, BitBucket, or some other platform with versioning control; and as a physical archive on a USB drive.