2008 Annual Report for NSF Project

"Resparking Innovation in Computing Education"

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Participants

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Craig Martell (Senior Personnel)
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Partner Organizations

ASSOCIATION FOR COMPUTING MACHINERY, INC.: In-kind Support

ACM Education Board and ACM SIGCSE executive committee endorsed the Rebooting Computing summit. ACM provided access to a listserv for communications within the summit design team and among the summit participants. ACM entered into an "in cooperation with" agreement that incurred no financial or other obligations on either side but allowed us to use the ACM logo and the listserv facility.

NPS FOUNDATION: Financial Support; In-kind Support

Handled private contributions that supported parts of the Rebooting Computing Summit.

Other Collaborators

They were numerous. We had a 19-person design team for the Rebooting Computing Summit. Each brought access to a network that needed to be represented in the summit.

Research and Education Activities

During the reporting period (2008) we did the following major activities.

(1) After extensive discussions among my NPS team and with people in my network, I concluded that our best hope for an intervention into the Computing Community's wicked problem, of poor identity and loss of student participation, would be a summit meeting that invited 200 people from all sectors of the field to come together and discuss how to reverse the problem. The NSF project manager endorsed the idea of a single large summit rather than two small workshops as envisioned in the original proposal.

(2) We decided to use Appreciative Inquiry, the facilitation processed used by the Navy for several of its successful summits, and brought Frank Barrett (a business

professor at NPS and pioneer of Appreciative Inquiry) in as a senior collaborator. Of all the facilitation processes we were aware, this one has the best track record for producing results.

(3) I organized and convened a 19-person design team that met March 11-12, 2008, at SRI in Menlo Park, CA. Frank Barrett and his partner, Ron Fry, ran through some of their Appreciative Inquiry processes and facilitated a long discussion about (a) the theme and value proposition of the summit, and (b) the invitation list. The title we agreed to was "Rebooting Computing: The Magic and Beauty of Computer Science". Our premise was that our field's doldrums are rooted in our having lost contact with the magical and beautiful things about computing that attracted all of us to the field. If we can help people recover this, we believed, it will help the whole field.

(4) I prepared a manifesto summarizing the summit's declaration and calling for others to join with us.

(5) With help from Robb Cutler (a design team member) we set up the website rebootingcomputing.org and placed the manifesto there.

(6) In the months that followed we set up an administrative staff, created a plan that would culminate in a well-run summit Jan 12-14, 2009, issued invitations, tracked responses, and set up a registration web site. We tracked the diversity of the responders and issued additional invitations to fill in the gaps. We created a Rebooting Community web site for wiki-type discussions of summit topics. We set up an ACM listserv, rebooting@acm.org, for all the registered participants.

(7) In August 2008 I proposed to NSF that we receive a supplement to our funding to allow us to offer scholarships to about 25 students and teachers who would like to come to the summit. The NSF approved $25K. We added it to our funds and prepared a process for students to apply for scholarships.

(8) Around December 1, 2008, a series of very lively conversations sprang up in the ACM listerv as participants began to discuss their ideas about the wicked problem and about projects that would help solve it. The first topics concerned the low participation rate of women. Another popular topic was the nature of computer science and a sense that the old definitions had become obsolete. Another popular topic was the external image of computing and its relation to our internal self-image. Another was the plight of C_S in K-12, especially high school.

(9) In my ACM CACM column, I continued to speak out about issues germane to the summit. The library of these columns is at
http://cs.gmu.edu/cne/pjd/PUBS/CACMcols .

(10) I attended the CAPTH PI meeting in November 2008 and spoke about how I see the problem facing our field, how we are approaching an intervention into this problem through the summit, and how I have been speaking out through the CACM and other venues.

Project Findings

(1) There is *HUGE* resonance around the theme "Magic and Beauty of Computer Science". Many people signed up for the summit on the basis of that theme alone. They told us they wanted to help recover that theme and then help to improve our field's identity and attract good young people. We had a 90% acceptance rate to our invitations and many people asking how they could help.

(2) The followon work of the summit will be very important to ultimate success. Project teams formed at the summit will carry out that work. We tried to generate a fund that could be used to support the meetings of the groups, but potential sponsors wanted more detail about what the groups would do and deliver. Since we did not know that yet, we were unable to create a follow-on project support fund in advance of the meeting.

(3) One of our partners is WGBH Boston, the station working with ACM to produce a series to portray a new image of computing. We agreed that their focus is on the external image, and ours is on the internal self-image. Our external image is generated by our actions, which are in turn consistent with our internal self-image. Our internal image has been focused on programming (the "CS=programming" image of long standing), which is widely seen as drudgework. Recovering the magic and beauty is essential to leaving this worn out image behind and replacing with a new and exciting one.

(4) Some of us developed doubts about whether the "computational thinking movement" will really help the field. While we agree that computational thinking is important, as it is in fact one of four core practices of the field, we found ourselves concerned that it is the main thinking behind programming and may do little to broaden the image of the field. We feel that a larger framework, such as for example the great principles framework, exposes all the core practices and all the principles of the field, providing a much larger arena for magic and beauty to manifest in.

Training and Development

We have greater contact with teachers and students in K12 and have become acquainted with many of their interests and concerns.

We have found a network of others who are interested in articulating the broad view of computing as a great domain of science.

Outreach Activities

We reached out to people in many sectors of the field and invited them to the summit. The acceptance rate was around 90%.

With help from the CSTA (computer science teachers association) we invited students and teachers to the summit and got scholarship funding so that they could attend.

We partnered with ACM (especially the education board and SIGCSE).

We partnered with the WGBH "new image of computing" project.

Publications

1. Denning, Peter. Voices of Computing. ACM *Communications 51* (August 2008), 19-21.
2. Denning, Peter, and Peter Yaholkowsky. Getting to "We". ACM *Communications 51* (April 2008), 19-21.
3. Denning, Peter, and Richard Riehle. Is Software Engineering Engineering? ACM *Communications 52* (March 2009), to appear.
4. Denning, Peter. Beyond Computational Thinking. ACM *Communications 52* (June 2009), to appear.

Internet Dissemination

`rebootingcomputing.org`

This is the home site for the summit process. It contains the Rebooting Manifesto, the design committee, and a link to the Rebooting Community.

`rebootingcommunity.org/community`

This is the home base for all the discussions and discussion groups surrounding the summit. It contains all the items posted to the ACM listserv. It has discussion areas for each of the 19 project action groups, together with methods for others to join the discussions and the groups.

`cs.gmu.edu/cne/pjd/cpath`

This is Peter Denning's information site for the project.

`cs.gmu.edu/cne/pjd/GP`

This is the home base for the Great Principles of Computing Project. It lays out in detail a principles-based framework for computer science and engineering and compares the new framework with the traditional technology framework for the field. The GP project gave us the confidence that there are new, exciting ways to look at the field and appreciate its depth and richness. The GP project is the starting point for the current project.

Contributions

The purpose of the overall project is to respark innovation in computing curricula. The computing field has reached its greatest heights when it has been at its most innovative. A resurgence of innovation will help resolve the doldrum of identity and attractiveness and make lasting contributions in the future.

The Rebooting Computing summit was conceived as the most effective means to jolt the field, producing movement among those who are feeling stuck. The summit invites a diverse group representing all sectors of the field and its clients, to discuss the magic and beauty of the field as it appears in their lives, to find common ground among their diverse concerns, and to organize and commit to

project actions teams that will intervene in the overall problem. It is obviously too early to tell if the summit will have this effect (it was held January 12-14, 2009 and this report is written shortly thereafter). However, all the early indications are that some movement was generated: the participants came in enthusiastic moods and departed with 19 action groups. If only 3 or 4 of the groups produces a significant result, the summit would already be a success.

If all this succeeds, many more people in the field will be in touch with the magic and beauty of the field. They will communicate it effectively to potential students and collaborators. They will attract more good students from more diverse populations to the field. They will enter into more collaborations with other sciences and engineering. The academics will engage in more curriculum innovation and make their departments exciting places to study computing.

Contributions to Other Disciplines

A concern behind the summit and the project is to communication the extraordinary depth and breadth of the computing discourse to people in other sciences and engineering. The better we become at offering our expertise, the more we will contribute to developments in other fields. This will be good for computing and will help attract young people. It will also demonstrate the ubiquity of computation in the deep structures of all fields.

Contributions to Human Resource Development

A concern behind the project and summit is to increase the participation by women and minorities in computing. The strategy is to expose the magic and beauty of what attracted us and to appeal to a similar sense in young people, in their teachers, and in potential collaborators.

Contributions to Resources for Research and Education

There is nothing significant to report yet. However it is worth noting that some of the summit project action teams aim to develop resources. One team is working to develop a new approach to parallelism, enabled by the multi-core processing technology. Another is developing a repository of tools that can help people learn and apply computational methods. Another is developing a "field guide" that will help people understand the structure and nature of the field and find answers to specific questions they have about how things work.

Contributions Beyond Science and Engineering

There is nothing significant to report yet. However it is worth noting that computing pervades many fields of science, engineering, economics, and humanities. The better we get at expressing how it can help, the greater the positive influence.