ResearchWeb

Illinois Institute of Technology
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IPRO 321
Final Report Draft

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IPRO It takes a team!
INTERPROFESSIONAL PROJECTS PROGRAM

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Executive Summary

The focus of our IPRO project was ResearchWeb, an IIT-centered interactive website allowing students and faculty to share research data, discuss their research findings, and find research opportunities. Our team brought together undergraduate students from several different departments, about half of whom were programmers. This report summarizes our goals and purpose, our team organization, our research findings, and our conclusions regarding the project's future.

The main purpose of our project was to create a website that would facilitate exposure of undergraduates to research. We found several obstacles for undergraduates, such as lack of awareness and centralized resources, and sought to remove them through our website. Our research in the matter brought up scattered resources for sharing research online, as well as IIT's own research opportunity listing, but these resources were either too obscure or not comprehensive enough to fully meet the needs we identified.

Furthermore, we felt that the rapid development and deployment of a website would provide invaluable experience both in terms of programming skills and fast-paced research and design.

We feel that the expansive potential of the site will be very helpful to those who inherit our project, though it may involve learning a new language for many of them. For this reason, great care has been taken to provide adequate documentation, and we expect future developers to continue this trend. We also recommend that future teams assign a member or group of members to server and database maintenance, since this ends up being a tedious and time-consuming task.

Team Purpose and Objectives

Team Purpose

Undergraduate research can be a valuable experience for students who are looking to apply what they learn in class to real-world problems or who are considering going to graduate school. The problem is that many students don't know what undergraduate research is or how to find a project to work on. ResearchWeb intends to solve this problem.

In addition, ResearchWeb is meant to broaden IIT undergraduate participation in research beyond the existing mechanisms such as fellowships, research and reading courses, and departmental projects. There is also the possibility of broadening this program to other scholarly individuals outside of the IIT undergraduate community. These individuals include IIT graduate students, students from other universities, and promising high school students. ResearchWeb is also meant to improve, and perhaps promote if need be, the transition from undergraduate education to graduate education. This would be fulfilled through the practical research experience of ResearchWeb's users.

Existing Technology

There is a list of undergraduate research opportunities on the research portion of IIT's main web page (http://www.iit.edu/research/undergraduate_research/). However, it was found that all of the opportunities are off campus and many of them are outdated. If you look very hard on myIIT portal you can also find a database of research projects on campus. However, they are not maintained, very few professors actually post projects there, and very few students even know about it.

For students interested in getting involved in undergraduate research the only real alternative is to ask professors in their academic department if they have open positions. For professors looking for undergraduates to work on a research project there is no place for them to go to find students with suitable interests and skills for the project, so they are left approaching students they've had in class. This can be time consuming for both students and professors and it discourages cross-departmental research collaboration. This is one of the main problems ResearchWeb intends to solve. We intend to give faculty a way to easily find the right students for their projects and students a way to find faculty members with interesting projects.

But ResearchWeb is meant to be more than just a database of projects like the myIIT channel. The website is also a place where the undergraduates will document their research work. It will provide a range of methods for collaborators to communicate and store data. It will also allow collaborators to discuss a research project independent of their location.

Some other sites have begun to crop up around the idea of research sharing, such as Mendeley (http://www.mendeley.com), but none combine the features, localization, and intuitive interface that ResearchWeb aims for.

Objectives

1. Create a simple, functional open source product.
2. Conduct adequate research to fulfill user requirements.
3. Improve undergraduate research experience at IIT

Organization and Approach

Our team developed a collaborative student research website through (1) issuing a survey to faculty and students about research, (2) identifying key requirements to facilitate research, and (3) adapting an open source project management website, Redmine, to our needs. We collaborated with the IPRO office to acquire hosting for our website on the IIT-operated server, Sloth.

As the semester began our IPRO team considered the abilities and developmental desires of the members to organize them into two sub-teams with different focuses. These sub-teams were Research/Marketing and Programming. As the semester progressed, the tasks and responsibilities of the team members changed.

Initially teams were structured using the agile development model. Two key features of the agile model are sprints, bursts of work, and scrums, quick meetings explaining status and work needed from others. This organizational model did not work for our team due to inexperience with both the development environment and the agile model. We switched to a standard collaborative model, which increased team's productivity greatly.

In addition to this final report, the work accomplished by this IPRO team is documented through a project plan, midterm presentation, readme files/comments found on the website, the website itself, final presentation, and abstract/brochure and exhibit/poster for IPRO day.

ResearchWeb IPRO 321 Team (Fall 2009)				
Name	Major	Year	Skills	Assignments
Anandha (Matt) Abhay	Computer Science	4	Groovy/Grails, various programming languages, leadership	Team leader, deliverables compliance officer project plan, midterm presentation, final presentation, final report

Zachary Cornelius	Electrical and Computer-Engineering	4	Backend programming, hardware management	Vice team leader, sub-team leader, project plan, server maintenance, midterm presentation, final presentation
Tom Corsus	Humanities with focus on Philosophy	3	Formal writing, editing, aesthetics	Deliverables editor, project plan, final report
Maximilian de Courten-Myers	Computer Science	4	Various programming languages, PHP, SQL	Project plan, midterm presentation, website view creator, final report
Adam Eberlin	Computer Science	3	Web design, graphic design	Project plan, midterm presentation, database modifications, final report
James Kapaldo	Physics	3	Graphic design and problem solving abilities.	Project plan, view design, website concept design, website reviewer, poster, brochure, final report
Bethany Nicholson	Chemical Engineering	3	Effective leadership abilities and knowledge of research and management	Sub-team leader, project plan, website reviewer midterm presentation, website concept design, final presentation, poster, final report
Yuriy Sizyuk	Physics	3	Problem solving skills and research procedure knowledge	Project plan, website concept design, website reviewer, brochure, poster, final report
Stephen Sundberg	Computer Science	4	PHP, MySQL	Project plan, website view creator, website design, final report

Analysis and Findings

Web 2.0

ResearchWeb takes full advantage of the developments of Web 2.0. Web 2.0 represents the transition from the internet as a medium for depositing and withdrawing information to a medium for dynamic interaction with information. We chose to adopt Ruby on Rails as our developmental platform to facilitate this progression.

Ruby on Rails is a web development platform based around the object oriented programming language, Ruby. It fits the needs of ResearchWeb and the idea of Web 2.0 because it excels in the generation of dynamic content. Dynamic content is made using "ruby" style web-pages that integrate the use of Javascript, AJAX, HTML, and CSS. The cutting edge of web development revolves around these languages and their interactions.

Redmine

It was also found that in order to rapidly prototype a product within the current semester, the second iteration of ResearchWeb should be founded on a pre-existing Ruby on Rails platform. The platform chosen was an open source project management website called Redmine. It was found that this would be the best platform to work with because it met many of the requirements listed out in the project plan delivered to the IPRO office earlier this fall, 2009. Major positive aspects of Redmine include:

- Secure log ins
- Integrated email server
- Private messaging
- Time tracking & project management tools
- Content hosting tools
- Administrative tool

Server

It was found that maintaining code and content on a virtual private server (VPS) would bring ResearchWeb's development process and work flow in-line with modern development practices. This came from the advice of a professional software developer, Nickolay Schwarz from Centro, a media technology company. Nickolay acted as the development team's external mentor. He is a highly qualified Ruby on Rails developer.

A back-up system was important to avoid potential loss of work. ResearchWeb's code is maintained on a very popular code version control system called Git. The system allows easy access to the code on a check-in, and check-out basis. As a result multiple coders can work at the same time without accidentally overwriting another team member's work.

Research

The main avenues of research for our project involved looking into the research process itself, learning about website usability, surveying potential users for desired features, and seeing how similar websites allowed users to share and comment on research, particularly with regard to privacy. This research involved drafting individual reports on various sites and articles, as well as compiling survey and research information into general reports.

Our research into the research process itself culminated in an interview with Eric Brey, the Assistant Dean of Undergraduate Research. This interview gave us a useful insight into undergraduate research as it exists at IIT, and gave us a sense of what resources were and were not present for undergraduates. One thing we learned, for instance, was that there is an online resource listing of research opportunities for undergraduates, but that this resource is not well maintained or well known by students.

We also looked into a variety of online resources which are useful for research. This led to the idea for inclusion of links to online academic journals. Otherwise, researchers mainly relied on faculty, physical tools, or subject-specific software to complete their tasks. This encouraged our vision of the LabBook as a tool which would allow the easy transfer of physical data as digital charts and tables, scanned notes, or software-specific files.

Our research into website usability resulted in a number of individual reports. These reports either investigated a particular website—noting on what it did well and what could be reappropriated for our project—or an article addressing usability issues.

Our user survey was sent out to a wide variety of students and faculty, and received an appreciable response. The survey was targeted at students and faculty who are/have been involved in undergraduate research and we received 38 responses. Questions asked in the survey included the user's individual research process, what would entice them to use a site for sharing research, what resources they relied on (including forms of communication), and what sort of privacy they would require for sharing research. The responses to these questions were varied. Some, faculty in particular, made it clear that they would not host any research on the site, regardless of the level of privacy restrictions. Others were less extreme, but made it clear that they would not want their research or data leaked before publication, and that matters of privacy and intellectual property were very important to them. Others seemed content with letting all their research and data to be completely public. This suggests that the need for privacy varies greatly from project to project.

We did more research regarding privacy, looking specifically at data privacy laws in the U.S. (which were found to be virtually non-existent) and privacy policies provided by websites which allow users to share research. This again resulted in a written document summarizing the research, which summarized our decision to allow the user to

determine privacy levels and suggested that we draft a privacy policy giving the user full ownership of their research while giving the site the ability to show and reproduce research marked as public.

From the user survey, we noted that two of the main complaints regarding UG research at IIT were that research opportunities are not well-advertised, and that students did not know what UG research was like. Our site was from the beginning an attempt to address the first issue, with our "job listings" feature being an essential feature of the site. The second issue we thought about resolving through a forum in which people could share their experiences, though hopefully the website itself would make the content and process of UG research clearer, as well as giving users a sense of the role played by undergraduates in the research.

When actually asked what features would entice them to use the site, participants gave a few interesting answers. One was that the site would have to look good and be easy to use, which validated our research into usability. Another precondition was that it would make progress visible and easy to track. Another user wanted a site which would focus on students and on-going research rather than the results of important projects. One user requested the ability to easily upload text and data. The LabBook addresses the issues of sharing data and making progress easy to track. Promoting focus on students and on-going projects is something that would have to happen once the site is up and running, but would make most sense for making ResearchWeb a relevant and accessible site.

Conclusions and Recommendations

When our IPRO started, the team was uncertain what a research website would entail. One important thread of discussion centered on what kind of features, tools, and resources the website should offer. These discussions generated a large list of tools that we wanted to include. As the semester progressed and our ideal design came to fruition we concluded that the amount of time required to fully complete our goals was beyond what one semester could offer.

We discovered that the use of Rails and Redmine allowed for a very rapid deployment of a pre-internal alpha prototype. Redmine is written on top of Rails, and comes readily deployable.

Something we should have taken into closer consideration was the use of an unfamiliar language. The language and platform we chose, Ruby and Ruby on Rails, had never been used by any of the members of the programming team. The closest any member had was working with Grails, which is Groovy's version of a rapid deployable web application platform. Problems arose with learning semantics and syntax, and these problems were compounded with learning the inner workings of the pre-existing platform, Redmine. Although these problems put obstacles to the project's progress they also gave each programmer invaluable experience and growth struggling with them.

To further this project, it is highly recommended that future coders continue to follow the coding conventions left by the Fall 2009 team. This means:

- Create new dynamic content by writing plug-ins for the project, rather than by hard coding changes directly into the Redmine developers' code.
- Include read-me files and comments in the code to help the developers picking up on the project to understand why changes were made, and what features they are directly linked to. Documentation will be essential to facilitating the transition from one development team to the next.
- Draw up UML documentation that will help understand how entities relate to each other. Understanding of the system as a whole is indispensable so coders know where to look to make changes to features or design schema.
- Assign a member or small group of members to maintain the server and its databases. This will allow the rest of the coding team to focus on deliverables issued out by non-coding sub-teams in 2010. Server and database maintenance can be a hassle, so this point is critical.
- Intertwine the groups that are made for next semester in a much tighter fashion. The member who was supposed to be this link between the two subgroups working on the project became ill, and he was not replaced. This caused some unnecessary confusion and slowed down the work flow due to the fact that the groups had trouble communicating with each other without a liaison.

A final recommendation with regard to the project is to analyze the end prototype. Does it fit the acceptance tests run by the non-programmers within the team? What does the open beta phase of the project imply about the future of the current prototype? Should a home-cooked website be created and tinkered with if the above doesn't turn out well? Sometimes it is difficult to take a pre-existing project and make it fit the needs of a new project.

Appendices

Included outside of this document are some of the reports that were generated during the semester.

Label	File Name	Description
1A	RW Pilot Report	Report on background research that was done before this IPRO
2A	Survey Results Summary	Summary of the survey results
3A	Privacy	Summary of the research that was done on privacy

Our bibliography is also included separately.