ResearchWeb

IPRO 321 – Spring 2010

Developing a Collaborative Online Student Research Forum

Final Report

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Table of Contents

Executive Summary

The purpose of IPRO321 was to develop an easy-to-use website focused on helping undergraduate students find, perform, and present research. This website is called ResearchWeb. The cornerstone of ResearchWeb is a database of available undergraduate research opportunities, and of labs performing such research, at Illinois Institute of Technology (IIT). A tutorials wiki for various tools used in research and a listing of research conferences of interest to undergraduates are also available.

Our major accomplishment for the semester is the creation of a fully functional website, accessible through myIIT. In order to have content on the site when it went live, we gathered information from a number of labs, finding available positions on campus, finding research conferences, and finding sources for various tutorials. We developed separate surveys for undergraduate students and faculty members. The number of responses we received was significant enough to draw conclusions from the analysis. In particular, over half of students and faculty surveyed were interested in a website like ResearchWeb.
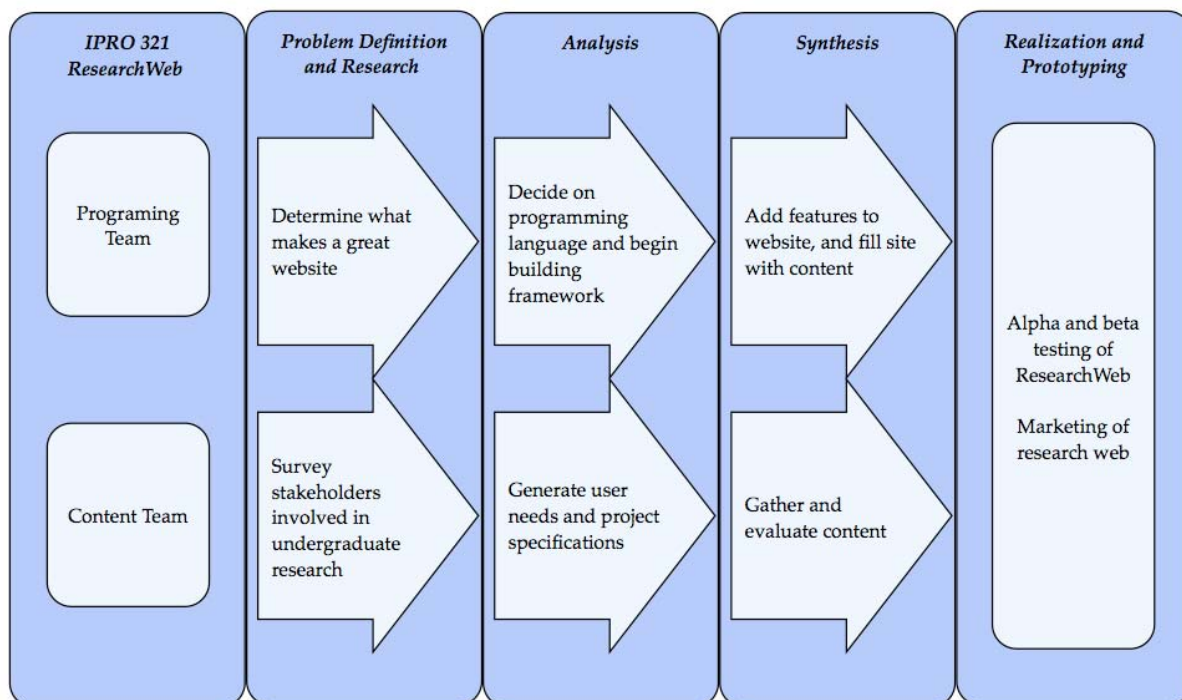
While the software development team created the code base, the content development team gathered information that was needed for the website. As a team, we made sure that the requirements that were previously determined were implemented correctly. While surveys were critical in finding direction, we used a Software Requirement Specification (SRS) to elicit consensus. The rapid development of a draft SRS gave us a firm, common direction for the website early

We recommend that ResearchWeb be publicized heavily within the IIT Community; Giving students and faculty members easy access to such a website will improve the quality, quantity and publicity of undergraduate research at IIT, by structuring and streamlining the process of finding research on campus. We also recommend that an administrative office, such as the Office of Undergraduate Research, continues to maintain the site after this semester ends. Finally, we recommend that an online IIT undergraduate research journal is created. The administration of such a journal could easily be integrated with the current ResearchWeb system, so that ResearchWeb is still a unified solution to undergraduate research at IIT.

Purpose and Objectives

Finding research as an undergraduate student at IIT is a complicated process. There is not any direct, reliable route to obtaining a position. Not only is it difficult to find positions, but once a student has found a position, there is often poorly documented specialized equipment that is integral to the student's research. Lastly, IIT has a limited infrastructure for presenting and publicizing research findings for undergraduates. ResearchWeb is our solution to these problems. We had the task of facilitating the performance of undergraduate research at IIT by creating a website that integrates and connects undergraduates with colleagues, faculty members and resources. Our approach to the task was three-sided, based on the three main stages of undergraduate research performance: looking for research opportunities, performing research, and

presenting findings. Tackling this project required a six-step process. To start, we identified the problems in each of the three stages of research. Second, we observed the performance of research in IIT. Third, we visualized potential features of ResearchWeb that would address these problems, and created a plan of attack. Fourth, we determined the most important features, allowing us to focus on correctly implementing these. Fifth, we implemented those features. Finally, we had an iterative test and development cycle, during which the content specifics were finalized. The last two steps can and should be iterated continually in the future. A diagram of this process can be seen below.

IPRO 321 ResearchWeb	Problem Definition and Research	Analysis	Synthesis	Realization and Prototyping
Programing Team	Determine what makes a great website	Decide on programming language and begin building framework	Add features to website, and fill site with content	Alpha and beta testing of ResearchWeb

Marketing of research web |
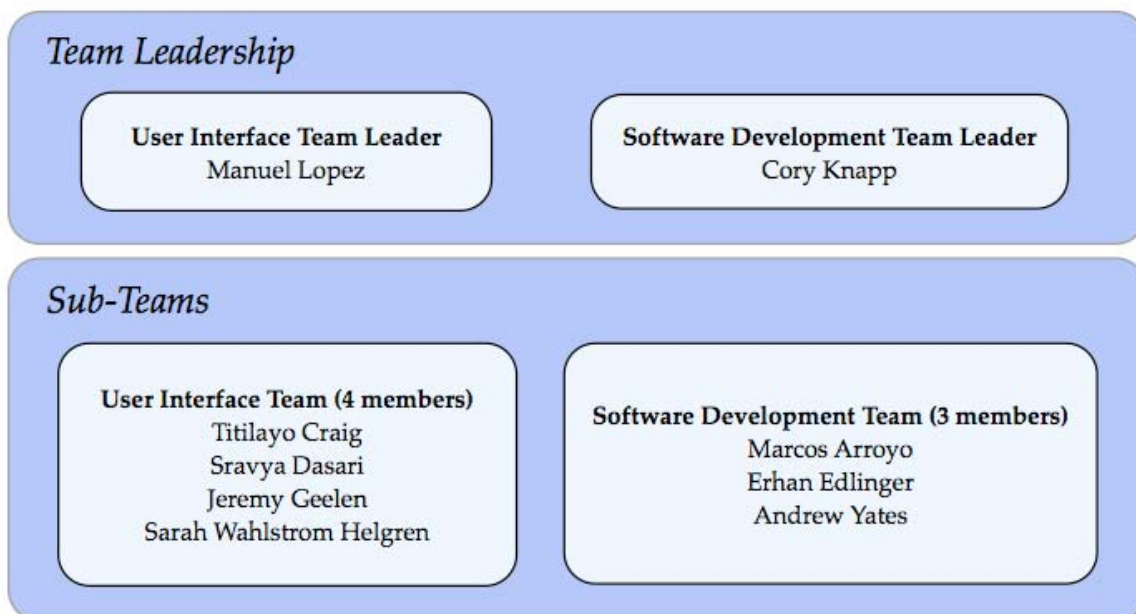| Content Team | Survey stakeholders involved in undergraduate research | Generate user needs and project specifications | Gather and evaluate content | |

Team Objectives:

- Guide undergraduate students in their first attempts to be part of a research team

- Increase communication of research opportunities to IIT students

- Ease the undergraduate research hiring process for professors

- Enhance collaboration between current undergraduate researchers with colleagues working in different projects or laboratories

- Streamline the peer-review process for undergraduate research papers so professors and students in a department related to the topic of a specific paper can easily and anonymously be involved in the peer-review process

- Disseminate information about upcoming research conferences and competitions

- Enhance communication between current undergraduate researchers and undergraduates not involved in research who are interested in specific research projects

- Facilitate the creation of undergraduate research journals

- Create a website that accomplishes the aforementioned objectives that is marketable to other research driven educational institutions

- Advertise this web-based tool to faculty members and students at IIT

These objectives led us to the development of a website that addresses issues with the current system. With such a website at IIT, the quality and quantity of undergraduate research at IIT will be increased, as administrative overhead will be reduced, and more students will be able to find research opportunities. Moreover, an active undergraduate research environment makes IIT a more attractive university for prospective students, drawing even more top quality students to IIT.

Organization and Approach

Our team was laid out in two sub-teams as you can see in the following diagram. The two team leaders worked in conjunction to determine the direction of the project, and to facilitate communication between the two sub-teams.

Team Leadership

User Interface Team Leader	Software Development Team Leader
Manuel Lopez	Cory Knapp

Sub-Teams

User Interface Team (4 members)	Software Development Team (3 members)
Titilayo Craig	Marcos Arroyo
Sravya Dasari	Erhan Edlinger
Jeremy Geelen	Andrew Yates
Sarah Wahlstrom Helgren	

To organize tasks, we used a Responsibility Assignment matrix (RAM chart). Each task was assigned at least one primary and a secondary; the primary was responsible for the work, and the secondary was responsible for cross-review. By keeping the RAM chart up-to-date, we were able to stay on task and make communication more fluid. We used a Gantt chart to determine an overall

timeline for the project. The tasks on the Gantt chart represented major milestones and on-going projects. While the RAM chart provided focus in the short-term, the Gantt chart provided long-term direction.

Since most of our documentation was internal and highly collaborative, we used Google Documents for most of our work. This allowed everyone access to the most recent information, and the most recent iteration of every document needed, thereby alleviating the difficulty of synchronizing separate worksheets for the same task. We could hold each other accountable for tasks, as we could see who had updated each document. Google Documents also gave the team a safe place to store documents; it was not possible for someone to lose an important document.

In order to determine which course of action would best achieve the objectives of the project, we developed surveys for undergraduate students and faculty members. The questions were chosen to gauge interest in and accessibility of finding, performing and presenting undergraduate research at IIT. The survey also had questions on what specific features students would want to see in a website. The faculty was broken down into three similar sections. Each section for the faculty survey involved how the research process would be facilitated for the students, or how it could be facilitated for them. We handed out paper surveys at the undergraduate research fair, and put an online copy of the surveys online at Survey Monkey.

All these tools helped organize plans for the semester. A marketing plan was develop and acted upon with the use of the RAM chart, the Gantt chart, and Google Documents. The plan consisted of:

- making flyers and placing them throughout IIT;

- sending out emails to various groups or organizations;

- publishing an article in TechNews;

- placing an article in IIT today;

In the very same way, we developed a content generation plan. We spent a great deal of time developing and carrying out this plan, in order to populate the website with real content. Using these planning tools effectively led to successful team organization and collaboration.

Analysis and Findings

Our team used the surveys we collected to determine the essential tools that both students and faculty will expect from ResearchWeb. An analysis of the survey results is in Appendix C. The results highlighted some important tools that should be implemented on ResearchWeb and also confirmed some of our initial hypothesis. It showed that a good number of IIT students and professors are interested in doing research but they lack the necessary resources. It also highlighted that faculty and students will use a website with the proposed functionality of ResearchWeb. Some of the tools they proposed to see implemented were tutorials, database of

ongoing conferences, database of available positions, current research laboratories and an undergraduate journal. This feedback helped us shape our focus for this semester and the future of IPRO 321.

Using this feedback our programming team went ahead and developed ResearchWeb. The website was written in Ruby language, using the Rails web development framework. Also, a backend MySQL database was used to keep track of users, positions and conferences. Our team chose to depart from the previous team's implementation, which was built on top of RedMine, a project management framework because it no longer met our objectives. We worked with Matthew Bauer to integrate ResearchWeb in the myIIT portal, thereby creating a secure way to ensure that users were IIT affiliates and streamlining registration.

While the programming team focused on software development the content team gathered content for the website, based on a content generation plan developed during the semester. The goal was to gather the necessary research positions and labs to populate the site, so that students will be able to use ResearchWeb as soon as it was launched. Our team first contacted Eric Brey, the director of the Office of Undergraduate Research (OUR) here at IIT. With his help, we were able to get a list of faculty who are or have been involved in undergraduate research.

Our team also met with key stakeholder Gerald Doyle, Vice Provost of Undergraduate Admission and Financial Aid. Through meetings with Mr. Doyle, we learned of the resources available to students who wish to perform research. Specifically, we learned that there was a significant amount of work-study money delegated to undergraduate research positions during the 2009-2010 academic year that went unused. Additionally, we learned that Mr. Doyle is willing to work with the Office of Undergraduate Research and the ResearchWeb team to create new research opportunities for students through travel grants and international student research funding.

Once the content team was done with the content generation plan, the marketing plan mentioned above was initiated. Our goal was to make ResearchWeb well-known and used by IPRO Day. Since one position was already filled 2 days before IPRO Day, we consider this a success.

Conclusions and Recommendations

By the end of the semester, we were able to make a fully functional website that implements the key features determined by survey. In particular, ResearchWeb contains a research position database, a lab profile database, a conference database, and a tutorial area for user-provided tutorials on software and equipment of interest to IIT student researchers. 5 labs on campus are already on ResearchWeb, and we have collected data to create more, pending approval. We collected a number of tutorials for students to browse through, as well as an extensive collection of research conferences. As of April 27, 2010, there are 5 lab profile pages, 8 research positions, and 27 conferences on ResearchWeb. The following statistics show the usage of ResearchWeb:

- Logins through myIIT: 339
- Unique logins through myIIT: 170
- Registered students: 155
- Registered professors: 19*
- Total page views: 5710**
- Students who entered profile information: 46
  * 5 professors were registered by us when their positions were added.
  ** Submitting a form counts twice, so this number is one to two times larger than the actual figure.

In order to maintain the content and codebase, the website must be passed on to an administrative office. The OUR is a good candidate for the future caretaker of ResearchWeb. In order for the OUR to accept ResearchWeb, it was determined that the website would need to accomplish the goals of the previous database, which can be found (As of April 29th, 2010) through the advising portal in the academics tab of myIIT. In addition, the OUR would need the resources to maintain ResearchWeb. We believe the database of research opportunities in ResearchWeb already meets the goals of the previous search engine. Discussions with the OUR and Vice Provost Jerry Doyle to determine the best approach to transferring control are still on-going; If this has not been resolved by the fall, it should be an immediate priority.

We recommend continued marketing and publicity to keep the research positions "fresh" and the content up to date. Since the content of the site is user-generated, students should be informed and encouraged to add content they find relevant. Without such active publicity, ResearchWeb will likely not reach critical mass, and will become useless. On the other hand, we believe the website will sustain itself with a large enough user base. We need something about ways of encouraging faculty.

Our final recommendation is for the creation of a peer-reviewed IIT undergraduate research journal. Ideally, such a journal would be implemented using the ResearchWeb system, since the infrastructure is already in place: the editorial board would have a role similar to that of a lab, and article submissions would work similar to position applications. While we have not had significant time to plan such a journal, we do have a few recommendations:

- Submission should be restricted to IIT undergraduate students. Ideally, submission happens through the ResearchWeb system.

- The editorial board should consist of undergraduates, with perhaps one or two faculty overseers.

- Undergraduate and graduate students should be involved in peer review.

Moreover, the Knapp Center and a few departments on campus have the equipment to create multimedia content. A multimedia journal would help IIT stand out as a research institute. If this path were taken, media-independent standards would need to be developed.

Appendix

Appendix A: Team Roster

Robert Ellis – Adviser

Team Member	Major	Contact email
Marcos Arroyo	Computer Engineering	marroyo1@iit.edu
Titilayo Craig	Applied Mathematics and Computer Science	tcraig@iit.edu
Sravya Dasari	Computer Science	sdasari2@iit.edu
Erhan Edlinger	Computer Science	eedlinge@iit.edu
Jeremy Geelen	Electrical Engineering	jgeelen@iit.edu
Cory Knapp	Applied Mathematics and Computer Science	cknapp2@iit.edu
Manuel Lopez	Aerospace Engineering	mlopez14@iit.edu
Sarah Wahlstrom Helgren	Biomedical Engineering	swahlstr@iit.edu
Andrew Yates	Computer Science	ayates@iit.edu

Appendix B: List of Key People Outside the IPRO 321 Team

Eric Brey (brey@iit.edu) is the Director of the Office of Undergraduate Research. He has been our primary contact outside of the IPRO 321 team. We have worked with him to ensure that ResearchWeb meets the needs of undergraduate research at IIT.

Gerald Doyle (doyle@iit.edu) is the Vice Provost of Undergraduate Admission and Financial Aid. He has helped us to find opportunities for research funding at IIT, and has helped us to find a way to continue to maintain ResearchWeb after the semester ends.

Matthew Bauer (matthew.bauer@iit.edu) is the Director of Undergraduate Student Advising. He has helped us to integrate ResearchWeb with myIIT
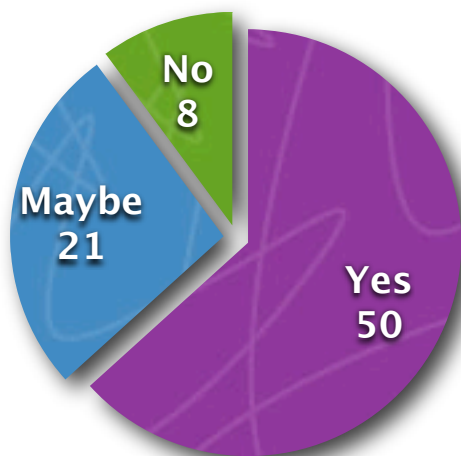
IPRO 321
Faculty and Student Survey Results
Prepared by Sarah Wahlstrom Helgren
April 7, 2010

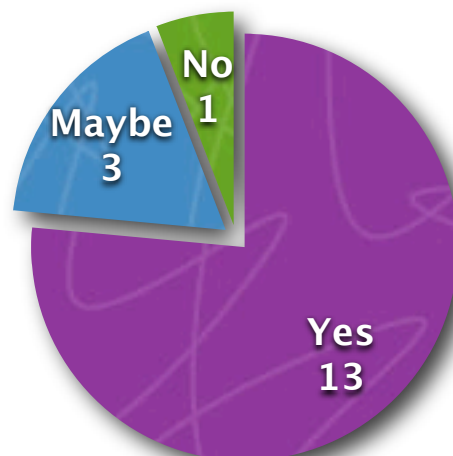# Interest in a Website for Undergraduates to View and Apply for Research Positions

Students

Faculty

No 1
Maybe 13
Yes 55

Maybe 9
Yes 8
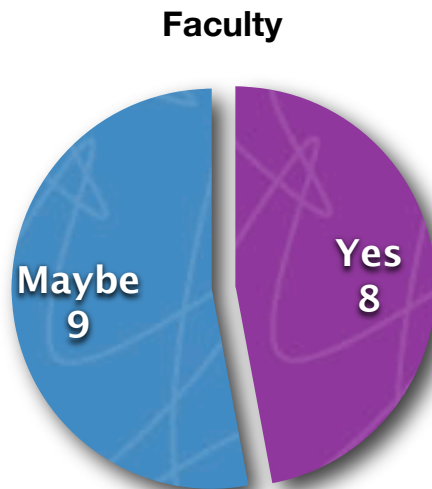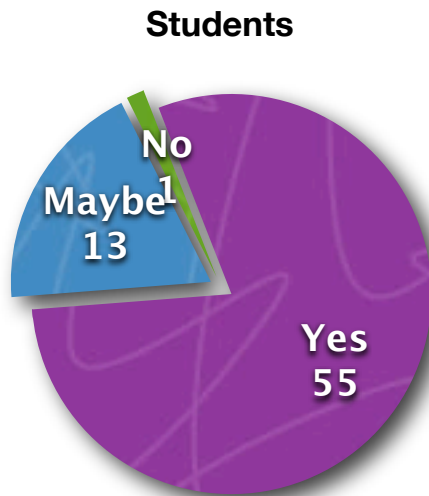
Interest in Undergraduate Research Positions

Student Interest in Having Positions

Faculty Willing to Establish Positions

No 8
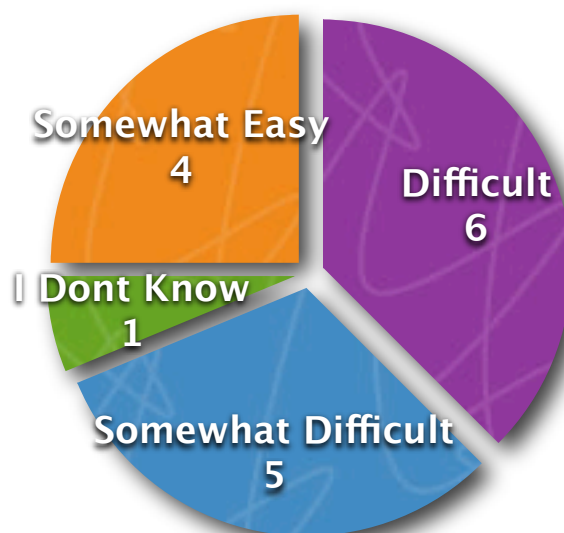Maybe 21
Yes 50

No 1
Maybe 3
Yes 13

Difficulty of Student-Faculty Connections

Student Difficulty of Obtaining Information About Research Opportunities

Somewhat Easy
15

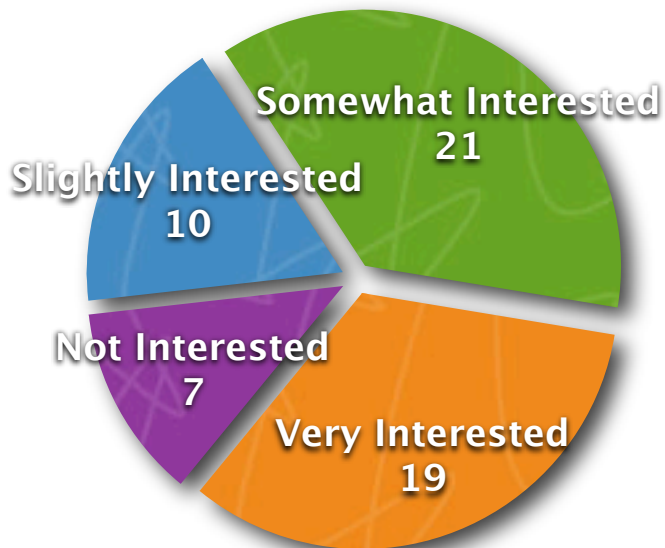Easy
2

I Dont Know
12

Difficult
15

Somewhat Difficult
27

Difficulty for Faculty to Get Undergraduate Students Involved with Research

Somewhat Easy
4

Difficult
6

I Dont Know
1

Somewhat Difficult
5

Student Interest in Research Tools

Blog/Wiki to Share Research Progress

Somewhat Interested
21

Slightly Interested
10

Not Interested
7

Very Interested
19

Tutorials

Somewhat Interested
19

Slightly Interested
9

Not Interested
3

Very Interested
27

Undergraduate Research Journal

Somewhat Interested
15

Slightly Interested
9

Not Interested
3

Very Interested
28

Research Forums

Somewhat Interested
24

Slightly Interested
9

Not Interested
8

Very Interested
16