Lab One: Descriptive Paper

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Abstract

A lack of undergraduate research participation has a direct link to low numbers of graduate admissions in universities. It is believed that many undergraduate students fail to participate in research because they are uninformed on the opportunities available to them or the inability to apply. ResearchLink aims to fix this issue by addressing the issues related to the communication, advertisement, and scheduling of undergraduate research opportunities.

Keywords: undergraduate research participation, research database, research opportunities
Lab One: Descriptive Paper

A major problem with academic research at universities today is the growing lack of undergraduate participation. When undergraduate students fail to participate in research opportunities, it can lead to students uninterested in continuing their education and ultimately a lack of students transitioning into advanced degree programs. This is primarily fueled by the lack of an efficient technique for undergraduate students to explore and participate in university sponsored research opportunities. Current solutions use inefficient and outdated methods of communication such as mass emails, word-of-mouth, and physical paper signs. While mass emails inform students about research opportunities, these email are often regarded as spam or simply forgotten. Word of mouth relies primarily on a professor to ask his or her own students to participate; this limits the scope of communication and a faculty member may only communicate with students who he or she thinks are interested instead of who is the most qualified. Using physical signs and advertisements is an outdated practice that is very inefficient at targeting a specific audience. Without a central location, there is also an inability to advertise to students and broadcast departmental successes.

Many universities and academic organizations would benefit from a product that would solve all of the problems outlined above. For example, Old Dominion University is interested and continuously looking for solutions to improve its ranking and enrollments. A variety of external agencies could benefit from such a product by modifying its listed opportunities. Corporations and businesses could post internships, scholarships, and training opportunities instead of research positions. This modified product would allow organizations to better recruit optimal candidates and train them.
Such a product would need to deliver and distribute opportunities according to the research coordinator’s specifications. Users interested in opportunities would need to be able to cater their own personal notifications to receive information relevant to them instead of receiving mass broadcasts that are irrelevant and unnecessary. For example, a computer science student would not need to receive notifications regarding potential phycology experiments and opportunities. Using notifications allows for personal reminders regarding opportunities and allows users to directly communicate with research coordinators and professors regarding opportunities. Lastly, this product would need a central location to provide an area for advertising research opportunities from all departments and locations and allow for the sharing of successes with both the public and prospective candidates.

**ResearchLink Product Description**

One such proposed product is ResearchLink. It solves all of the previously stated problems and effectively solves them by using solutions outlined above. ResearchLink removes the middleman in terms of advertising by creating a central hub of opportunities. It caters to both the research coordinator and potential candidates. ResearchLink is a live, up to date service which provides real-time information about research opportunities for both the public and the research community. ResearchLink is convenient and provides a centralized location for students and users interested in research. Furthermore, ResearchLink consolidates notifications, information, and communication into one product instead of relying on multiple systems. By default, this type of system promotes the growth of research opportunities and would eventually allow students to connect with research companies outside of their university.

Many of ResearchLink’s proposed implementations are a direct result of its goals and objectives as a product. ResearchLink’s main objective is to enhance research opportunity
exposure and promote undergraduate research. In doing so, universities like Old Dominion would be able to attract more undergraduate and graduate students. It will accomplish its main objective by providing up to date information constantly in real time so that students can never miss out on an opportunity. As previously stated, ResearchLink aims to promote communication between both faculty and students and to highlight the successes within each department as a result of successful communication. Finally, ResearchLink aims to create an organized and intuitive user experience so that students can effectively match, search, and apply for research opportunities.

**Key Product Features and Capabilities.**

ResearchLink will consist of three distinct account types with varying features and levels of control. These three types of users will consist of administrators, faculty and professors, and student accounts. Users can access ResearchLink on a variety of devices by using either ResearchLink’s web interface or mobile interface. By doing so, it allows students to apply and explore opportunities wherever an internet connection is present. ResearchLink’s features are directly tied to the type of account being used and will be presented in this manner.

The primary user or base account of ResearchLink is a student account. Students have the ability to create accounts and profiles. Students also have the opportunity to share information on their profile like completed courses and GPA as well as other research opportunities they have participated in. Students also have an area on their profile to share their interests and goals for research. Outside of account creation and modification, students can view departmental profiles and search for research opportunities where they can subsequently apply for them. Students also have the ability to view professor and faculty profiles.
The subsequent tier of users are professors, instructors, and faculty. Faculty members have access to every feature a student has such as profile creation and the sharing of personal information related to research. However, these users are allowed to create not just accounts but also departmental profiles. Faculty members can also edit departmental profiles that they have either created or have access to. Faculty members can perform advanced searches of student profiles based on student qualifications and merit. This allows professors to reach out to students who they believe are qualified enough for the research opportunity they are coordinating instead of waiting on candidates to apply.

Similar to other types of software and systems, administrators will focus on completing and maintaining the backend services of ResearchLink. These tasks include but are not limited to account creation, opportunity creation, and archiving old opportunities on ResearchLink’s main database. Administrators have full access to ResearchLink and can create any type of profile including other administrative accounts.

**Major Components.**

ResearchLink requires a physical server that has both a SQL database server, and a webserver for hosting ResearchLink’s multiple interfaces. In terms of software, ResearchLink makes use of the LAMP structure by utilizing Linux, Apache, MySQL, and PHP. Linux is required to run the physical server and function as the foundation for subsequent software. Apache is used to handle and create the backend web and mobile interface which users use to connect to ResearchLink. ResearchLink’s database uses a version of SQL known as MySQL to store information such as accounts, opportunities, and other information. Finally, PHP is used to display, pull, and push information between the user’s interface and ResearchLink’s database.
Identification of Case Study

There are some solutions that aim to alleviate the problems associated with undergraduate research participation. Many universities have developed their own database software to post information regarding research opportunities and information about research around the campus. Another mainstream solution which utilizes a live database is Pivot. Pivot functions very similarly to ResearchLink, however it is not as customizable and cannot be tailored to meet the demands of different universities and research organizations. This means that Pivot is not implemented by the majority of universities in the United States and abroad. This very fact further fuels the issue of unprepared graduate students and an overall lack of undergraduate participation in research.

Solutions other than ResearchLink implement many useful features, but lack in terms of communication, advertisement, and encompassing them into one package. Degraded communication as well as a lack of advertisement go hand in hand with the amount of candidates that apply for research opportunities. As a result, undergraduate research participation drops. This can ultimately lead to low admittance numbers into graduate programs or graduate students who are uninformed or unprepared for the research that is required of them. ResearchLink aims to fix this issue by making sure students are aware of opportunities that meet and fit their demands.

ResearchLink’s initial users will be universities followed by research organizations. Universities would be ResearchLink’s main customers and users since it’s primarily designed for such institutions. However, ResearchLink can easily be modified and altered to meet the needs of organizations such as National Aeronautics and Space Administration (NASA) and the National Science Foundation (NSF) for posting research and grant opportunities for external
candidates. One such University that would benefit from ResearchLink who will also serve as the primary case study is Old Dominion University’s Computer Science department.

**ResearchLink Product Prototype Description**

Old Dominion University’s Computer Science Department will make use of ResearchLink’s prototype. The initial prototype will function very similarly to the full-fledge product and both will share a common appearance. It will function on-site, remotely, and on a variety of devices. To simulate an actual university and prove ResearchLink’s effectiveness as a solution, mock student profiles and research opportunities will be created. Prototype faculty accounts will be able to create research opportunities and push notifications to mock students. Faculty accounts will also be able to search student accounts using advanced searches. Student accounts will be able to search and filter results for research opportunities as well as receive notifications of new opportunities and their approaching deadlines. To better asset user’s testing the prototype, helpful guides and tutorials will be provided. This will aid users in transitioning to the new system and avoid a future, underutilized system.

**Prototype Architecture.**

The prototype will run on a computer science department’s virtual server capable of hosting a website as well as a database. As previously stated, ResearchLink will utilize a LAMP structure and so will the prototype. Apache2 server will be version of apache used for website hosting. MySQL database will be utilized for storing information as well as simulating student and faculty information and news on a banner at the top of the interface. The prototype will also use PHP 3.0 and the Laravel framework 5.2 for developing the actual web and mobile interfaces. Composer will be used in conjunction with PHP to manage dependencies.
Prototype Features and Capabilities.

ResearchLink and its prototype will share many important features. Obviously, the prototype will have a limited number just to demonstrate functionality. The prototype will feature customizable alerts after a research opportunity has been created. These alerts will be linked to a calendar which faculty members can manipulate for both new and re-occurring opportunities. Finally, there will be a mock news feed which displays information about student and departmental successes regarding research. One important feature of the prototype is the ability to archive expired opportunities instead of deleting them.

Prototype Development Challenges.

ResearchLink’s prototype development isn’t expected to face any major development challenges. However, due to the limited of experience of the development team, some issues related to skill set deficiencies are to be expected. Most of the development team is familiar with HTML, CSS, and JavaScript. Only a few are familiar with PHP and the Laravel framework which will be used to construct the majority of the prototype’s interface. Certain aspects of web design will need to be learned while developing the prototype such as web application security, testing website interfaces, and actually deploying the website on to the web. Beyond skillsets, there may be difficulties with integrating ResearchLink with existing systems like ODU’s Banner and the My ODU portal.
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