Lab 1 – Research Link Description

Old Dominion University

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Lab 1 – ResearchLink Description

1. Introduction

Research is a fundamental component in the progress of mankind. Most of the academic institutes promote a research culture among students. Old Dominion University (ODU) is one of those institutes offering 54 master programs and 42 doctoral programs (University Facts & Figures, 2016). At ODU, undergraduate and graduate enrollments in 2016 are 81% and 19% respectively (University Facts & Figures, 2016). These facts show a gap between undergraduate and graduate enrollments. It is found by American Council of Learned Societies and referred by Council on Undergraduate Research that students are not engaged in undergraduate research due to lack of time and interest, or limited information about available opportunities (Vieyra, 2013).

Hence, students can be inspired towards research if they can receive information for research opportunities with frequent reminders. The ODU administration aims to improve the different issues including awareness of updated information regarding research activities, the creation of communication channels among all stakeholders, and promoting the available opportunities.

At ODU, current research traditions are not attracting a large number of research-oriented undergraduate candidates. Currently, ODU is using the conventional method to announce research opportunities. This method attracts a few undergraduate students. Currently, a research opportunity is posted on one or more notice boards. In today’s era of technology, such an obsolete method of announcements does not work; students usually are not aware of all opportunities. Outdated opportunities remain on the notice boards, which is another barrier for interested researchers in promoting such opportunities. Moreover, ODU lacks an electronically updated notification system to announce deadlines. An absence of such a system results in research not being publicly recognized for completion of research projects.
According to Council on Undergraduate Research, students who participated in research activities during their undergraduate studies were more inclined towards graduate programs (Vieyra, 2013). Hence, the promotion and systematic sustainability of research culture can increase the enrollment rates in graduate programs. Therefore, focus on improving the current system of information dissemination through electronic announcements of research opportunities, reminders for deadlines, and recognition of achievements is required.

The proposed solution, ResearchLink, would create a hub for students, faculty, and administration. This hub would decrease the communication gap among all related stakeholders. The proposed system would not only aim to facilitate the students in terms of research opportunities but also through announcements of available internships and scholarships. Thus, the students at undergraduate and graduate levels would have an opportunity to explore more in terms of their professional grooming and financial assistance. With more research opportunities, ODU would likely sustain a pool of talented students.

2. ResearchLink Product Description

ResearchLink, through a web portal, would be available for students, faculty, and administrators. Research opportunities, co-op, and internships positions would be posted directly on the ResearchLink portal. An upcoming event and auto-notifications system would update all stakeholders in a timely manner. Students, faculty, and administration would be able to align their profiles according to their capabilities and interests. ResearchLink would allow administrators and faculty members to highlight the individual and departmental achievements.

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2.1. Key Product Features and Capabilities

ResearchLink can be controlled by three major roles - faculty members, administrators, and students. Each role has different privileges while using the ResearchLink portal. It can also be used by the people not affiliated with ODU but they are restricted to creating profiles and searching opportunities. ODU students can login to their profiles on the ReserachLink portal with their Monarch Identification and Authorization System (MIDAS) IDs. They have the ability to create their own profiles while highlighting their interested research areas. Consequently, they can also apply for related research opportunities. They can be notified about current and upcoming opportunities along with the given deadlines.

Similarly, faculty will have a platform to announce the upcoming opportunities which may include the duration of research, budgeted amount, and the available number of participants. The faculty will also be able to view the archives of expired opportunities. They will use a filtered searching option which will help them to find students in terms of qualifications, GPA, and research interests. The faculty members and administrators will notify the students about the available opportunities. The faculty will also have the opportunity to announce achievements made by individuals or groups for the completed research projects.

The administrators would have the highest authoritative roles which include the development of individual profiles, modification of profiles, and deletion of profiles. Administrators would also have the privileges of all other roles. They would be capable of upgrading a student’s status to faculty status and vice versa. Authorized users can use the ODU ResearchLink through a web browser and mobile devices.

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2.2. Major Components (Hardware/Software)

ResearchLink will have two major hardware components - Microsoft SQL Database Server and Web Server. The developing software structure will consist of Linux, Apache, MySQL, and PHP (LAMP). ResearchLink will use MySQL to create and maintain the database for user’s information. Apache will be used as a web server because of its reliability, speed, and sound security. PHP, a server-side scripting language, will be implemented to incorporate the database information. The web server will process the PHP scripts and fetch the required data.

Major Functional Component Diagram (MFCD) in Figure 1 illustrates the structure of the software. The user’s accounts consist of students, faculty, and administration. They will be able to connect the ODU ResearchLink portal through their valid MIDAS IDs. The users will be connected to the MySQL database after processing their MIDAS authentication. Four algorithms will check the authenticity of the data - login, creating the profile, creating the research opportunity, and searching option according to a user’s requirement. These algorithms will not process invalid or duplicated data. Users will receive error messages if inaccurate entries are made. Two algorithms will be used to process the notification system. The option of “Send Notification” will notify the related users after comparing the deadline date with the current date. The option of “Add Notifications” through another algorithm, will add a record in the notification table after notifying the users. Faculty and administration will be able to get required reports through MySQL database queries.

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3. Identification of Case Study

Due to the conventional communication system at ODU, the information about different opportunities reaches a limited audience. ODU is currently offering many graduate and doctoral programs which can attract a large number of undergraduate students. The ODU ResearchLink is proposed only for the ODU Computer Science Department; however, its scope can be extended in the future to facilitate other departments and research organizations.
4. ResearchLink Product Prototype Description

The ODU ResearchLink prototype has limited functions as compared to real world product. The prototype allows the users to evaluate and test the product before its formal launch. There can be additional requirements identified by the users during prototyping. The ODU ResearchLink is a new system; hence, it may be underutilized initially. During the development process, the deficiencies in the ResearchLink prototype can be identified. The scalability of the system in terms of network traffic can also be tested through dummy data. Moreover, multiple users can simulate the research portal to test the integrity of the system. The real-time users of the system (student, faculty, and administrators) can login onsite or remotely.

4.1. Prototype Architecture (Hardware/Software)

ResearchLink will utilize different software, hardware, and algorithms in order to process different types of data. The ResearchLink prototype will use two algorithms for notifications; MySQL database for storing and processing the data, and the user interface for the user’s interaction with the system. In prototype architecture structure, ResearchLink will use the ODU Computer Science virtual machine for hosting.

Figure 2 illustrates the prototype’s major functional components. In the prototype, the devices will be connected with a virtual PHP server. MySQL database queries will process data through PHP virtual machine. The database will process all queries and data to the user. The file server is used for central storage and management of data files.

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4.2. Prototype Features and Capabilities

The prototype objective is to demonstrate a research hub among all stakeholders of the ODU ResearchLink. The key function of this web portal is to send customizable alerts to all users for new opportunities. Public recognition of the successful students and departments would be a key factor to attract, engage, and support more students. The proposed system would also be capable of making an archive of the expired opportunities. Users would receive calendar-based reminders for upcoming opportunities. The users would also be able to test all features with the dummy data. Table 1 shows the comparison between prototype and real world product.
Table 1

*Real World Product and Prototype Comparison*

<table>
<thead>
<tr>
<th>Features</th>
<th>Real World Product</th>
<th>Prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Users</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Devices Connection</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>ResearchLink Portal</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MySQL Database</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Web Server</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Virtual Machine</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>User Authenticity</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MIDAS ID Credentials</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Email Notification</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1. Real world product and prototype comparison

4.3. **Prototype Development Challenges**

There are certain challenges and risks associated with the development of ODU ResearchLink portal prototype. The deployment of Banner and My ODU with ResearchLink has technological and security issues because ODU Banner database provides controlled access to financial, student and personnel data. The team has followed best practices for information security. The team has limited knowledge of HTML, CSS, JavaScript, PHP and Laravel Framework. In order to address this challenge, the team has developed prototype milestones for each member. Testing will be performed properly before any new technology is deployed.
Glossary

**Apache2 server**: Web server software.

**Banner**: Old Dominion University’s Administration System that provides controlled access to financial, student and personnel data. This system is only available to faculty and staff.

**CSS**: Cascading Style Sheets is a style sheet language used for describing the presentation of a document written in a markup language.

**GPA**: Grade Point Average.

**HTML**: Hyper Text Markup Language is the standard language for creating web pages and applications.

**JavaScript**: A script language for programming on the web.

**LAMP**: A combination of Linux Apache MySQL PHP.

**Laravel framework**: A powerful MVC PHP framework, designed for developers who need a simple and elegant toolkit to create full-featured web applications.

**LINUX**: An open source version of UNIX operating system.

**MFCD**: Major Functional Component Diagram.

**MIDAS**: Monarch Identification and Authorization System.

**MySQL**: Open-source relational database management system.

**NASA**: National Aeronautics and Space Administration; Offers Undergraduate Research fellowships and internships.

**NSF**: National Science Foundation (NSF); Offers funded research opportunities through Research Experiences for Undergraduates (REU).

**ODU**: Old Dominion University.

**PHP**: Server scripting language for making dynamic and interactive web pages.
References


Vieyra, M., Carlson, A., Leaver, E., & Timmerman, B. Undergraduate Research: I Am Not Sure What It Is, But I Don’t Have Time to Do It Anyway. Council on Undergraduate Research Quarterly, (Spring 2013, Volume 33, Number 3).