Lab 2 – ResearchLink Prototype Specification

Old Dominion University

CS411

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Version 2
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1. Introduction

Old Dominion University (ODU) is 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 may 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. ODU is using the conventional method to announce research opportunities. This method attracts a few undergraduate students. 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 Outdated opportunities remain on the notice boards, which is another barrier for interested researchers in promoting such opportunities.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.

According to the Council on Undergraduate Research, students who participated in research activities during their undergraduate studies were more inclined towards graduate
programs (Vieyra, 2013). The promotion and systematic sustainability of a 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 communication 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.

1.1 Purpose

ResearchLink, a research opportunity portal, will be developed for the ODU Computer Science department to announce research opportunities available to undergraduate students. ResearchLink will highlight the student or departmental success stories not only to the ODU community but also on public platforms. These success stories will attract new undergraduate students and encourage them to enroll in graduate programs.

ResearchLink will send new research opportunity notifications to the users. ResearchLink will be capable of archiving an expired research opportunity. The students and faculty will be able to post their research opportunity experiences. Students will be able to search a research opportunity according to their personal interests. Faculty will be notified about the student research interests, and they will have the option to connect with a specific student after analysis of students’ profile. ResearchLink will provide bidirectional communication
between students and faculty. ResearchLink will provide searching and filtering feature for all research opportunities.

ResearchLink cannot create a research opportunity. An authorized user has to create a research opportunity profile. All stakeholders have to make their own profiles. The users need to apply for their interested research opportunity through the web portal. The ResearchLink prototype cannot interface with the ODU Banner database.

1.2 Scope

ResearchLink will be able to post the research related news on the ResearchLink product launch page with a last in, and first out, looping structure. ResearchLink will be a convenient and an intuitive research portal for all users to interact with each other under one umbrella according to their research interests. Moreover, undergraduate students will be able to connect with research organizations via ResearchLink portal. It will also promote internships and co-op opportunities which will be helpful for both students and companies.

ResearchLink will provide up-to-date information for most recent research successes and opportunities as well. These research success stories on the research portal will increase a research culture among students and enhance enrollments. Moreover, ResearchLink will help undergraduate students with an easy transition into the world of graduate academia.

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1.3 Definitions, Acronyms, and Abbreviations

**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.

**Bootstrap**: HTML, CSS and JS framework for developing a responsive web-based project.

**Browser**: A web browser is a software application for retrieving, presenting, and traversing information resources on the World Wide Web.

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

**Date Object**: An object that enables basic storage and retrieval of dates and times.

**Engine**: In computer programming, an engine is a program that performs a core or essential function for other programs.

**GPA**: Grade Point Average.

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

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

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

**Laravel**: A powerful model-view-controller (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.

**OECD:** Organization for Economic Cooperation and Development.

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

**Virtual Machine (VM):** In computing, a virtual machine (VM) is an emulation of a computer system.

**W3C (W3C):** The World Wide Web Consortium.

**Web Application:** In computing, a web application or web app is a client–server software application in which the client (or user interface) runs in a web browser.

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1.4 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).

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1.5 Overview

The product prototype specification gives a general description of ResearchLink. It illustrates the overall structure, features, logical components, and the logical interrelationships of the different units of the research portal. The ResearchLink prototype features are used to create, control, and manage the research portal in terms of output, displays, and user interaction. The structure of the prototype defines the hardware and software configurations.

2 General Description

The ResearchLink prototype provides all basic functions for the web portal. All users can create and update their profiles. The essential functions of the research portal are opportunity creation, newsfeed, and filtered results of the students and opportunities. For the prototype demonstration, dummy records are populated in the ResearchLink.

2.1 Prototype Architecture Description

The ResearchLink prototype is comprised of a web interface, a notification system, and MySQL database. ResearchLink can be accessed by the web only. The web interface provides user account creation for administrators, faculty members, and students. Users can edit their profiles according to their research interests. Faculty and administrators can fill out the research opportunity form and can post on the ResearchLink's website. The newsfeed can be found on landing page and homepage of the ResearchLink website. Users can search current and expired opportunities. Faculty can search student profiles. A notification system can send web and email messages to users about all opening and closing opportunities. Faculty can also see a notification message when a student shows interest in a research opportunity. Figure 1 illustrates prototype major functional components diagram (MFCD).
2.2 Prototype Functional Description

The ResearchLink website has a user interface. A user can navigate to different web pages after accessing the ResearchLink website. The ResearchLink sitemap is illustrated the different web pages in figure 2.

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ResearchLink accepts only authenticated users who are permitted to edit profile information saved in the ResearchLink database. Any user has to register before accessing the ResearchLink database. An email with ODU domain name is accepted by authentication. Figure 3 represents the user register page.
After registration, the users can login to their accounts. Users can create or edit their profiles and search or create research opportunities. Figure 4 illustrates the login page.
A research opportunity is stored in the ResearchLink database. Users can find an opportunity by using keywords according to their desired searches. Faculty can search for a student who has a profile on the research portal. The calendar-based feature is capable of removing an active opportunity and marking as an expired opportunity. Figure 5 represents the create opportunity web page.
Figure 5. Create opportunity page diagram

The ResearchLink website notification system will send notifications about research opportunity creation, a user's account status changes, and successful research stories. Users will be able to mark the read messages and delete a message notification. The ResearchLink email notifications system will have the same features as a website notification system with the exception of the turnoff email notification capability on the user side.

ResearchLink will use public and internal newsfeed features to promote research culture among students. A calendar-based feature will use a looping structure by archiving the newsfeeds after 60 days. ResearchLink database will provide security, efficiency, and flexibility required for maintaining the data.

Testing is necessary in order to ensure the delivery of the high-quality product which requires lower maintenance cost and hence result into more accurate, consistent and reliable information. The ResearchLink database has been populated with dummy records for testing purposes. Three types of user's data have been inserted in the database - administrators, faculty members, and students.
The research portal information can be accessed, managed, and updated by a MySQL relational database. The database provides efficient retrieval of data. There are 16 tables used to create the database. Figure 6 represents the database schema.

Figure 6. ResearchLink database schema
The data of the ResearchLink portal will be changed frequently. Therefore, good logics and well-defined algorithms will be the key factors for a successful launch of the product. Four algorithms will check the authenticity of the data - login, creating the profile, creating the research opportunity, and sorting the opportunity according to a user’s requirement. These algorithms will not process invalid or duplicate 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.

The login algorithm will check the authentication of the user. If a user does not exist in the database, or an incorrect password is used, an error message will pop-up on the user’s screen. After all valid authentication, the user will be login to the home page. Figure 7 represents the login algorithm.

![Figure 7. Login algorithm]
Users will be able to make a profile according to their interests. A user’s profile will be associated with the ODU email address. Each user’s profile will be added to the ResearchLink database. Figure 8 represents a profile creation algorithm.

![Profile creation algorithm diagram]

Figure 8: Create profile algorithm

A research opportunity will be unique and created by a faculty member. ResearchLink will not allow the duplication of the research opportunities. Figure 9 represents the opportunity creation algorithm.
ResearchLink has the ability to search student profiles and research opportunities. Both students and faculty members can search current and expired research opportunities. Users can search a research opportunity by keywords. Users can also filter and sort the research opportunity. The SQL query pulls the results from the database after a valid input and displays them on the web interface. Figure 10 illustrates the search algorithm.
Figure 10. Search algorithm