Audio Reading Service Listener Web and Mobile Interface

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1. Introduction and Background

The purpose of this senior capstone project is to create a Web application for the Department of Audio Reading Service at the Allen County Public Library (ACPL) at Fort Wayne, Indiana. The Web application is designed to be used by ACPL to collect the information of users who have a visual or reading impairment, including any individual who is unable to read conventional printed material because of blindness, low-vision, a literacy issue, or a physical impairment that makes it difficult to hold a book or turn pages such as stroke, Parkinson's or arthritis. The project needs to provide an easy-to-access interface for users to input their data such as demographics, access to service, service type, and customer satisfaction. Moreover, the project should deliver Web functionalities that allow ACPL to retrieve, store, and analyze users' data (e.g., users' profile and other survey data) through Web browsers and mobile devices. Our designed Web application will help ACPL better serve users with disabilities.

Currently, ACPL sends or receives the application form of the audio reading service through mail. After receiving the application forms, ACPL records the users' information on an excel file. Since there are hundreds of users, the retrieving and the maintaining of such a spreadsheet are very time consuming and error prone. In this project, we propose to use Web application to make the process more effectively and efficiently. That is, users of the audio reading service can fill out the application online through our designed Web site; and ACPL administrators can log into the system to retrieve and manage users' profile, and assign audio radios. Through our designed system, both users and ACPL administrators can save time and communicate more efficiently.

2. System Architecture

The system architecture of our design Web application is illustrated in Figure 1. A user or an organization can apply for the audio service by filling out an online form. Once the form is submitted, the data are stored in the database. An administrator at ACPL can login to the system through Web interface and manage the system. The functionalities for the administrator interface include searching, reading, creating, and updating users' and radios' profile, as well as assigning radio(s) to a user or an organization.

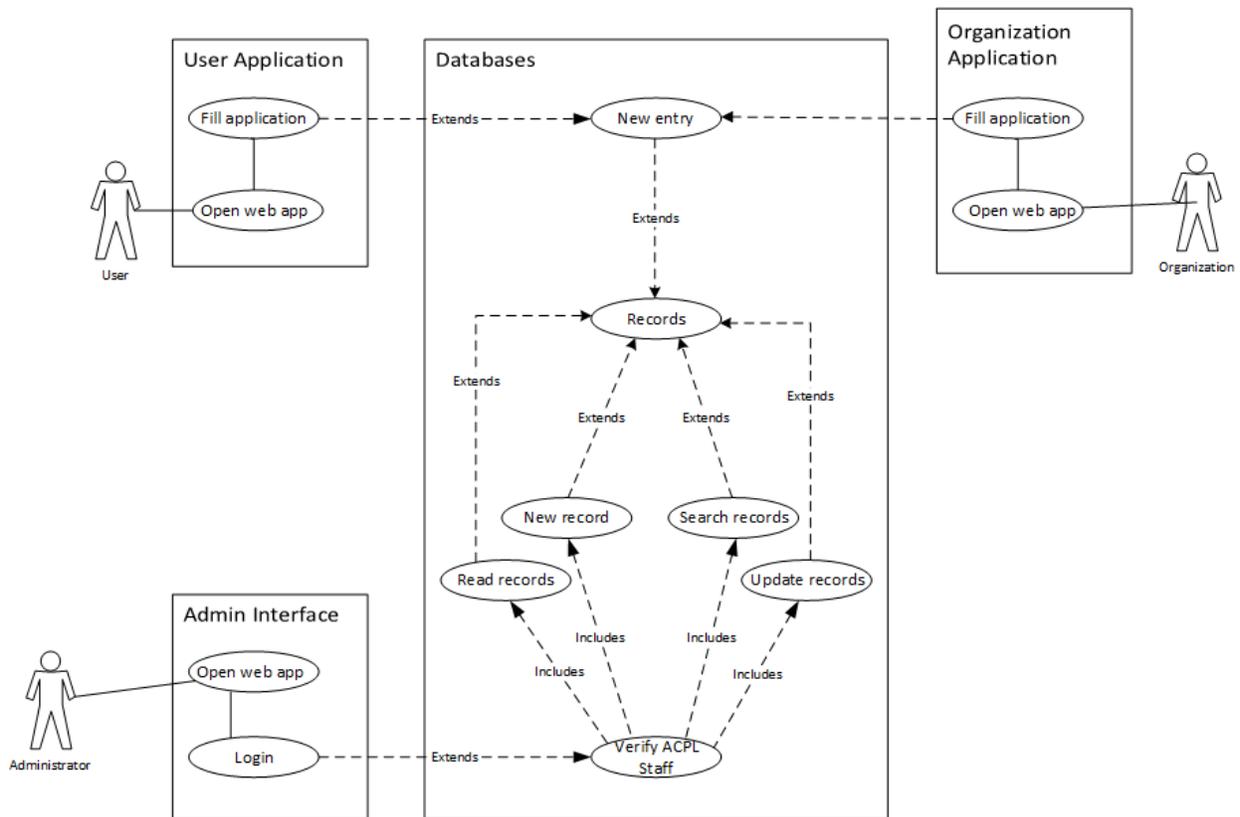The main challenges to implement such an architecture lie in two aspects:

Figure 1. System Structure of Our Web Application

(1) Ease of use. The information for both user's interface and admin's interface must be displayed in a user friendly manner. Especially, the user's interface should be accessible to people with visual or reading impairment. Moreover, the functionalities must be beneficial and practical for the ACPL.
(2) Eliminating errors. This project will not be continued by other students in the future. Therefore, the software system must be as bug-free as possible.

To overcome these challenges, we apply industry standards in our Web application.

3. Standards Applied

We apply two industry standards in our implementation: the Americans with disabilities act (ADA) compliance and ISO/IEC/IEEE 23026 standards. In the following, we explain in detail how we applied these two standards.

3.1. The Americans with Disabilities Act (ADA) compliance standards

Referring to [1] and [2], we design Web pages in a way so that they are accessible to people with visual or reading impairment. For example, we use titles, context, and other heading structures to help users navigate complex elements and pages. Moreover, we use white color as the

background color and black or blue color as the font color for online application forms, so that it is easier to be assessed by low-vision people, as shown in the following figure.

Figure 2. Online Application Form

3.2. ISO/IEC/IEEE 23026 standard

Referring to [3], we followed the requirements and guidance in ISO/IEC/IEEE 23026 standard on the life cycle of Web sites, in order to improve the usability and the maintainability of Web sites.

3.2.1. MVC Framework (Section 6.1)

According to the ISO/IEC/IEEE 23026 Standard, it indicates "Separation of content and presentation management is a primary design principle." To separate the view, model, and control, we applied Zend framework [4]. Our implementation code can be found online in GitHub (see [5]). Figure 3 shows the directory structure of source code for "application" part. It is clear that "models", "views", and "controllers" are separated.

admin	Imported correct user data.
configs	Connection to audioreadingservice database
controllers	Fixed issue with applications being unaccepted due to controller acti…
email	Update sendEmail.php
forms	Update OrganizationForm.php
layouts/scripts	Update layout
login	Update redirect
models	Update
views/scripts	Fixed issue with applications being unaccepted due to controller acti…
Bootstrap.php	Merge remote-tracking branch 'origin/master'

Figure 3. Directory Structure of Source Code for "Application" Part

3.2.2. Website Lifecycle Management (Section 6.3)

According to Section 6.3 (developing a strategy for website lifecycle management) in the ISO/IEC/IEEE 23026 Standard, we used the Scrum method in our project management. Specifically, we use a month as a Sprint. In each Sprint, we select user stories, design the system, implement the features, and test them. At the end of the Sprint, we meet with ACPL representatives, and show them what we built in this Sprint and get the feedback from them. Since we meet ACPL often, we can know whether what we are building is what ACPL wants and can change our design before we spend too much time on the wrong implementation. Moreover, we used an online software project management system, Pivotal Tracker [6], to help us track the progress of the project. Figure 4 shows a screenshot of the system.
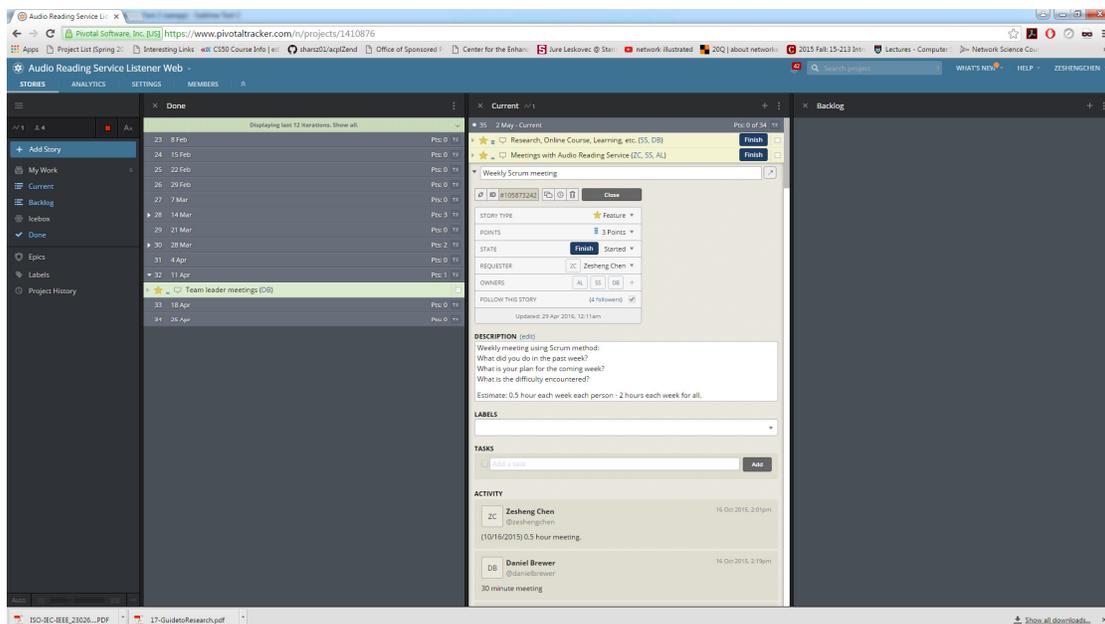

Figure 4. Screenshot of the Pivotal Tracker System

3.2.3. Implementation (Section 7)

According to Section 7 (designing websites for system, software, and services documentation) in the ISO/IEC/IEEE 23026 Standard, we structured pages through navigation tabs. For example, Figure 5 shows the structure of the admin interface. The navigation tabs are shown for each page in the admin interface.
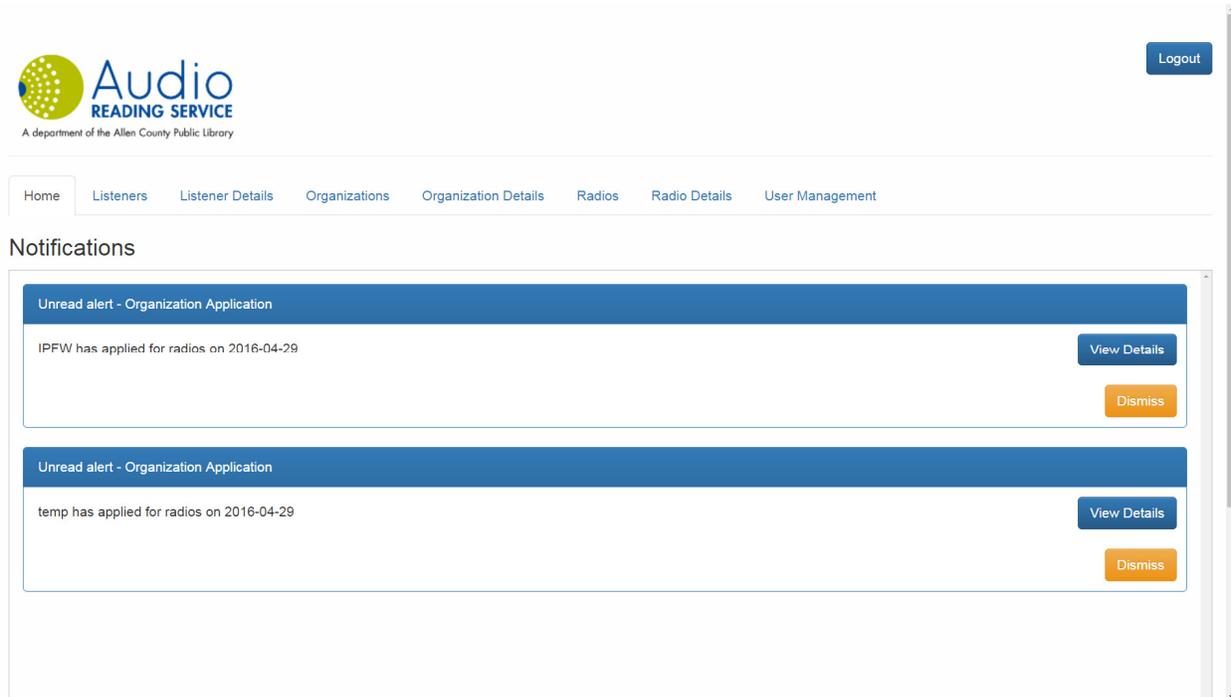

Figure 5. The Structure of Admin Interface.

Moreover, we used cookies to provide the function to allow the browser to remember admin's login username and password. Figure 6 shows the login page with the option on keeping admin logged in by applying cookie.
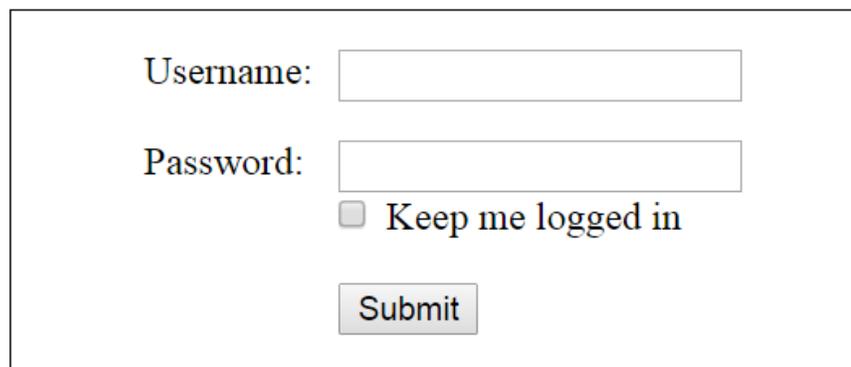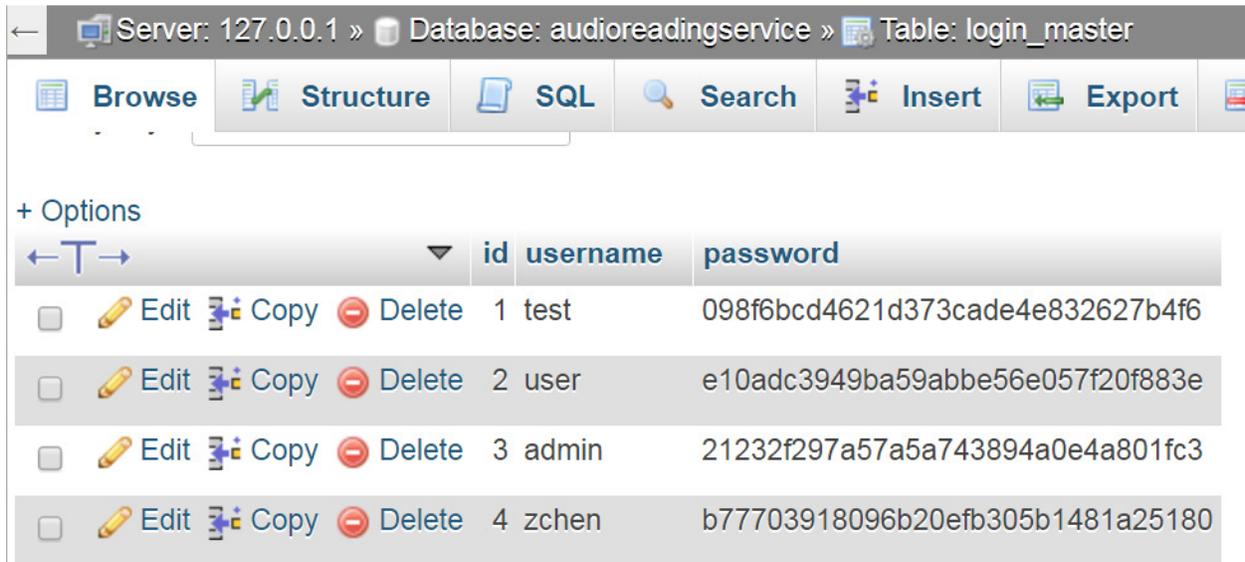

Figure 6. The Use of Cookie for Admin Login.

3.2.4. Security (Section 7.6)

According to Section 7.6 (authentication) in the ISO/IEC/IEEE 23026 Standard, security is an importance consideration for Web design. In our application, we attempted to secure users' password by applying the MD5 encryption algorithm. Figure 7 shows a screenshot of login_master table in the MySQL database. It can be seen that since the password is encrypted, even if an attacker can break into the database system, he/she cannot obtain the original password.

Figure 7. Secure Users' Password in Database.

4. Testing

We have implemented the system and moved the code to the actual server at ACPL (see [7]). The ACPL administrators are testing our implementations right now. Once they find a bug, we will fixing it right away. Moreover, ACPL plans to invite real users (especially people with visual or reading impairment) to access the Web site to get the feedback on the usability of the Web application.

5. Summary

In conclusion, in this senior capstone project we have implemented an Audio Reading Service Listener Web application that complies with the ADA compliance and ISO/IEC/IEEE 23026 standards. We found that these standards are very helpful in guiding us to build a Web product that is easy to use and to deliver what the users want.

References

1. The Americans with Disabilities Act (ADA) compliance standards [Online]. Available: http://www.ada.gov/ (May/2016 accessed).

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4. Zend Framework [Online]. Available: http://framework.zend.com/ (May/2016 accessed).

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7. Audio Reading Service at the Allen County Public Library (ACPL) at Fort Wayne, Indiana [Online]. Available: https://arsdatabase.acpl.lib.in.us/RadiosApp/public/index.php/Index (May/2016 accessed).