Improvement on Usability of a Student Registration System using Accessible Rich Internet Applications (ARIA)

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# ABSTRACT

Upon the emergence of new technologies, user experience has been one of the priorities when developing websites. However, not everyone can benefit from the available features of a website due to certain disabilities such as blindness and the inability to use a mouse. With the use of WAI-ARIA or simply ARIA, advanced web applications can now be highly accessible and usable to users especially those with disabilities. The principal objective of this study is to add keyboard shortcuts using Accessible Rich Internet Applications (ARIA) to web pages that can enhance user experience of those who cannot use the mouse to navigate through the system. The respondents’ data will be analyzed with the use of System Usability Scale (SUS) [1] to measure the system’s overall usability attribute. The said scale is composed of ten statements which will be either agreed upon or not by the respondents by rating each from 1 to 5; 1 being the lowest and 5 being the highest.

# INTRODUCTION

As technology advances, new websites also emerge that offer functionalities which require more interaction with the users and one of those is a registration system for schools and universities. In designing interactive websites, the feedback on the site’s usability from the user is one of the criteria to be considered [2]. Usability measures the user experience associated with the whole experience of the user using the system. On a deeper context, ease of navigation is just one of the subcomponents of overall usability attribute of a website. In a registration system, in this case or in any system, it is important that various users can navigate through it without having a hard time.

However, there are users that require assistive technologies to collaborate with the ever-growing web who are, nowadays, being compromised. In fact, there are users who cannot use the mouse for certain reasons who are having difficulties interacting with websites. These websites or web applications should be easy-to-learn, efficiently and effectively supports users’ tasks, and is satisfying and engaging to use [3] for it to accommodate these kinds of users. Some websites are adjusting to the problem by minimizing textual contents and use graphical illustrations instead; changing menu bar orientations to visually ease the users’ web experience. However, overall usability does not only include visual experience.

Accessible Rich Internet Applications (ARIA), a specification provided by the Web Accessibility Initiative (WAI) to improve the accessibility of web applications for different kinds of users [4], can be incorporated with websites to ease the navigation for it to become more user-friendly to special kinds of users. Furthermore, it can add to the supply of knowledge regarding the organization of a registration system of other schools and its own departments, especially to the Institute of Computer Science under the College of Arts and Sciences in University of the Philippines Los Baños which served as the *keeper* of SystemOne for the past years. It could also open rooms for improvement of other registration systems that will be used by the university.

# Related work

According to Nielsen (2004), problems with website usability come from complex and text-heavy information, difficulty in search functionality and navigation, up to different user preferences of font size and color. Website usability along with user experience may vary across cultures because of their own meanings to objects (Smith & Yetim, 2004, Frandsen-Thorlacius, Hornbæck, Hertzum, & Clemmensen, 2009, Yeo, 1998). Users prefer websites which has “cultural markers” from their own culture which will eventually increase website usability (Sun, 2009). This was supported by a study of Marcus in 2009 which used cultural markers to examine three website elements – language, color, and pattern/image. The study concluded that those websites with cultural markers are much preferred by its target users (as cited in Nawaz & Clemmensen 2013) [5]. With this set of information, website usability can be considered subjective to the preferences and tradition and culture of its users.

Deliva [6] focused her study on applying and assessing usability by conducting a survey which evaluate the ease of navigation, user-friendliness, and search functionality of Open Journal Systems. Open Journal Systems, an open-source journal management and publishing system, was used by different disciplines in Deliva’s study. Some of the issues presented were the confusion on navigation menus and having many white spaces on the site. On the other hand, respondents commended the system’s feature that lets the users to change the font size of the text. The findings are seen as the type of usability improvement that mainly concerns the content management of the system which is, however, different from the focus of this study.

On a study by Buzzi and Leporini [7], Accessible Rich Internet Applications (ARIA) was used to improve the usability of Wikipedia for the blind. The new Wikipedia is now simpler to use with the help of a screen reader because ARIA provided page overview, rapid navigation, and total user control of the interface. The study was later on further collaborated with two more authors [8].

Kanahori [9] used ARIA-supported live-regions to control a speech engine. He developed *Finger Skitter,* a Javascipt-based software that helps visually impaired people to get information from the web with voice navigation. ARIA was also included in a study by Abou-Zahra, Brewer, and Henry [10] that evaluated the impact on this kind of web accessibility tools as the web continues to grow and presented further research opportunities to make the web universally usable to every kind of users.

In spite of the availability of several researches and studies on ARIA and improving usability, the presented review shows insufficient information on usability improvement of student registration systems using Accessible Rich Internet Applications (ARIA). As this gap arises, this study aims to provide supplementary knowledge on the said topic.

# METHODOLOGY

1. Development Environment

The technologies that will be used in developing the web portal are the following:

* MongoDB - is a free and open-source cross-platform document-oriented NoSQLdatabase.
* Express.js - is a Node.js web application server framework, designed for building single-page, multi-page, and hybrid web applications.
* Node.js - is an open-source, cross-platform runtime environment for developing server-side web applications.
* React.js - is the "View" in the application, a fast one and provides different ways to organize your templates and gets you think in components.

1. User Types

* Administrator/s: users who belongs to the registration team. The administrator will be assigned to manipulate the data in the system.
* Bona fide students: users who will be allowed to use the registration system with its functions like change of matriculation that enables add/swap/cancel a course.

1. System Design and Specifications

The following modules will be offered by the registration system. Each of the said modules will be accessed depending on the type of user.

**Login Page**

This module enables the use the registration system.

* Login: The administrator/student will should have a valid email account to be able to proceed.
* Logout. *Shortcut: CTRL + Alt + O*

**Home Page**

Any kind of post such as updates on incoming registration, as well as announcements will be managed by this module.

* Add/Delete/Edit/View: The administrator will be allowed to add, delete, edit or view post/s. Students will only be allowed to view the post/s.*Shortcut: CTRL + Alt + H*

**Change of Matriculation Page**

This module handles all the manipulation the student wants with his/her schedule for the incoming semester.*Shortcut: CTRL + Alt + M*

* Enlist/Waitlist/Cancel/Swap: The student will be allowed to enlist/waitlist/cancel/swap for a course.

*Shortcuts: CTRL + Alt + E for Enlist/Waitlist*

*CTRL + Alt + C for Cancel*

*CTRL + Alt + S for Swap*

* Finalize: The student will be allowed to finalize the schedule if he/she is already satisfied with the changes. *Shortcut: CTRL + Alt + F*
* Download Schedule: The student will be allowed to download the schedule as an image file with .png as extension.*Shortcut: CTRL + Alt + D*

**View Student Checklist**

This modules handles all the manipulation the administration wants with the student’s schedule for the incoming semester.*Shortcut: CTRL + Alt + V*

* Search Student: The administration will be search a student given his/her student number to be able to view his/her checklist.*Shortcut: CTRL + Alt + A*
* Add Recommended Courses: The administration will be allowed to add recommended courses given the student number.*Shortcut: CTRL + Alt + R*
* Add Total Units: The administration will be allowed to add units given the student number.

*Shortcut: CTRL + Alt + U*

1. System Testing and Debugging
2. The system will be checked if it meets the design and specifications in every module.
3. The system will be tested to determine if it works properly and correctly on all possible inputs and constraints.
4. The error/s found in the system will be debugged.

# EVALUATION

Upon the completion of the registration system, *Accessible Rich Internet Application (ARIA)* will be integrated to the system for navigation. The system will be deployed to a total of 56 UPLB students with one male and female student per each year level (Old freshman, Sophomore, Junior, and Senior) from the 7 different colleges (CA, CAS, CEM, CDC, CEAT, CFNR, and CVM). The survey will be conducted to evaluate the usability of the created registration system. The survey will evaluate the ease of navigation, user-friendliness, and completeness of the registration features.

The respondents’ experience using the system will be analyzed with the use of System Usability Scale (SUS) [1] to measure the system’s overall usability attribute. The said scale was created by John Brooke in 1986 which can evaluate numerous products and services such as hardware, software, mobile devices, websites, and applications. The SUS is composed of ten statements which will be either agreed upon or not by the respondents by rating each from 1 to 5; 1 being the lowest (strongly disagree) and 5 being the highest (strongly agree).

# timetable

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| **DATE** | **ACTIVITY** |
| January 18-22, 2016 | Take tutorials and install necessary tools (Express JS, React JS, CSS with Less, and MongoDB) |
| January 25-February 5 | Develop *Login, Home, View of Minichecklist, Change of Matriculation, View Student Checklist* pages |
| February 8-19 | Create user accounts and add the database to the system |
| February 22-March 4 | Integrate SystemOne features (features should be fully working) |
| March 7-April 1 | Integrate ARIA to the pages |
| April 4-15 | Test (for developers only) and debug |
| April 18-29 | Deploy experiment (for users) with survey |
| May 2 - 13 | Data analysis and Release of results |

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