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Gongju, Korea

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Dept. of Library & Information Science Education, Kongju National University
Institute of School Library in Kongju National University
Dept. of Library & Information Science, Chonbuk National University
Institute of Culture Convergence Archiving, Chonbuk National University
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Korean Library and Information Science Society
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<td>14:00-16:30</td>
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| 14:00-14:30 | **Session III (대학본부, 국제회의실(1층))**  
  ▶ Chair: Eungi Kim (Keimyung Univ.)  
  ① Research Data Quality Accreditation Standards in Institutional Repositories  
  • Presenter: Namtip Wipawin (Sukhothai Thammathirat Open University, Thailand)  
  • Discussant: Hea Lim Rhee (KISTI)  
  ▪ 기관 레포지터리에서 연구데이터 품질 인증 기준  
  • 발표자: 남팁 위포윈 (STOU대, 태국)  
  • 토론자: 이혜림 (한국과학기술정보연구원) |
| 14:30-15:00 | ② Information and Media Literacies in Dystopian Young Adult Literature  
  • Presenter: Jonathan Hollister (Pusan National University, Korea), Don Latham (Florida State University, USA)  
  • Discussant: Young-Seok Kim (Myongji University)  
  ▪ 디스토피아 청소년 문학에서 정보 및 미디어 리터러시  
  • 발표자: 조나단 홀리스터 (부산대); 돈 라담 (플로리다주립대, 미국)  
  • 토론자: 김영석 (명지대) |
| 15:00-16:00 | **Coffee Break** |
| 15:30-16:00 | ③ The Design and Development of a Mobile Application "Mahidol Libraries e-Journals" for Electronic Resource  
  • Presenter: Sikharin Suwannatee (Mahidol University, Thailand)  
  • Discussant: Durk-Hyun Chang (Pusan National University)  
  ▪ 전자 자원 이용을 위한 모바일 어플리케이션 "Mahidol Libraries e-Journal"의 설계와 개발  
  • 발표자: 시카린 수완티 (마히돌대, 태국)  
  • 토론자: 장덕현 (부산대) |
| 16:00-16:30 | ④ Assessing the Social Media Presences of Libraries on Twitter  
  • Presenter: Jisue Lee, Lorri Mon (Florida State University, USA)  
  • Discussant: Yong-Jae Lee (Pusan National University)  
  ▪ 트위터를 사용하는 공공도서관의 소셜미디어 영향력 평가  
  • 발표자: 이지수, 로리 몬 (플로리다주립대, 미국)  
  • 토론자: 이용재 (부산대) |
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The Design and Development of a Mobile Application “Mahidol Libraries e-Journals” for Electronic Resource

Sikharin Suwannatee
(Mahidol University, Thailand)
The design and development of a mobile application
"Mahidol Libraries e-Journals" for electronic resources

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Abstract — This paper presents the design and development of a mobile application "Mahidol Libraries e-Journals". This application uses AngularJS and Ionic Framework technologies to provide access to electronic information resources, such as an electronic database and journals in support of student, academic, and staff teaching and research. This application provides a modern information delivery service by allowing users to access the database at any time from any location, and supports both Android and iOS systems.

I. INTRODUCTION

Due to the modern technological advances in today's social networking, especially in communication for work and education, most organisations and companies try to focus on developing this kind of service, data access with smartphone and tablet devices, in order to meet the needs of their customers more quickly and more effectively. Mahidol University Library and Knowledge Centre is a place that provides electronic information resources, including books, journals and electronic databases through its electronic database resources website [1], with the aims of supporting Mahidol University student, academic, and staff teaching and research.

Mahidol University Library and Knowledge Centre recognises the importance of providing electronic information resources via mobile devices commonly used today in the form of mobile applications. Creating a mobile application requires a lot of experienced and skilled application developers and needs a lot of budget. In general, developing applications will be “Native” style which means to develop the applications based on tools and languages that are tailored for developing the applications on particular operating systems. For example, tool like "Xcode" and "Objective-C" or "Swift" are designed to be used to develop mobile applications.
on iOS operating systems, or tools like “Android Studio”, “Android SDK”, and a language like “JAVA” are used to develop mobile applications on the Android operating system.

The advantages of “Native” style are that application developers can access the full functionality of the platform and reach its maximum performances. Moreover, it is flexible and very useful for developers. However, “Native” style cannot be developed once and used with multiple platforms. To develop applications with “Native” style to run on both iOS and Android operating systems, developers need to do it twice. That takes a lot of time to do the research and improve the process and the cost is quite high too[2].

With restrictions on the “Native” style development of applications, Mahidol University Library and Knowledge Centre has developed application by using the technology called “Hybrid App” or “Cross Platform”, which can develop applications by using any one language, but can be applied to other platforms. The instruction set is written only once but available on all platforms. It can run both iOS and Android. There are many frameworks has developed the “Hybrid” style application development, both free and paid [3]. In designing the application, “Mahidol Libraries e-Journals” of Mahidol University Library and Knowledge Centre decided to use the framework called "Ionic Framework"

The “Ionic Framework” is a set of instructions for developing application, “Hybrid Mobile Application” style, which is developed once and can be run on both the iOS and Android operating systems. It helps reducing the cost of creating an application. There is no need for a professional software developer to create an application because in creating the user interface (UI), we can use HTML, CSS, and JavaScript, which are the general languages used to create a website which all software developers are familiar with.

II. TECHNOLOGY USED TO DEVELOP MOBILE APPLICATIONS

Ionic Framework is an open source, permitting the use under the The Massachusettes Institute of Technology (MIT), and can be used to create your own work or any other commercial purposes for free. Ionic Framework is designed to be able to develop applications in the same way as Native style. From table 1, it shows the results of the comparison of all frameworks. It can be seen that the Ionic Framework gets the score of 7/10, which tells a native-like performance. Iconic Framework also supports 2 technologies that have been popular in developing mobile applications, Apache Cordova Framework and AngularJS Framework [4].
TABLE I

<table>
<thead>
<tr>
<th>Framework</th>
<th>Native-Like performance</th>
<th>Support Cordova/AngularJS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ionic framework</td>
<td>7/10</td>
<td>Yes/Yes</td>
</tr>
<tr>
<td>2. Onsen UI</td>
<td>6/10</td>
<td>No/Yes</td>
</tr>
<tr>
<td>3. Framework 7</td>
<td>8/10</td>
<td>No/Yes</td>
</tr>
<tr>
<td>4. React native</td>
<td>8/10</td>
<td>No/Yes</td>
</tr>
<tr>
<td>5. jQuery mobile</td>
<td>3/10</td>
<td>No/Yes</td>
</tr>
<tr>
<td>6. Native script</td>
<td>8/10</td>
<td>No/Yes</td>
</tr>
</tbody>
</table>

Figure 1. The Cordova Framework consists of three major functional components: the Web app, the Webview, the plugin.

The core workflow of the Ionic Framework consists of two major components: the Apache Cordova Framework and the AngularJS. The Apache Cordova Framework's architecture is shown in Figure 1. The Cordova Framework consists of three major functional components: the Web app, the Webview, the plugin. The Web app acts as a web application that can be developed with programming languages HTML, CSS, and javascript, which are standard technologies for creating sites. Webview is the core of Cordova, built-in browser [5].
serving to open the HTML file that you want to show the user interface. Finally, Cordova plugin
mainly makes contact with Hardware of Mobile because it has API which directly interfaces to
the Hardware such as camera, contacts, media and network.

AngularJS is a framework that works on the client side operating by JavaScript, which
manages the logic and enables the application to interact. AngularJS’s core capability is 2 ways
data binding. It can bind Javascript variable values to HTML tags and can generate tags or
attributes in HTML.

III. MOBILE APPLICATION DESIGN FOR ELECTRONIC INFORMATION RESOURCE

![Ionic Framework Diagram]

SERVICES.

Figure 2. shows the structure of the Mahidol Libraries e-Journals application.

Mahidol University Library and Knowledge Centre provides electronic information
resources including books, journals and electronic databases through the e-database website
[1]. On the e-database website, there are more than 100 databases, some of which are
expensive. An e-database website may not reachable for the users searching for research or e-
books on mobile since they needs to access a mobile browser first. The users may find it
inconvenient because there are too many steps without input fields for searching with keyword.
Moreover, e-database website is not designed to respond to the size of the screen of the user's
mobile phone. Therefore, Mahidol University Library and Knowledge Centre designed the
"Mahidol Libraries e-Journals" application to encourage users to access the electronic resources database on mobile phones more conveniently. The design relies on a list of database resources from the e-database website. Figure 2 shows the structure of the Mahidol Libraries e-Journals application.

The structure of the Mahidol Libraries e-Journals application consists of two layers, the first is the Android operating system and the iOS. The application layer deals with the Ionic Framework through OS API. In the Ionic Framework layer, it includes the Apache Cordova module, the Web application (run by AngularJS, the Ionic framework, and common codebase), and WebView (a cross-platform built-in browser). The application design phase of "Mahidol Libraries e-Journals" has the following steps:

A. **Installing development environment on a PC**

Before creating a project by the Ionic Framework, we have to prepare the environment and tools for developing applications that are compatible with the operating system the developer uses. For Windows operating systems, NodeJS must be installed as a runtime for Javascript to work. How to install Ionic Framework can be learned here [6].

B. **User Interface design for the information resource database service.**

The application is designed to have 3 pages consisting of a welcome page for visitors (Home). The second page contains the database listing and the database images, along with the database description text. For listing information, path of image and database description, they are stored in a JSON file. In the second page, there are Sub Pages for the external link to access the database. The last page is a service page for users who are outside the network or VPN Access.

C. **Working with the Ionic CLI and templates**

In order to run Ionic Framework, you can enter the command Start, Build, Run and Emulate Ionic apps through the CLI (command line utility), which is similar to the terminal on the Mac operating system, or the Command Prompt on the Windows Ionic Framework, that provides many basic template apps for us to choose. For the "Mahidol Libraries e-Journals" application, we used the standard Ionic Template to create the application. The Template component is shown in Figure 3.
E. **Understanding basic Ionic CSS components**

Components of the Ionic Framework's are CSS Class Libraries in a variety of HTML tags to be chosen for creating an application. The "Mahidol Libraries e-Journals" application consists of the Components Header, Footer, Buttons, List, Tabs, and Search.

F. **Using Angular controllers**

Creating application "Mahidol Libraries e-Journals" takes into account the convenience of the user by designing to have input field for database search by keyword. The search function is written by AngularJS, using ng-query as a special attribute for the HTML tag. Figure 4 shows the application "Mahidol Libraries e-Journals"

G. **Limited to Mahidol University personnel only.**

To restrict database users, this application is reserved only for members within Mahidol University. The EZProxy system is used with the "Mahidol Libraries e-Journals" application when users search for the desired database. Before the user accesses the database, they must be personally identifiable through the EZProxy system of Mahidol University by using the University Account. Then the database can be used.
IV. CONCLUSION

This article presents the design and development of Mahidol Libraries e-Journals application of Mahidol University Library and Knowledge Centre in order to provide electronic information resources via wireless mobile devices which supports both Android and iOS operating systems. The application is created by using the popular Ionic Framework which is a free technology. It helps saving cost and also saving a lot of time in creating the application. Moreover, the developer can write the program once and use it with many platforms. General website developers are able to make the applications easily. This enables the Mahidol University Library and Knowledge Centre to provide up-to-date services.

REFERENCES

[1] Website e-database Mahidol University Library and Knowledge Center:
http://www.li.mahidol.ac.th/e-resource/databases.php


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Sikharin Suwannatee was born in Nakhonpathom, Thailand. He received the B.S. degree in telecommunication engineering from the Faculty of Industrial Education, King Mongkut Institute of Technology Ladkrabang, Thailand, in 2006, the M.E. degree in Electrical Engineering from the Faculty of Engineering, King Mongkut's University of Technology North Bangkok, Thailand, in 2009.

He is currently a Information Specialist at Mahidol University Library and Knowledge Center, Thailand.