

DEVELOPMENT OF MOBILE WEB APPLICATION WITH ONLINE MAP SERVICES FOR STORING STUDENT TEACHING AND INTERNSHIP INFORMATION

การพัฒนาเว็บแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ร่วมกับแผนที่ออนไลน์ สำหรับจัดเก็บข้อมูลการฝึกประสบการณ์วิชาชีพครู

noppadon phumeechanya

นพดล ผู้มีจรรยา

Lecturer, Department of Computer Education, Faculty of Science and Technology

Nakhon Pathom Rajabhat University

nop123@gmail.com

Abstract

In Thailand, a teaching internship is an essential requirement for the Bachelor of Education. Students who study Computer Education Program at Nakhon Pathom Rajabhat University are required to do an internship in their last year of study. Currently, there is no computer system or application available to store all information related to a teaching internship. The objectives of this research were 1) to develop the mobile web application with online map service for storing student teaching and internship information, 2) to assess the efficiency of mobile web application, and 3) to assess the satisfaction of supervisors upon mobile web application. The samples of this research included; 1) 5 specialists with specialization in computer, and information and communication technology, and 2) 12 supervisors of computer education program. The samples were selected through purposive sampling process. Research instruments included: 1) mobile web application, 2) mobile web application efficiency assessment form, and 3) mobile web application user satisfaction survey.

The research results were as follows: 1) the mobile web application is compatible with both PC computer and mobile devices. It contains 2 parts which are (1) administrator application, used for managing information related to students, schools, internships, and supervisors, and (2) university supervisor application, overseen by supervisors to keep track of their interns, school locations, contact details, and maps, 2) the efficiency assessment by specialists using Black-Box testing and the result revealed that the application can deliver highest efficiency, and 3) supervisors also have highest satisfaction after using this application because it can efficiently provide more convenience for their planning and travelling.

Keywords: Mobile Web Application; Online Map Services; Teaching Internship

บทคัดย่อ

การฝึกประสบการณ์วิชาชีพครูเป็นสิ่งสำคัญของการจัดการเรียนการสอนในหลักสูตรครุศาสตรบัณฑิตของประเทศไทย สาขาวิชาคอมพิวเตอร์ศึกษา มหาวิทยาลัยราชภัฏนครปฐม ได้จัดให้นักศึกษาได้มีการฝึกประสบการณ์วิชาชีพในชั้นปีสุดท้าย แต่ในปัจจุบันยังไม่มีระบบคอมพิวเตอร์หรือแอปพลิเคชันสำหรับจัดเก็บข้อมูลการฝึกประสบการณ์วิชาชีพครู งานวิจัยนี้จึงมีวัตถุประสงค์เพื่อ 1) พัฒนาเว็บแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ร่วมกับแผนที่ออนไลน์สำหรับจัดเก็บข้อมูลการฝึกประสบการณ์วิชาชีพครู 2) ประเมินประสิทธิภาพของเว็บแอปพลิเคชัน และ 3) ประเมินความพึงพอใจของอาจารย์นิเทศ กลุ่มตัวอย่างประกอบด้วย 1) ผู้เชี่ยวชาญด้านคอมพิวเตอร์ และเทคโนโลยีสารสนเทศและการสื่อสาร จำนวน 5 คน และ 2) อาจารย์นิเทศประจำสาขาวิชาคอมพิวเตอร์ศึกษาจำนวน 12 คน โดยการเลือกกลุ่มตัวอย่างแบบเจาะจง เครื่องมือที่ใช้ในการวิจัยประกอบด้วย 1) เว็บแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ 2) แบบประเมินประสิทธิภาพของเว็บแอปพลิเคชัน และ 3) แบบประเมินความพึงพอใจของอาจารย์นิเทศ

ผลการวิจัยพบว่า 1) เว็บแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ที่พัฒนาขึ้นสามารถทำงานได้ทั้งบนเครื่องคอมพิวเตอร์ส่วนบุคคล และอุปกรณ์เคลื่อนที่ ประกอบด้วย 2 ส่วนคือ (1) แอปพลิเคชันส่วนของผู้ดูแลระบบ ทำการจัดการข้อมูลนักศึกษา ข้อมูลโรงเรียน ข้อมูลการฝึกสอน และข้อมูลอาจารย์นิเทศ และ (2) แอปพลิเคชันส่วนของอาจารย์นิเทศ ใช้ดูข้อมูลนักศึกษาฝึกสอนที่ตนเองรับผิดชอบ ดูตำแหน่งโรงเรียน ข้อมูลการติดต่อบุคลากรที่เกี่ยวข้อง และเส้นทางการเดินทางไปยังโรงเรียนด้วยแผนที่ออนไลน์ 2) ผลการประเมินประสิทธิภาพของแอปพลิเคชันด้วยวิธีการ Black-Box testing โดยผู้เชี่ยวชาญ พบว่าแอปพลิเคชันมีประสิทธิภาพอยู่ในระดับมากที่สุด และ 3) ผลการประเมินความพึงพอใจของอาจารย์นิเทศพบว่ามีความพึงพอใจอยู่ในระดับมากที่สุด เนื่องจากช่วยเพิ่มความสะดวกสบายในการวางแผนการนิเทศและการเดินทางได้เป็นอย่างดี

คำสำคัญ: เว็บแอปพลิเคชันบนอุปกรณ์เคลื่อนที่ บริการแผนที่ออนไลน์ การฝึกประสบการณ์วิชาชีพครู

1. INTRODUCTION

Since an teaching internship is an essential requirement for the Bachelor of Education in Thailand and student teachers are given an opportunity to teach at school so that they can gain a direct teaching experience, the Council of Teachers of Thailand has created standards and criteria for the certification of a degree stating that at least 1-year experience of teaching internship is required [1]. This standard is also applied at Computer Education Program, the Faculty of Science and Technology at Nakhon Pathom Rajabhat University, and student teachers will do their teaching internship in their last year of study. The management of information related to the teaching internships are currently filed and stored in hard copy format or on spreadsheets because the Department is lacking technological system to help with the information management. This causes difficulties when retrieving information. Also, some key details that are necessary for supervisors such as school locations, maps, and contact details, are not available.

Nowadays, mobile technology has played a huge role on everyone's daily life since it provides more convenience and easy accessibility and connectivity to the internet. Mobile technology is widely recognized in Thailand. According to the survey of the National Statistics Office, the population aged over 6 years old who use computers, internet, mobile phones, and smartphones during year 2012-2016 has the tendency to increase the use of mobile phones. In 2016, the number of mobile phone users was at 81.40% while that of smartphone users were 50.50% of total population [2]. This also includes the use of mobile phones by teachers, students, and members of the educational institute as researching tools.

Ethan Marcotte [3] has invented the website development concept known as Responsive Web Design (RWD) that enables a website to work well across a variety of devices and its contents to be amended. Responsive web design can make developing website easier and take less time to complete which is also suitable for the development of mobile web application.

Google Maps is one of the services run by Google. It was first launched in 2005 with the purpose to provide online maps that came with other services such as main locations, routes, and satellite display has been made available. A website developer can add Google Maps APIs into their website to visualize maps with free of charge. It also provides other functions such as locations display geographic coordinates of places, and routes details [4]. Hence, Google Maps is the suitable tool to use for displaying information of schools at which student teachers are doing their internships so the supervisors know the exact locations of schools that they need to supervise.

The researcher offered the idea to develop the mobile web application using online map services for storing student teaching and internship information in order to facilitate supervisors with the tool to access student teachers' information, instruction details, school locations, and routes to schools via mobile devices and personal computers. The application enables supervisors to conveniently look up for the information needed for planning a supervision trip which can save time and cost of travelling.

2. RELATE WORK

The rapid growth of mobile technology and wireless communication nowadays have caused widespread uses of mobile technology in every field. In education, the technology has been implemented for multiple purposes, one of which is the learning approach conducted on mobile devices which is also known as m-Learning, and the use of technology on educational administration and management. Jankoaw Saiplang [5] has developed mobile learning on process modeling for system analysis and design subject. Jian and others [6] have designed and developed campus information system. Budi and Sukmana [7] have designed and developed the application for academic information management which allows students and lecturers to use on their mobile devices. Akilandeswari and others [8] have developed the website and mobile app development for faculty information management system to collect data from faculty members.

These days, websites are developed and designed to be compatible with every type of devices, in other word, Responsive Web Design (RWD) [9]. This method enables website developers to create a website that works on all types of devices. Oliveira and others [10] have developed the responsive online book as web application. Adinugroho and others [11] have implemented the RWD to his mobile web application development to be used as students' and lecturers' portfolio gallery.

The development of mobile application with online map services is becoming more common because developers can add a program to show selected locations on online maps. Indriasari and others [12] have developed the application which detects the position of the volunteers in order to improve disaster management service in Indonesia. Nama and others [13] have developed the web based geographic information system for public services in Indonesia. Yang and Hsu [14] have developed the mobile application for helping tourists in Taiwan to plan their trips.

The implementation of such technology on teaching internship is epitomed by the ROGI (Remote Observation of Graduate Interns), a technology-mediated performance based assessment and reflection of teaching, developed by Heafner and others [15]. This system allows supervisors to conduct a supervision online.

Student teachers studying Computer Education Program at the Faculty of Science and Technology of Nakhon Pathom Rajabhat University are required to enroll in teaching internship in their last year of study. For the 1st semester of academic year 2017, 129 student teachers were doing their internships at 69 schools. Thus, no computer system or application are available to store all information related to teaching internship; therefore, the researcher has developed the mobile web application. The application will enable supervisors to conveniently look up for key information via PC and smartphones.

3. RESEARCH OBJECTIVE

1. To develop the mobile web application with online map service for storing student teaching and internship information.
2. To assess the efficiency of the mobile web application with online map service for storing student teaching and internship information.
3. To assess the satisfaction of supervisors upon the mobile web application with online map service for storing student teaching and internship information.

4. SCOPE OF STUDY

1. The representative samples of this research included; 1) 5 mobile web application efficiency assessment specialists who were selected through purposive sampling process from educational institutes recognized for their specialization on computer, information technology, and ICT for education, and 2) 12 supervisors who have been using the mobile web application as part of their roles for Computer Education Program, Faculty of Science and Technology of Nakhon Pathom Rajabhat University. Those of which were selected through purposive sampling process.

2. Research instruments used in this research included: 1) the mobile web application with online map service for storing student teaching and internship information, 2) mobile web application efficiency assessment form for specialists, and 3) mobile web application user satisfaction survey.

5. RESEARCH METHODOLOGY

The development of mobile web application with online map service for storing teaching internship relied on the software development life cycle (SDLC) [16] which consists of 5 steps including; 1) requirement analysis 2) design 3) coding 4) testing and 5) maintenance. Each step can be explained in details as follows:

5.1 Requirement Analysis

This is the first step of application development with the purpose to analyze requirements of users - system administrators and supervisors. According to the analysis, system administrators' requirements were; 1) the ability to access and manage school data, 2) to oversee and manage students' data, 3) to oversee and manage supervisors' data, 4) to oversee and manage student teaching and internship information, and 5) to control settings of the system such as internship semester. Supervisors' requirements included; 1) to view their students' teaching internship data, 2) to search and look up for other students' teaching internship data, 3) to see direction to each school on online map, 4) to have access to and use contact details of relevant people, and 5) to edit personal information of the supervisor. The application for an administrator and that for a supervisor can be displayed on mobile devices.

5.2 Design

The design of the mobile web application with online map service for storing student teaching and internship information is based on the development of the mobile web application in which its system architecture can be seen in figure 1.

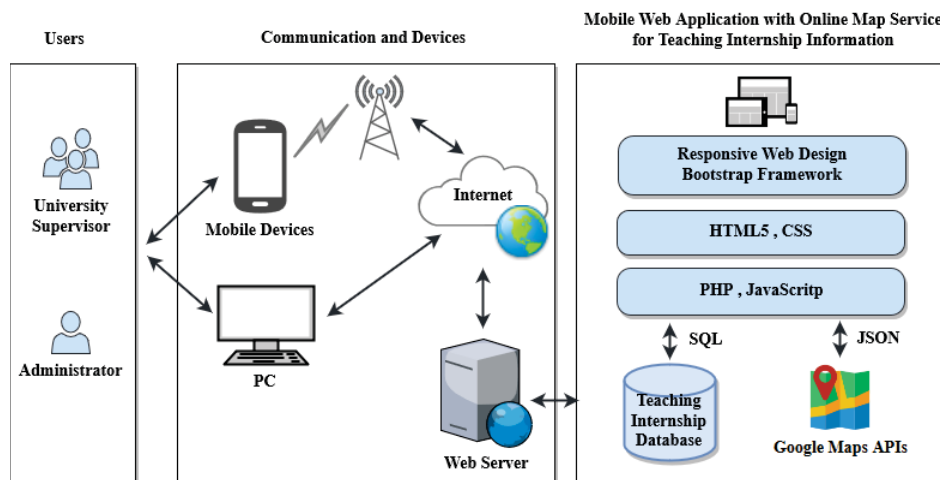


Figure 1 System Architecture

1. User : System users can be divided into 2 groups; system administrators and university supervisors. Users can use the application on their mobile devices such as smartphones or tablets and they can also access the application on a personal computer. To use the application on a computer; 1) system administrators register students who enrolled in teaching internship, then record other details of students. 2) A supervisor can access the application on their mobile devices and see their students' information. For planning a supervision, the supervisor can look up for all information such as student teaching and internship information, maps, and routes to schools.

2. Communication and Device : The application works as a web application installed on web server. Users can use it on their mobile devices that is connected to the internet using 3G, 4G technology or Wi-Fi to access the application using web browsers available on the devices such as Safari or Google Chrome. Users can also access the application on a regular PC.

3. Mobile Web Application : The mobile web application with online map service for teaching internship has been developed on the Bootstrap framework. Bootstrap is an open source for developing with HTML, CSS, and JS which can be used to create mobile web application quickly. It also has the responsive web design function that adjusts display to fit both mobile devices and computer PC. The application is connected to MySQL database in which its program is controlled by PHP and SQL. Each database can be added, deleted, or updated. Main database of this application consists of school data table, student data table, supervisor data table, and student teaching and internship information data table. The application can display online maps provided by Google Maps APIs. To visualize the maps, Javascript control is created to respond to queries like school locations, routes and directions to schools. The information is transferred in JSON format in order to be compatible with Google Maps APIs.

5.3 Coding

The mobile web application has been developed on web application framework which is based on HTML5. Bootstrap framework version 3, efficient framework that allow developers to work on their web application in responsive design, has been used online by CDN (Content Delivery Network). CSS3 is also implemented for web application decoration to make it more attractive. PHP is used for connecting and managing information in the database while SQL is used for other functions such as adding, deleting, and updating information. MySQL database is used to store data tables. Google Maps API version3 provided by Google will be activated with Javascript in order to visualize maps on the mobile web application. Class Marker will be read to show school location, while class DirectionsService and class DirectionsRenderer will be read to show routes and directions to school.

5.4 Testing

Black-Box testing was used to test the mobile web application. The test consisted of 3 methods including; 1) integration testing – program modules are tested as a group to check whether they are functioning correctly and unitedly, with the purpose to test a developer, 2) functional and System testing – conducted by 5 specialists in application development and information technology to find out efficiency of Mobile web application, and 3) acceptance testing – web application is installed on web server and then supervisors tested the system by using the application and assessing their satisfaction. The results of efficiency assessment and satisfaction assessment were analysed by mean (\bar{x}) and standard deviation (S.D.) consisting of 5 criteria for evaluation according to the idea of Likert scale.

5.5 Maintenance

After the testing for Mobile web application is completed, some amendments and improvements were added according to feedback from the professionals and users so that the application is compliant with the requirements and always ready to use.

6. RESEARCH RESULTS

6.1 Mobile web application with online map service for student teaching and internship information.

1. Administrator application contain display screens for school data management, teaching internship student data management, supervisor data management, and teaching interment data management. School location that will be added to the database is shown on online map.

2. University supervisor application for supervisors to check their supervision information and plan their supervision trip is shown in figure 2.

Once supervisors log on to the system, university supervisor application will display current student teaching and internship information and the menu. Figure 2 (a) shows; 1) students who need to do teaching internship, 2) students and school search, 3) edit supervisor details, 4) change password, and 5) log out. Figure 2 (b) shows list of interns that are due to be supervised. Figure 2 (c): supervisors can see student information under their supervision. The information that can be viewed are photograph, personal information, teaching information, teaching schedule, and contact details of relevant people.



Figure 2 University Supervisor Application

Figure 2 (d): school location can be viewed on Google Maps. A call button will allow supervisors to call any relevant people such as students or school supervisors. Figure 2 (e) and figure 2 (f): supervisors can look up for routes and directions to school via online maps. The application assists supervisors to plan their supervision and it can be a useful tool that allows them to contact relevant people conveniently and quickly.

6.2 Mobile web application with online map service for storing student teaching and internship information efficiency assessment.

Table 1 Efficiency Assessment

Evaluated Contents	Result		Efficiency Level
	\bar{x}	S.D.	
1. Functional Requirement Test	4.65	0.55	Highest
2. Functional Test	4.70	0.48	Highest
3. Usability Test	4.71	0.48	Highest
4. Efficiency Test	4.44	0.56	High
5. Security Test	4.73	0.48	Highest
Overall	4.65	0.51	Highest

From table 1, the overall efficiency was rated at the highest level ($\bar{x}=4.65$, S.D.=0.51). When considered each issue, it was found that efficiency assessment of security test was rate at the highest level ($\bar{x}=4.73$, S.D.=0.48), followed with usability test, functional test, functional requirement test, and efficiency test.

6.3 Supervisors satisfaction assessment on mobile web application with online map service for storing student teaching and internship information.

Table 2 Satisfaction assessment from supervisors

Satisfaction Item	Result		Satisfaction Level
	\bar{x}	S.D.	
1. Satisfaction on application functionality	4.73	0.45	Highest
2. Satisfaction on application interface	4.67	0.47	Highest
3. Satisfaction on convenience when using application	4.75	0.45	Highest
Overall	4.72	0.46	Highest

Table 2 shows the satisfaction assessment of the mobile web application with online map service for storing student teaching and internship information by supervisors. Overall satisfaction was rated at the highest level ($\bar{x}=4.72$, S.D.=0.46).

7. DISCUSSION AND CONCLUSION

1. The results of the development on the mobile web application with online map service for storing student teaching and internship information have shown that the application can deliver high efficiency, according to the specialist assessment. This is because the mobile application was developed on SDLC system which allows developers to analyze requirements prior to design and create functions that efficiently and accurately complies with the needs. The display screen was also designed to meet user requirement. This is consistent with El-Seoud's research [16] on mobile application development for effective course management system. In addition, it is complying with the research of Indriasari and others [12] who have developed the application called "MyMapVolunteers" that effectively and efficiently detects the position of the volunteers in order to improve disaster management service in Indonesia.

2. In terms of the satisfaction of users who are mostly supervisors, overall, they were highly satisfied with the application functionality because the mobile web application with online map service meets their needs. They can use the application to quickly look up for any information related to teaching internship. The application provides more convenience for them to contact relevant people, helps them plan a supervision. Most importantly, the application is accessible anywhere and at any time on any types of devices; PC computer or mobile devices, because the application was implemented with responsive design that can effectively adapt to fit different types of screen. This is consistent with Nama and others [13], who used Google Maps API for developed the web based geographic information system for public services in Bandar Lampung City in Indonesia to improved a better public service for the citizens. Furthermore, this complies with Adinugroho and others [11], who implemented the RWD to his mobile web application development for students' and lecturers' portfolio gallery called BINUS Store. This application can provide better user experience. It is easy to use and offers a good user interface.

8. RECOMMENDATION

8.1 Recommendation on application of this research's results.

1. Any education institutes that apply this mobile web application should prepare their infrastructure such as the internet access, web server and mobile device.
2. Supervisors should be trained to use a mobile web application for maximum benefit.

8.2 Recommendation on further research.

1. The mobile web application with online map service can be applied to others application such as storing student houses location on the map and display location related to education information.
2. In the further research, mobile applications can be developed with other application development tools such as Ionic framework and Angular framework for improve the efficiency of the mobile application.

เอกสารอ้างอิง

- [1] The Teachers Council of Thailand. 2014. **Standards and criteria for the certification of a degree**. Retrieved August 15, 2017, from <http://www.ksp.or.th/ksp2013/profile/index.php?l=th&tid=3&mid=34&pid=6>
- [2] National Statistical Office. 2017. **The 2016 Household Survey on the Use of Information And Communication Technology**. Retrieved August 15, 2017, from <http://www.nso.go.th/sites/2014en/Pages/Statistical%20Themes/ICT.aspx>
- [3] Marcotte, E. 2011. **Responsive Web Design**. New York: A Book Apart.
- [4] Hu, S., & Dai, T. 2013. Online Map Application Development Using Google Maps API, SQL Database, and ASP .NET. **International Journal of Information and Communication Technology Research**, 3(3), p 102-110.
- [5] Jankoaw Saiplang. 2017. A Development of Mobile Learning on Process Modeling for System Analysis and Design. **Journal of industrial education**, 15(1), p. 25-33.
- [6] Jian, F., Jian, R., Ren-Yi, F., & Jing, L. 2015. Design and Implementation of Campus Information System with Android and Web Dual-mode Based on MVC Pattern. **International Journal of u-and e-Service, Science and Technology**, 8(7), p. 313-320.

- [7] Budi, S., & Sukmana, H. T. 2016. Developing mobile-based academic information system: A case study at Islamic State University (UIN) Syarif Hidayatullah Jakarta. **Cyber and IT Service Management, International Conference**, p. 1-5.
- [8] Akilandeswari, T., Monisha, P., & Punithavathi, A. 2017. Website and Mobile app development for Faculty Information Management System. **International Journal of Advanced Research Trends in Engineering and Technology**, 4(20), p. 36-40
- [9] Baturay, M. H., & Birtane, M. 2013. Responsive web design: a new type of design for web-based instructional content. **Procedia-Social and Behavioral Sciences**, 106, p. 2275-2279.
- [10] Oliveira, A. E., França, R., Ferreira, E., Silva, F. G., & Castro, J. G. 2014. Responsive Online Book based on the Multimedia Learning Theory. **Proceedings of the 3rd International Conference on Context-Aware Systems and Applications**, p. 80-85.
- [11] Adinugroho, T. Y., Heriyanni, E., & Musthofa, T. A. S. 2017. Mobile web application for students' and lecturers' portfolio gallery. **Library Hi Tech News**, 34(5), p 14-18.
- [12] Indriasari, T. D., Anindito, K., Julianto, E., & Pangaribuan, B. L. 2017. A Mobile and Web Application for Mapping Disaster Volunteers' Position in Indonesia. **International Journal of Interactive Mobile Technologies (IJIM)**, 11(3), p. 98.
- [13] Nama, G. F., Ulvan, M., Ulvan, A., & Hanafi, A. M. 2015. Design and implementation web based geographic information system for public services in Bandar Lampung City—Indonesia. **Science in Information Technology (ICSITech), 2015 International Conference**, p. 270-275.
- [14] Yang, S. Y., & Hsu, C. L. 2016. A location-based services and Google maps-based information master system for tour guiding. **Computers & Electrical Engineering**, 54, p. 87-105.
- [15] Heafner, T. L., Petty, T. M., & Hartshorne, R. 2012. University supervisor perspectives of the remote observation of graduate interns. **Journal of Computing in Higher Education**, 24(3), p. 143-163.
- [16] Abou El-Seoud, S., El-Sofany, H., & Taj-Eddin, I. 2016. Mobile Applications and Semantic-Web – A case study on Automated Course Management. **International Journal of Interactive Mobile Technologies (IJIM)**, 10(3), p. 42.