

## Analysing the Implementation of Mobile Application Technology in Computer Science Syllabus

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### ABSTRACT

Nowadays mobile computing technologies become an important area of study. The increasing growth in wireless communication and mobile computing forces us to design a new mobile computing syllabus. Relatively, most universities offer mobile computing courses, much less align with the industry demand. Our suggested mobile application technology syllabus design focuses on the improvement of the syllabus topics, course delivery methods and evaluation or assessment methods that will provide a comprehensive syllabus to industries necessities. This paper presents a new mobile application technology topics syllabus that cover various aspect of mobile computing including big data solution.

**KEYWORDS:** Mobile Computing, Syllabus, Industry Demand, Mobile Application Technology.

### INTRODUCTION

In recent years, due to the lower cost and small features, mobile devices have gained popularity among gadget lovers. Additionally, mobile devices have an excessive capability to act as a set of complete computer [1] with a flexibility mechanism for time and space saving [2]. The convergence of mobile application has been predicted since the year of 2001[3]. Then, web-enabled mobile devices started to become a challenge to web designers and programmers[4]. Rumours about mobile network will overtake fixed Internet access by 2014 has become a reality now[5]. Until 2014, the mobile users have reached 60% of the population worldwide as shown in Figure 1 [6]. As a result, the marketing strategy in industry has also been shifted to mobile e-commerce eventually [6-7].

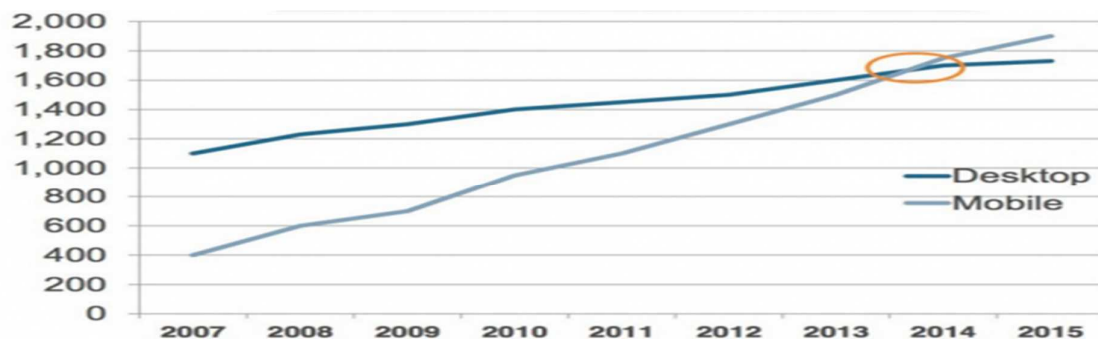


Figure 1: Numbers of mobile users' from year 2007 until 2015

Due to the rapid progressing of applications in mobile platform, the requirements for mobile application development skills are expected to increase to 3.4% in the year of 2017[8]. It is proven by over the 916 IT professional, 35% of the respondents from the Computerworld's Forecast survey have responded that spending more on mobile applications in 2017 would be a worth it. Consequently, making mobile has become the number 2 spending priority for the year [9] and ranked as 7th from 10 hottest most in-demand skills in the globe[10]. Knowledge in the modern world is transformed by the development of revolutionary technologies in society[11]. Therefore, higher education started to create mobile technology syllabus in their curriculum mainly

in computer science where it continues to reinvent itself every 5-7 years[12]. The researchers in higher education started to discuss about mobile technology since year 1990's[13-15]. Since then, higher education institution also started to design their syllabus. Meaning, mobile technology reached to more than 10 years in computer science field. Thus, it is the time to compare the existing mobile application technology syllabus and curriculum in higher education to be review and consider in designing new mobile application technology syllabus in computer science field.

## METHODOLOGY

The research begins with a contents comparison of mobile application syllabus offered by the local and abroad universities. The information used for the comparison gained through the universities' official web page using Google search engine. The keyword was defined as "mobile application technology syllabus in computer science" and 673,000 results found. Then, from those result, 25 undergraduate course were selected that offer Mobile Application Technology by different universities. Top 25th universities that provide full syllabus information including the assessment methods in their official websites[16-37] were compared and aligned with current industrial needs in mobile application technology. The list of the universities are shown in Table 1.

**Table 1: List of university and mobile development course code offered.**

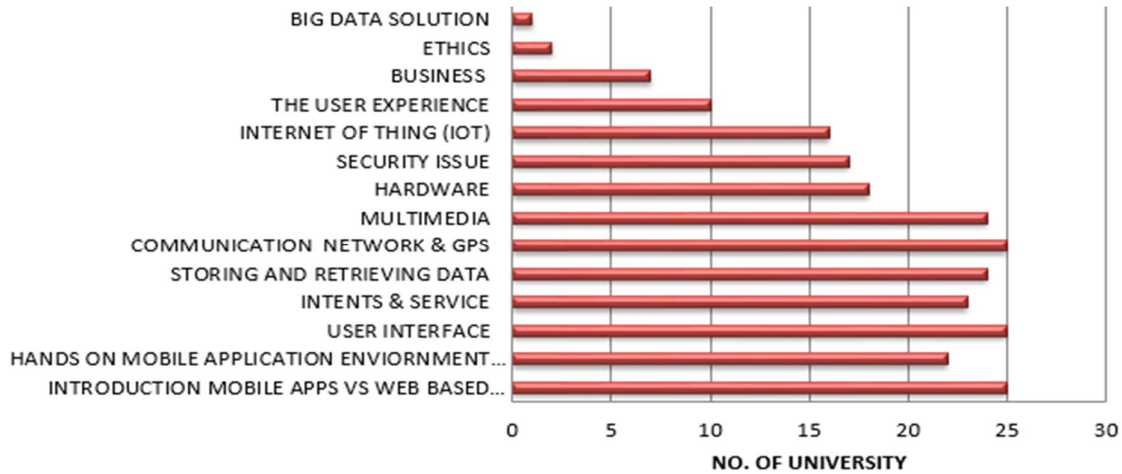
No	University	Course Code and Course Name
1	American Public University	ENTD313: Mobile Application Design and Development
2	Arizona State University	CIS 394-Introduction to Web and Mobile Programming Mobile Technologies for the Enterprise
3	Boston University	MET CS 683 Mobile Application Development
4	City University of Hong Kong	CS4295 Mobile Application Programming
5	Dalhousie University	CSCI-4176 Mobile Computing
6	Florida Athlentic University	ISM 4058 Mobile Apps for Business
7	Florida International University	COP4655 Mobile Application Development
8	Gujarat Technological University	3360704 Mobile Computing and Application Development
9	KTH Royal Institute of Technology	ID2216 Developing Mobile Applications
10	Massachusetts Institute ofTechnology	Communicating with Mobile Technology
11	Michigan State University	CSE 476: Mobile Application Development
12	Monash University	FIT2081-Mobile Application Development
13	Prince Sattam Bien Abdulaziz University	CS4831 Mobile Applications Development
14	Princeton University	COS598B Mobile Computing
15	San José State University	CS 175 Mobile Device Development
16	Saylor Academy	CS412: Mobile Applications Development
17	Southern Polytechnic State University	IT 4903/6903 HTML 5 and Mobile Web Development
18	Stern School of Business Norman White	INFO-GB-3322 Design and Development of Web and Mobile Applications
19	Stevens Institute of Technology	BT310 Section A; Programming for Mobile Applications
20	The Ohio State University	CSE 5236-Mobile Application Development Syllabus
21	Thompson Rivers University	COMP 2160 Mobile App Development 1
22	University of Verginia	CS 4720 Mobile Application Development
23	University of Melbourne	COMP90018 Mobile Computing Systems Programming
24	University of South Carolina	CSCE590 Mobile App Development
25	University of Southern California	ITP 140 Mobile Application Technologies

## FINDINGS AND DISCUSSION

Preliminary analysis revealed very similar pattern in mobile application technology syllabus among these 25 universities. This is one of the reason to lead them always align with industry needs. A deep analysis discussed further in gathering information in order to design a new mobile application technology syllabus. The discussion also considered and aligned the industrial feedbacks and demand towards current and future mobile application technology in industries.

### Topics in Syllabus

Based on the mobile application syllabus that covered in the 25 universities, researcher found 14 common topics as presented in Figure1. A topic on big data solution seems to be minimal adapted in the syllabus due to the new emergence area. The topic on ethics has also been considered as a need in the syllabus, but only in less than 5 universities.



**Figure 2: Comparison of topics covered in the mobile application syllabus among the 25 universities**

Although business is an established topic, only less than 10 universities used the topic in the mobile application syllabus, not so much different with the topic on user experience. The rest of topics are very popular in used, which the most widely included in the syllabus are communication network and GPS, user interface and introduction to mobile apps vs web based.

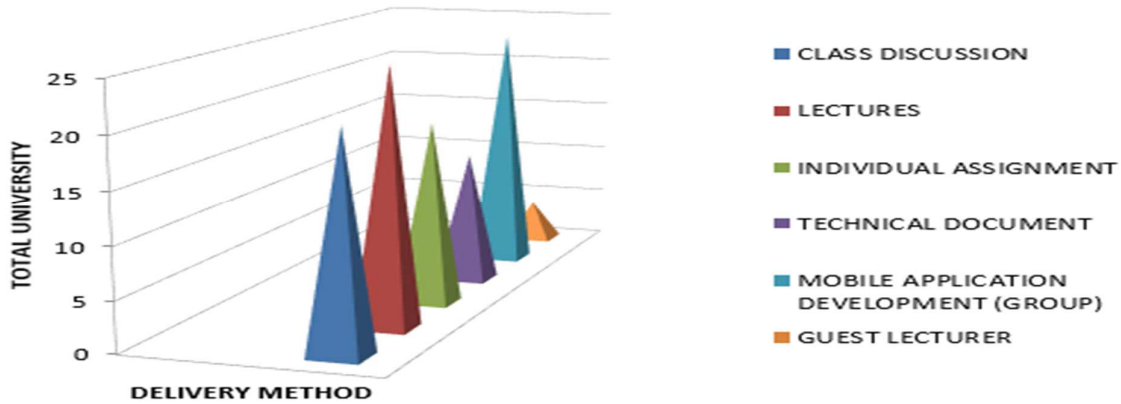
Therefore, researchers suggest the existing syllabus should be upgraded and consider to include big data solution because it is exponentially growing [38]. In the other hand, a specific ethical guideline should be imposed to the syllabus to shape good practices and attitudes in developing mobile applications. Hence, the syllabus will produce future mobile developers with the ability to ethically develop a mobile application that effectively and efficiently captures, processes and analyses huge and massive data which can lead to efficiency improvements in business and decision-making. Furthermore, business is also an important topic to be included so that the student will be a future employer rather than employee. Researchers recommend including all 14 topics in the new syllabus as shown in Table 2.

**Table 2: Recommended topic in new mobile application technology syllabus**

No	Topic	Included
1	Introduction Mobile Apps Vs Web Based Application	✓
2	Hands On Mobile Application Environment (Setup)	✓
3	User Interface	✓
4	Intents & Service	✓
5	Storing And Retrieving Data	✓
6	Communication Network & GPS	✓
7	Multimedia	✓
8	Hardware	✓
9	Security Issue	✓
10	Internet Of Thing (IoT)	✓
11	The User Experience	✓
12	Business	✓
13	Ethics	✓
14	<b>Big Data Solution</b>	✓

**Course Delivery Method**

It is also important to study the course delivery methods for teaching the mobile application topics. Teaching method refers to the general principles, pedagogy and management strategies used for classroom instruction in delivering information and knowledge to the students [39]. Figure 3 illustrates the comparison of course delivery method.



**Figure 3: Comparison on delivery method in mobile application syllabus among 25 universities**

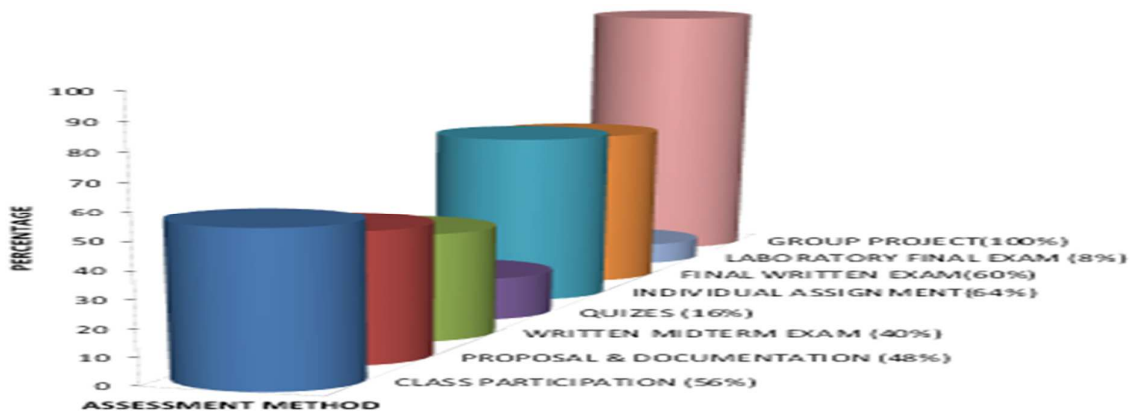
Figure 3 shows that class discussion, lectures and mobile application development in group are the common way of teaching delivery. This is followed by individual assignment and producing technical documentation. Some universities (less than 5) invited guest lecturer as to increase students’ interest in the topics. In conclusion, existing delivery method implementing Student-Centered approach which students play an active and participatory role in their own learning process[39]. Inviting guest lecturer was brainy approach to create dynamic, fresh and interesting learning environment. Nonetheless, academic trip to relevant company in industry and inviting an experience person from industry should be consider as a value added to the student knowledge and experience. Rationalisation for suggested new method delivery are simplified in Table 3.

**Table 3: Recommended topic in new mobile application technology syllabus**

No	Delivery Method	Rationalisation
1	Academic trip	Student will gain real experience by visiting and experiencing actual working environment in industry. The trip suggested to be included in semester 3 or 4 before implementing their final project.
2	Inviting an experience professional (Professional guest)	To compliment inviting guest lecturer, researchers believe guest professional is relevant method in providing an effective, dynamic and practical teaching and learning (T&L) environment. Researchers suggest to embrace this method during proposal preparation period. So that, student proposal become more realistic, business oriented and relevant to the industry necessities.

**Evaluation/Assessment Methods**

The percentage of assessment is an essential element to be viewed. As illustrated in Figure 4, practical based assessment is a very common. All the 25 universities preferred group project followed by individual assignment and final written examination. Class participation, proposal and documentation and written midterm examination are the assessment methods implemented by not less than 40% of the universities. The analysis result on evaluation/assessments methods shown in Figure4.



**Figure 4: Comparison on assessment method in mobile application technology syllabus among 25 universities**

Refer to Figure4, the two bottom assessment method which is not popular among universities are quizzes (16%) and laboratory examination (8%). We agree that quizzes are not really significant to assess the skills of the student in developing mobile application. However, laboratory final exam is very significant to assess student skills, ability and understanding towards syllabus. Researchers are highly recommended to consider it in the new mobile application technology syllabus without disregarding class participation, proposal and documentation, individual assignment, written midterm examination and group project. Table 4 represents proposed assessment method in mobile application technology syllabus with justification.

**Table 4: Proposed assessment method in mobile application technology syllabus**

No	Assessment Method	Included	Justification
1	Class participation	✓	To assess closely individual student engagement and performance.
2	Proposal and documentation	✓	To assess student ability in preparing professional documentation.
3	Written midterm exam	✓	To assess student understanding towards theory and mobile issues solution.
4	Quiz	✗	Student understanding towards theory and mobile issues solution can be assessed in midterm exam. Redundant assessment.
5	Individual assignment	✓	To assess individual student skills and understanding.
6	Final Written examination	✗	Less skills able to assess in written examination.
7	Laboratory examination	✓	Student skills, ability and understanding able to evaluate.
8	Group project	✓	More practical appraisal to assess student ability, skills and performance to accomplished a group project in developing relevant mobile application able to appraise.

### CONCLUSION AND RECOMMENDATIONS

This research successfully determined that the existing mobile application technology syllabus is still relevant to be implement with minor improvement. As a higher education institution, researchers believe every syllabus must be revised and aligned with industries demand which will provide more comprehensive and applicable syllabus to industries necessities. The suggested element in this paper may be relevant for next 3 years. Afterwards, further analysis still needed to ensure the syllabus is remaining pertinent.

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