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Mobile Applications in Educational Institutions

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***Abstract*—The proliferation of mobile devices in our daily life has resulted in a technological and cultural shift in the society. Availability of information via this medium is profoundly altering the way we perform our activities, like, searching, shopping, government interaction, education etc. Educational institutions across the globe have started providing mobile applications (apps) to become easily accessible to their stakeholders – students, teachers, etc. In this paper, we discuss the mobile apps provided by the different education institutions. We have performed a study of top universities based on Times Higher Education World University Rankings Report 2013-14. The paper focuses on penetration of the mobile apps, the kind of mobile apps supported by the institutions (native apps/mobile web), and the functionality provided by them.**

Keywords—Mobile App; Educational Institutes; Universities; Native Apps; Mobile Web

I. INTRODUCTION

Mobile technology along with internet access has overcome barriers to information and has made enormous information available at fingertips. Mobile technology is altering the ways in which individuals work. Activities like, buying and selling, accessing social networking sites, watching videos, reading newspapers, etc. can be performed from anywhere and at any time using the mobile devices. In fact, the usage of mobile is accelerating day by day which is evident from various reports.

- The Ericsson (NASDAQ:ERIC) Mobility Report [3] states that mobile subscriptions are expected to reach 9.3 billion by 2019, and more than 60 percent of these,5.6 billion, will be for smartphone.
- According to the U.S. Digital Consumer Report [7], Americans now own four digital devices on average, and the average U.S. consumer spends 60 hours a week consuming content across devices.
- According to Avendus Report 2013 [1], there are over 2.4 billion Internet users in the world, of which 1.5 billion access the Internet via their mobile devices. An astounding growth can be witnessed in the use of mobile devices across various continents, in academics as well as industry.

Universities have started accepting 'Mobile devices' as a medium of engagement with their stakeholders. Information that was earlier provided to students, teachers, parents, government bodies and other people via websites is now also delivered through mobile.

In this paper, we study the evolution of mobile technology in top universities of world, the mobile technology adopted by the universities and features present in their mobile apps. The rest of the paper is organized as follows: Section 2 describes need for the universities to have mobile presence. The options available to universities to establish themselves in mobile era are discussed in Section 3.Section 4 presents different forms in which mobile technology has penetrated the top universities of world. Key features provided by university apps are discussed in Section 5. Section 6 states the conclusion. Section 7 confers the acknowledgement.

II. NEED FOR UNIVERSITIES TO HAVE A 'MOBILE ENGAGEMENT STRATEGY'

Designing an effective mobile website has become a necessity for universities. With the increasing percentage of students using smart phones, many university websites worldwide are moving towards addressing mobile needs [4].A number of renowned universities have already entered the mobile realm; those who have not shifted to mobile so far have also started thinking about it. With mobile becoming so pervasive, every major educational institute is altering their 'stakeholder engagement strategy' keeping "mobile" on its mind. Students have got so accustomed to mobile devices that

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universities need to address the issue of providing information access via mobile devices. A research study '2013 E-Expectations Report'[8], stated that:

- 78% students have regular access to mobile device;
- 43% students use mobile device for web browsing;
- 68% students have viewed college website on mobile device;
- 73% students expressed interest in downloading campus-specific applications for schools

The above data illustrates that the alumnus, current and future student communities are likely to rely heavily on mobile devices for information needs, like, campus maps, attendance, results, calendar, etc.

The mobile applications (apps) by educational institution provide personalized information to the users. The apps uses features, like, push notification (sending message from college server to app users) to send messages to students, like, change in exam dates, due date for form submission etc. Apps use in-built features of smart phones, like, GPS or sensor to provide information about location of a building in university and the route to reach them. It can also be used to track movement of students in certain areas of campus for service usage, safety and other purposes. Students can interact with app to provide feedback, submit assignment, participate in discussion or simply review lectures.

III. MOBILE WEB VERSUS NATIVE APPS

The mobile applications can be developed for a specific platform, like, android, iOS, windows etc. or can be generic. Native apps are platform-specific whereas generic apps are termed as mobile web. We discuss the two kinds of apps in the following subsections.

A. Mobile Web

The mobile web are developed using HTML and CSS and operate on various platforms. They are further classified as Responsive web, Mobile websites and Mobile web apps.*Responsive Web* is websites that have only one site which is shared and fits all devices by rendering itself differently on each device. These are adaptive websites that apply a different style depending on size and features of the device. *Mobile websites* are websites specially designed to optimize pages for mobile devices. They have their own URL. Many companies differentiate their mobile site from website by "m.domain.com". *Mobile web apps* are not real apps; rather they are mobile websites that when opened via a mobile device browser gives look and feel of a mobile app. They are hyperlinked collection of web pages that can be installed on any web-enabled mobile device by creating bookmark to the respective webpage. Screen can be horizontally swiped to look at other sections of web page. The browser tabs, buttons and bars are not visible to give a more native app like experience to user.

B. Native Apps

Native Apps are applications written in native language of a particular platform like Objective-C for iOS, Java for Android, and C #for Windows Phone. They are downloaded from app store and installed on the mobile device. They can take full advantage of features of the device for which they are developed. They use camera, accelerometer, GPS, contact-list etc. Native apps live on the device itself and not on the web server, so they can operate offline also. Fig.1. shows the interaction of user device with mobile web and native app.

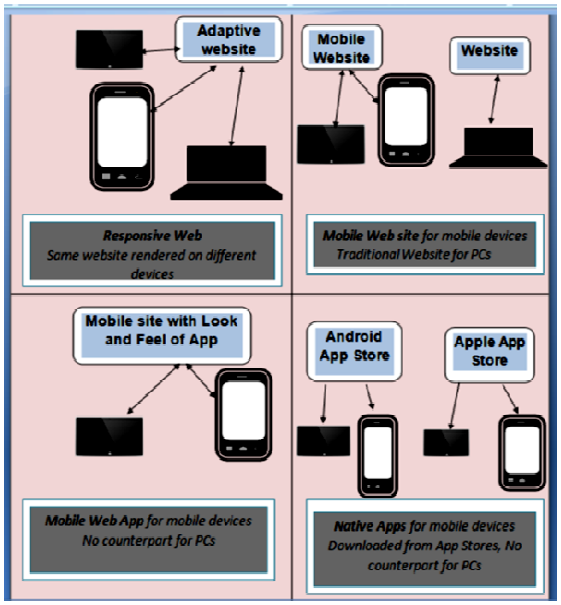


Fig. 1. Interaction of Devices with Mobile Web and Native Apps

In addition to mobile web and native apps, there is a third category, Hybrid Apps, which is an amalgamation of both. Hybrid apps are installed from a web store and can access device capabilities that are inaccessible by mobile web applications. They are developed using open standard based web technologies, such as, HTML5, CSS, and JavaScript.Fig.2 highlights features of mobile web and native app.

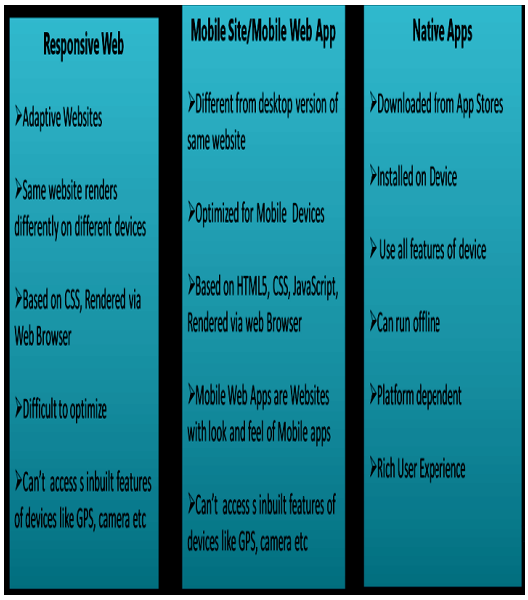


Fig. 2. Comparison: Responsive web, Mobile Web, Mobile App

For educational institutions, to opt for mobile web or native app is a tough decision. A survey of students may be conducted at university to understand student inclination for mobile web or native apps. For example, EDUCAUSE mobile app survey for Purdue University students [5] showed strong preference for native apps.

IV. MOBILE PENETRATION ACROSS UNIVERSITIES

To understand presence of mobile apps in the universities, we use the Times Higher Education World University ranking for 2013-2014. We performed a study of top Universities from every continent to understand the type of mobile presence of these universities. We visited the websites/mobile websites of these universities [9]...[41] and searched Google and Apple App Stores to identify mobile options that these universities provide to their stakeholders. Table 1 shows the kind of mobile presence the universities have. We found that some of the top universities, like, University of Tokyo do not have mobile presence.

TABLE I MOBILE PRESENCE IN GLOBAL UNIVERSITIES

Continent	Country	Name	Mobile Web	Native Android	Native iOS
Asia	Singapore	National university of Singapore	✓	✓	✓
	Hong Kong	The University of Hong Kong	✓	✓	✓
	China	Tsinghua University	—	✓	✓
	Japan	Kyoto University	✓	✓	✓
	Hong Kong	Hong Kong University of Science And technology	✓	✓	✓
Africa	South Africa	University of Cape Town	–	✓	✓
North America	United States	California Institute of Technology	–	✓	✓
	United States	Harvard University	✓	✓	✓
	United States	Stanford University	✓	✓	✓
	United States	MIT	✓	✓	✓
	United States	Princeton University	✓	✓	✓
	United States	University of California, Berkeley	✓	–	✓
	United States	University of Chicago	✓	✓	✓
	United States	Yale University	✓	✓	✓
	United States	University of California, Los Angeles	✓	✓	✓
	United States	Columbia university	✓	✓	✓
	Colombia	University of the Andes	–	✓	✓
	Brazil	State University of Campinas	–	✓	✓
Europe	UK	University of Oxford	✓	✓	✓
	UK	University of Cambridge	–	✓	✓
	UK	Imperial College of London	✓	✓	✓
	Switzerland	ETH Zurich-Swiss federal Institute of technology Zurich	–	✓	✓
	UK	University College London	✓	✓	✓

	UK	London School Of Economics and Political Science	✓	✓	✓
	Sweden	Karolinska Institute	–	✓	✓
	Switzerland	Ecole Poly Technique Federale de Laussane	✓	✓	✓
	UK	King's College London	✓	✓	✓
Australia	Australia	University of Melbourne	✓	–	✓
	Australia	Australian National university	✓	✓	✓
	Australia	University of Queensland Australia	–	✓	✓
	Australia	University of Sydney	✓	✓	✓
	Australia	Monash University	✓	✓	✓
	Australia	University of New South whales	✓	✓	✓
	Australia	University of Adelaide	✓	✓	✓
	Australia	University of Newcastle	✓	✓	✓
Number of Universities (Total =35)			26	33	35

Based on data in the above table, we observe that all the universities in our data set have mobile presence in one form or the other (mobile web/native app).Thirty three out of Thirty five universities in our datasets have native apps for android platform and all the universities have mobile presence on iOS platform. Some universities have native apps for other platforms, like, Windows Phone OS or Blackberry but we have not included platforms other than android and iOS in our study. Fig.3 shows a graphical view of data listed in Table I.

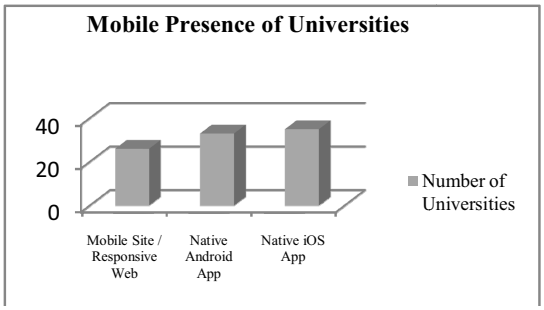


Fig. 3. Mobile Presence of Universities

Some of the key observations are as follows-

- More universities were found to have native apps than mobile web.
- Universities providing native apps were for more than one platform - android, iOS.
- Universities having mobile web also had a native app for at least one platform. As can be seen, a common practice followed by most of universities is to have native apps for one or two popular platforms and a mobile web for all other mobile devices.

V. FEATURESOF UNIVERSITY MOBILEAPPS

Students expect mature apps that are 'informative as well as impressive'. Besides providing useful features such as library catalogues, campus maps, apps should be able to engage stakeholders through visuals and videos. Findings of a survey conducted on 363 undergraduate and graduate students of National Dong Hwa University, Hualien, Taiwan, clearly state that 'the potential for mobile applications in university libraries is quite great' [2].Other features like transport information and campus news are also considered important in university apps.

Since websites were the first user interface of universities for many years (till mobile became mainstream), we studied websites of popular universities round the globe like Harvard university[42] ,Stanford university[43] etc., and identified most important features/utilities that were present on these websites. With the ongoing paradigm shift from websites to mobile, now, these features must be provided via their mobile counterparts. These features include:

- Interactive campus maps
- Searchable Library/Course catalogues
- Admission process
- Videos for campus tours
- Results
- Timetable
- Upcoming events, performances, lectures
- Transportation and contact information
- Directory/Campus Contacts

We have visited Google and Apple app stores to jot down the features provided by university apps/sites. For the data set considered in the previous section, we show in Table II, the absence or presence of above listed features in the respective mobile sites/apps.

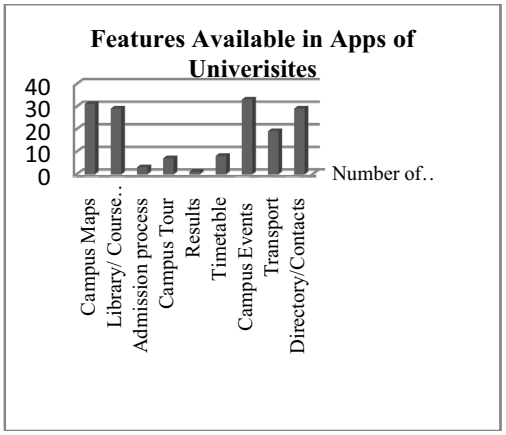
TABLE II FEATURES OF UNIVERSITY MOBILE APPS

University Name	Campus Map	Library/ Course Catalogue	Admission process	Campus Tour	Results	Timetable	News/ Events/ Calendar	Transport Information	Directory/ Contacts
National University of Singapore	✓	✓	✓	—	—	✓	✓	✓	✓
The University of Hong Kong	✓	✓	—	—	—	✓	✓	✓	✓
Tsinghua University	✓	✓	—	—	—	—	✓	—	—
Kyoto Univerity	—	✓	—	—	—	—	—	—	—
Hong Kong University of Science And technology	✓	✓	—	✓	—	—	✓	—	✓
University of Cape Town	✓	✓	—	—	✓	✓	✓	✓	—
California institute Of Technology	✓	—	—	—	—	—	—	—	✓
Harvard University	✓	✓	✓	✓	—	—	✓	✓	✓
Stanford University	✓	✓	—	—	—	—	✓	—	✓
MIT	✓	✓	—	✓	—	—	✓	✓	✓
Princeton University	✓	✓	—	✓	—	—	✓	✓	✓
University of California, Berkeley	✓	✓	—	✓	—	—	✓	—	✓
University of Chicago	✓	✓	✓	✓	—	—	✓	✓	✓
Yale University	✓	—	—	—	—	—	✓	✓	✓
University of California, Los Angeles	✓	✓	—	—	—	—	✓	✓	✓
Columbia university	✓	✓	—	—	—	—	✓	✓	✓
University of the Andes	✓	✓	—	—	—	—	✓	—	✓
State University of Campinas	—	✓	—	—	—	—	✓	—	—
University of Oxford	✓	✓	—	—	—	—	✓	✓	✓
University of Cambridge	✓	✓	—	—	—	—	✓	✓	—
Imperial College of London	✓	✓	—	—	—	✓	✓	✓	✓
ETH Zurich-Swiss federal Institute of technology ,Zurich	—	—	—	—	—	—	✓	—	✓
University College London	✓	✓	—	—	—	✓	✓	—	✓
London School Of Economics and Political Science	✓	✓	—	—	—	✓	✓	—	✓
Karolinska Institute	✓	✓	—	—	—	—	✓	✓	✓
Ecole Poly Technique Federale de Laussane	—	✓	—	—	—	—	✓	✓	✓
King's College London	✓	✓	—	—	—	—	✓	—	✓
University of Melbourne	✓	—	—	—	—	—	✓	—	✓
Australian National university	✓	✓	—	✓	—	—	✓	✓	✓
University of Queensland Australia	✓	—	—	—	—	✓	✓	—	—
University of Sydney	✓	✓	—	—	—	—	✓	—	✓
Monash University	✓	—	—	—	—	—	✓	✓	✓
University of New South whales	✓	✓	—	—	—	—	✓	✓	✓
University of Adelaide	✓	✓	—	—	—	—	✓	✓	✓
University of Newcastle	✓	✓	—	—	—	✓	✓	—	✓
Number of universities apps/mobile sites providing particular feature	31	29	3	7	1	8	33	19	29

Based on the data given in Table 3, the key observations are as follows -

- Campus news/events are most commonly provided feature provided by about 94% universities.
- Campus Maps is next common feature provided by about 89% universities.
- Directory (key phone numbers) and library catalogues are next most popular features, available in 82% of our data set.
- Transport information is provided by 54%
- Less common features are results, admission provided by less than 10% universities.

Fig.4. is a graphical representation of the observations.



There are some interesting features that are not listed above but were found in apps of some of the universities. For example, Kings College, London provides a feature in its app to find the computer in lab that is available for use. Some universities, like, NUS Singapore provide a feature that shows availability of dining options in the campus. Some universities provide access to scores/statistics of their sport teams. Fig. 5 shows snapshots of feature screen of mobile apps of some universities.

Fig. 5.Feature Screens of University Apps

VI. CONCLUSION

The growth of mobile phones (and internet) has made it another medium through which universities can engage with their stakeholders. Top universities now provide mobile access for students using mobile web or native apps. These have features which help students manage their academic activities and provide information about happenings around the university. The ability to deliver personalized information to students makes these Apps a powerful tool for Universities. Universities in the developed world and in parts of Asia have already established their mobile presence while those in Africa and South America are catching up. In future, mobile engagement is expected to become a key criterion for measuring any university's popularity.

VII. ACKNOWLEDGMENT

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