



The Impact on the Rapidly Changing Mobile Devices Market on e-Learning in Higher Education

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ABSTRACT

The business sector for cell phones is advancing rapidly, carrying with it both new innovations and also expanded desires for the execution of cell phones and substance. For higher training establishments that need to empower learning on cell phones, these adjustments in innovation and desires will have a critical effect on e-Learning techniques. Taking a gander at current business sector information and estimates, this paper gives a point of view toward patterns in the cell phone and applications market and additionally viewpoints on how changes in this business sector will affect e-Learning.

Keywords: Mobile Devices, Higher Education, E-Learning.

I. INTRODUCTION

The business sector for cell phones – tablet PCs, advanced mobile phones, tablets, and so on – is changing and developing quickly, carrying with it new gadgets, new principles and new assumptions about portable abilities. For advanced education establishments that need to empower learning on cell phones, these progressions will keep on having a critical effect on these endeavours. Given the consumerization of versatile innovation in the course of the most recent decade, the era of understudies now entering advanced education have elevated requirements toward cell phones and portable substance. Joined with the quickly changing portable innovation market, understudies' exclusive standards exhibit a huge test for establishments in making and sending substance which has an expansive reach yet meets clients' originations of value and usefulness. This paper analyzes the present conjectures and patterns in cell phones, working frameworks and applications to highlight a challenges' percentage organizations will confront with portability and e-Learning. The last area gives points of view on the effect of these cell phone and application patterns on e-Learning at advanced education organization.

II. MOBILE DEVICE TRENDS

A. Tablet market

While tablets are relatively new to the mobile market, they have quickly moved from a niche product into a mainstream consumer good. According to the technology forecaster Gartner, the global purchasing of tablets jumped from 17.6 million units in 2010 to a projected 64 million in 2011. This number is expected to reach 326 million units in 2015.

In terms of devices, Apple's I-Pad has been and is projected to remain the leader in tablet sales through 2014, during which time it is anticipated to hold more than 50 percent of the market share. The decline in I-OS market share over the next three years will be caused by the growth of Android as well as the entry of other competitors like Microsoft. Forecasts in spring 2011 which put Android as a growing competitor for Apple in 2011 were revised in the fall with a less optimistic outlook – a 28 percent decrease from original projections. The adoption rate of Android tablets, for the time being, has been slower than expected, according to an analysis by Canaccord Genuity [4]. This trend will likely be subject to change as the Android OS runs on a large variety of tablets from different manufactures.

While their market share is anticipated to remain low, with no individual competitor at more than 5 percent, other platforms have and are projected to enter the market. In fall 2011, Amazon released Kindle Fire and Sony released Tablet S, both which run on Android. Several companies including Samsung, HP, Dell, and Nokia are planning to release Windows 8 tablets during the latter half of 2012, which is slated to increase Microsoft's OS market share significantly [9,1].

Given that the tablet market is still in its infancy, the certainty of market forecasts is somewhat unclear. HP's Touch Pad, for example, was expected as a substantial market competitor but was discontinued about a month after its release. As seen in the chart below, while there is a relatively significant amount of volatility, forecasts by Gartner show that it is highly likely I-OS and Android will combine to dominate the tablet OS market over the next few years. Nevertheless, given the various diversity which will continue to exist in the market, education institutions will need to be prepared for a fragmented tablet OS landscape with at least four different platforms (I-OS, Android, QNX, and Microsoft).

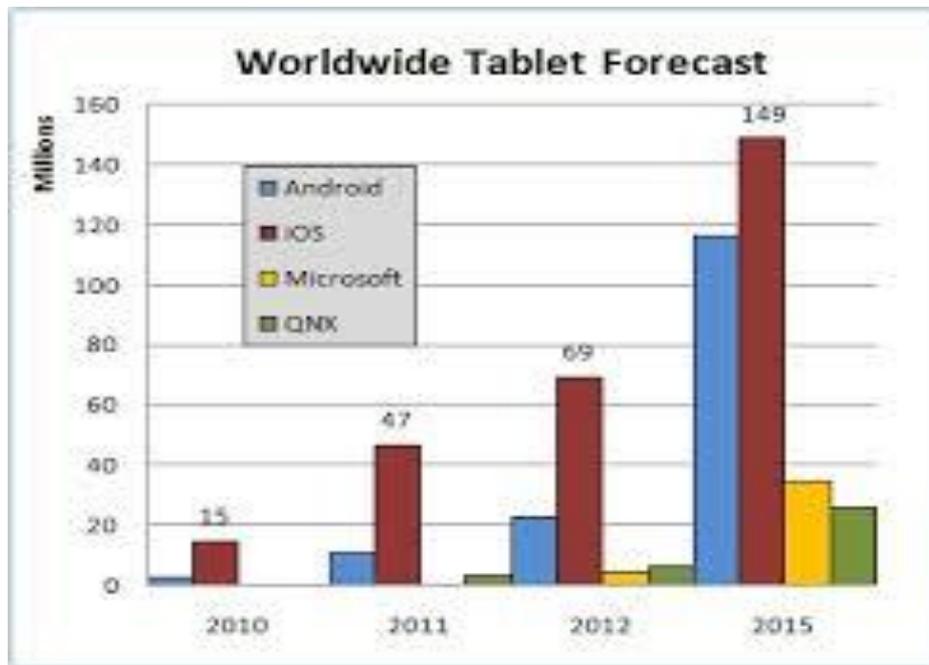
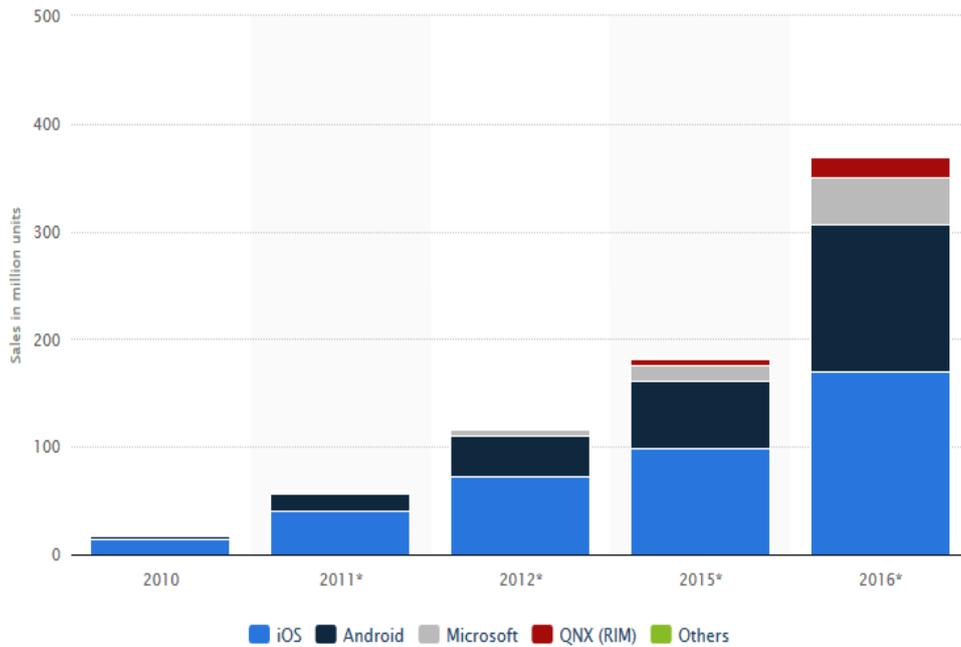


Figure 1. Forecast of worldwide tablet sales to end users by OS, 2010-2015

By 2015, the normal offering cost of all open OS gadgets (i.e. each OS with a distributed programming advancement unit and application system pack) is anticipated to be at USD 300 or less, setting up cell phones as the standard cellular telephone [12]. The relative reasonableness of cell phones will add to the development of the worldwide introduced base of cell phones, anticipated to main one billion units before the end of 2012.

Android gadgets will, as indicated by Gartner, keep on overwhelming the cell phone market and develop to an offer of 49 percent by 2015, up from 23 percent in 2010. Google's stage will be trailed by Microsoft's Windows Phone OS, which is estimated to build its piece of the overall industry from 5 percent in 2010 to 20 percent by 2015. Apple's iOS will represent 20 percent, and BlackBerry maker RIM's piece of the pie will remain at 17 percent. Nokia's Symbian stage is anticipated to drop from its 2010 business sector pioneer position with 38 percent to 0.1 percent in 2015, on the grounds that Nokia chose in February 2011 to change its OS to the Windows Phone 7.

In this manner, like the tablet showcase, the cell phone OS scene is anticipated to stay divided with four overwhelming stages (Android, Microsoft, iOS and RIM). Be that as it may, three stages which can possibly essentially change in the business sector throughout the following 12-year and a half are Samsung's OS Bada, Microsoft's Window's Phone, and Blackberry.

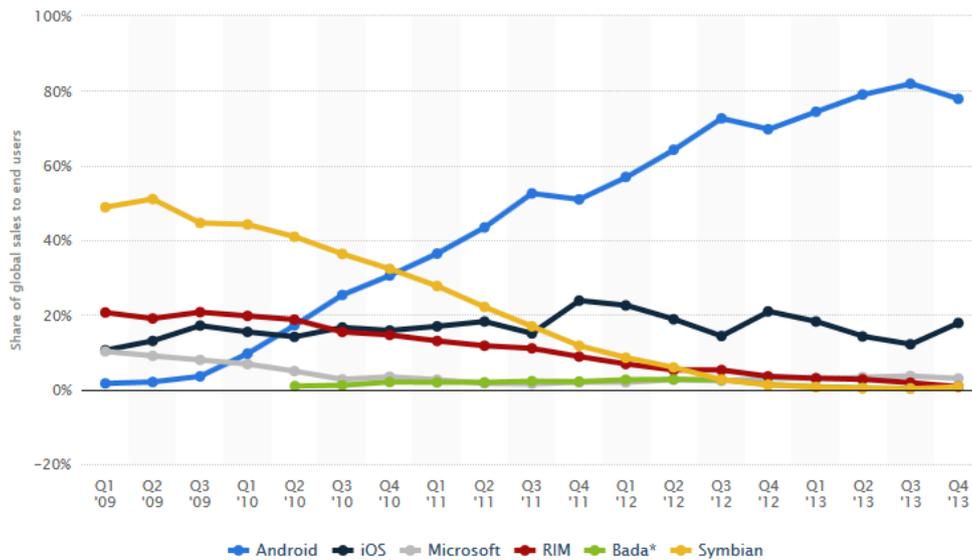


Figure 2. Forecast of worldwide smartphone sales to end users by OS, 2010-2015
 Source: Gartner.

The above Gartner conjectures possibly disparages Samsung's OS Bada, which it incorporates into the class "different OS". In Q3 2011, in spite of the accomplishment of the Samsung Galaxy, which keeps running on Android, Samsung's push of Bada Smartphones sold more than 2.5 million gadgets – rather than Window's telephone which sold 1.7 million gadgets amid Q1-Q3 in 2011. On the off chance that Samsung organized the generation of Bada cell phones over Android gadgets, Bada may turn into an immediate opponent for the Windows Phone OS, in spite of the presentation of Nokia's new Windows gadgets [3]. Blackberry saw a genuine drop in deals all through 2011, completing at 8.8 percent of the world business sector in Q4 2011 – contrasted and 14 percent in Q4 of 2010 [11]. In January 2012, the organization got another CEO whose expressed objective is to build up the organization for more extensive buyer bid, as opposed to its past spotlight on the undertaking. Contingent upon the achievement of the new CEO, Blackberry's anticipated offer could be far littler in 2

B. e-Book reader market

As indicated by the economic specialist Juniper, tablet shipments are anticipated to reach 67 million by 2016 – about tripling the number for 2011 (25 million altogether). As per the examination firm IDC, Amazon drove the tablet market in Q3 of 2011 with a 51.5 percent piece of the overall industry, with Barnes and Noble after at 21.2 percent. The tablet business sector is stratified into two fragments: On the one hand, there are committed tablets, of which some are advertised by eBook merchants, for example, Barnes & Noble, Amazon, or Google. Then again, eBooks are additionally perused on high performing Tablet PCs and cell phones, quite with applications from Kindle, Barnes & Noble, Google, and Apple (iOS just). As indicated by a 2011 Pew examination study, 12 percent of the US populace has a tablet and 8 percent a Tablet. Just 3 percent own both gadgets [9]

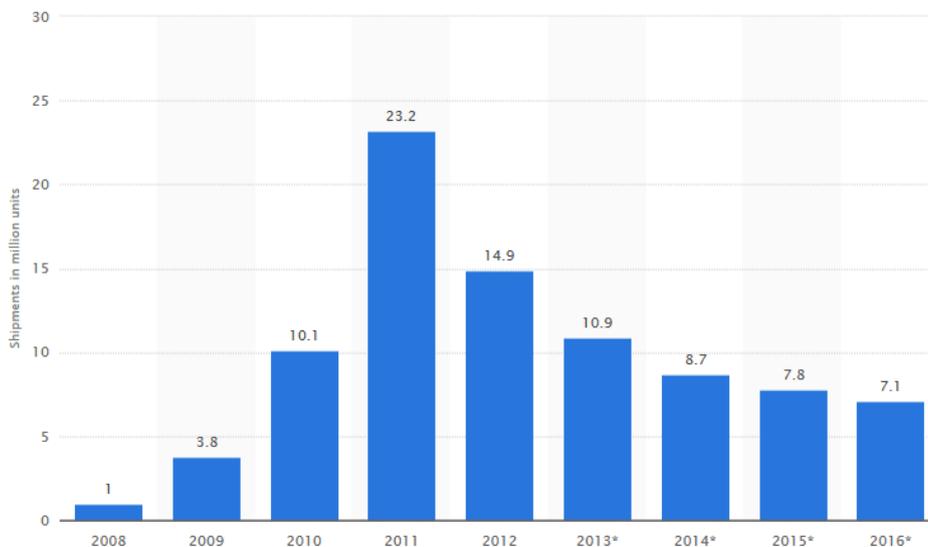


Figure 3: Shipments of e-book readers worldwide from 2008 to 2016 (in million units)

After some time, tablets and tablets are prone to merge into one gadget. Aside from weight and impressive value contrasts, the fundamental point of preference of committed (highly contrasting) tablets over tablets is the translucent e-ink show that

does not weariness the client's eyes and can be perused even in direct daylight. Show innovation that joins both shading and e-ink is as of now in the business' advancement pipeline. Apple, for instance, secured a patent for a half and half screen for its gadgets, which lets the client switch between the shading (LCD or OLED) presentation and e-ink [5].

C. Mobile platform standard trends: apps vs. web

As indicated by a US study by Flurry Analytics in June 2010, clients were burning through 21 more minutes a day scanning the portable web than utilizing applications. This behavioral example changed with the expanding accomplishment of applications. In June 2011, clients spent overall 74 minutes for every day versatile perusing and 81 minutes for every day utilizing applications [10]. Applications have turned into a noteworthy piece of versatile client conduct which is reflected in the adjustment in the quantity of applications downloaded every day from significant stores like Apple – 18.4 million in Q3 2010 to 33.3 million in Q3 2011.

While application downloads have kept on expanding, portable web is likewise a developing pattern because of its gadget and stage rationalism. Up until fall 2011, one noteworthy issue for the advancement of versatile substance on program based stages has been the hostile issue of Adobe Flash for portable, which has not been bolstered on iOS (e.g. substance made with Adobe Flash couldn't be played on an iPhone). In November 2011, in any case, Adobe declared that it would stop the advancement of its Flash portable program module. The crevice left by Adobe Flash will gradually start to be filled by the new program programming dialect HTML5, which will likewise help in defeating a portion of the OS discontinuity in the cell phone market in close to what's to come. HTML5 bolsters non-exclusive sound and video measures, and takes into consideration the production of drawing in, interactive media rich substance that can be completely incorporated with cell phones. One of the biggest issues with moving to online stages has been clients' elevated standards got from encounters with local applications. Key improvements with JavaScript and Node.js, be that as it may, are serving to empower a more regular look and feel with HTML5 which is more like that of local application.

III. IMPACT OF MOBILE TRENDS ON E-LEARNING

While trends in the mobile device market continue to change and evolve, the overall shift towards mobile is clear, resulting in an ever greater impact on e-Learning. The following section explores issues which are already affecting higher education institutions today, and will remain important for institutional e- Learning strategies in the future.

A. The nature of mobile devices

Cell phones offer, by definition, a fundamentally diverse client experience from conventional desktop and PCs. Along these lines learning on cell phones is likewise an essentially diverse affair, especially with respect to the measure of data that can be retained from the cell phone at any one time. The porting over of substance from existing classroom-and desktop/tablet based e-Learning materials can bring about noteworthy arrangement issues as far as meaningfulness and determination, as well as far as the adequacy of substance transmission.

Organizations, in close association with employees, should choose which materials could make included quality in a prepared structure and how that frame can best come to fruition. Given the expansive scope of necessities and prerequisites of making admirably working versatile empowered substance, its advancement regularly requires consistent criticism and tweaking by workforce, understudies, IT and institutional organization. Especially if a foundation is simply making a versatile technique, the guiding of specific courses or material in portable structure may be the most ideal route for organizations to bolster and develop versatile substance and institutional information about learning on cell phones. The learning picked up from one test case project can serve as a premise for the improvement of different activities.

B. Supporting a fragmented landscape

While mobile device and OS market forecasts can change dramatically year to year, they do provide an idea of where the market is heading. As discussed in the second section of this paper, while some convergence is expected in both the tablet and smartphone markets, fragmentation – device, manufacturer, operating system, etc – will continue to be a key characteristic of the entire mobile market.

Unfortunately, when it comes to institutional support for learning on mobile devices, there is not, and likely will not be a device or platform panacea. For institutions that want to accommodate learners on their own devices, there are a number of issues that they will face.

For one, creating and deploying native mobile apps can be a major challenge that even many large private sector companies are reluctant to undertake. Programming, customizing and updating apps for multiple devices and OS according to the different screen-sizes, resolutions, orientation (landscape or portrait), color graphics and video/audio formats is time consuming, not cost-effective, and subject to different security and reliability issues.

As a consequence, education institutions are increasingly shifting their attention from apps to browser-based platforms that can be accessed on any type of handheld device. New development platforms such as the UCLA Mobile Web Framework and the Quali Foundation Mobility Enterprise are facilitating the development of mobile websites and allow for a decentralized and bottom-up development of mobile learning capacities [6].

However, as discussed earlier in this paper, mobile web does yet not provide the user experience and functionality (i.e. the ability to take full advantage of the device's native capabilities – camera, microphone, etc.) that a native application does. The end of Adobe

Flash for mobile and the maturation of HTML5 over the next few years will push to establish the web as a viable cross-device alternative to apps. This will certainly enable higher education institutions to better provide mobile learning programs which do not require students to have a certain OS and/or mobile device and will allow students to directly access any learning content with their device of choice (mobile or non-mobile), without the need to preinstall apps.

Despite the advancements toward better mobile web, progress toward a true “native” alternative has not yet arrived. Thus the fragmentation of both devices and operating systems will ultimately force higher education institutions to make certain choices about mobility: Institutions that choose to focus too narrowly on any one device or platform may miss opportunities to reach a broad audience may find themselves flat-footed when the market presents a new opportunity. Conversely, institutions which focus too broadly (i.e. only at device agnostic solutions) may miss out in providing learners with an engaging enough mobile experience. As the speed of mobile development moves ahead rapidly, institutions may find their middle-of-the-road efforts met by underwhelmed audiences whose daily consumer experience with their mobile device is far more rich.

C. Demands from on-campus mobility

Understanding market trends and challenges can help a higher education institution better adapt its mobility and e-Learning strategies by creating awareness of possible new market players, shifts in usage patterns, and new or emerging capabilities (e.g. tablet computers with e-ink capability). It should be considered, however, that the market for mobile devices/OS is segmented and thus will see different expressions in different user groups (i.e. differences seen in age, occupation, region, etc.) of which a higher education institution could consist of many. Depending on the higher education institution (i.e. a small liberal arts college versus a large public research university versus a midsized community college) the device and OS preferences may be substantially different among users. Some of the multitude of factors affecting device and OS preferences and usage in a higher education institution include:

- Institution type (i.e. liberal arts, research, business, etc.).
- Program (i.e. undergraduates, graduates, PEL, etc.).
- Population mix (i.e. domestic versus international).

In considering these factors, higher education institutions should use annual surveys in order to truly know what mobile device trends are occurring on campus and how strategies and responses should be modulated. Such surveys should collect data on both students and faculty members as well as in class and out of class usage patterns.

Institutions should also use surveys to identify user groups which may be affected with changing trends or institutional policies (i.e. shifts toward or away from apps, etc.). These surveys should also be used as an opportunity to identify user groups who would be better reached with a more targeted strategy or who may not be able to engage with e-Learning on mobile devices due to a lack of resources.

D. Outlook

Despite the constraints and challenges which institutions will face in implementing mobile opportunities for e-Learning, mobile contrivances present unparalleled learning opportunities which higher education cannot afford to ignore. On the most rudimentary level, mobile contrivances sanction institutions to tap into learning streams anywhere and anytime through Wi-Fi and data connectivity. Given the incrementing mobility of society which is reflected in the magnification of mobile workers, mobile commerce, etc., classroom and learning boundaries have been increasingly blurred into all facets of daily life.

On a more advanced level, the implements which mobile contrivances provide – cameras, microphones, recording contrivances and up-and-coming technologies like Near Field Communication (NFC), Augmented Authenticity (AR), etc. – enable institutions to offer their students authentically twenty-first century learning opportunities. As these capabilities perpetuate to grow in both reach and scope, the possibilities for e-Learning will perpetuate to broaden. Institutions which seek to provide the best opportunities for their students and faculty will require to perpetuate to visually examine trends in the mobile market in order to best support mobile learning and ascertain the institution will be able to meet learning and edifying prospects in the future.

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