HTML5 – bridging the mobile platform gap: mobile technologies in scholarly communication

The explosion in smart mobile devices is increasing demand for mobile-enabled content and services. The growth in this market has provided opportunities for scholarly publishers to deliver targeted and relevant mobile content and information to their customers.

Most innovative publishers have started to experiment with mobile strategies, and have developed applications for iPhone, Android and BlackBerry. However, since these devices are based on different technology platforms, development for multiple devices inevitably means significant duplicated effort as application code cannot be shared between them.

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HTML5 provides publishers with a new set of powerful technologies to mitigate this problem. By using HTML5 and web services, publishers can cut out wasted effort and build cross-platform apps which work on all current mobile devices. This paper explores the options in more detail, and shows how publishers can reduce development costs, improve time to market and deliver more future-proof mobile applications.

E-reading comes of age

The proliferation in recent years of smart mobile devices, e-readers, tablets and the like is arguably the development that at last makes e-reading a practical and mainstream reality, and therefore signals a new maturity in the digital publishing industry.

Reading e-books or e-journals on a desktop computer was never an entirely satisfying experience, and they were always going to seem like poorer versions of their real-world equivalents until the delivery technology evolved to a point where they could begin to offer added value – in terms of greater convenience, speed and enhanced media possibilities – over physical publications. Now at last it seems that reading from a screen, rather than from a printed page, can offer a compelling value proposition to the end-user. And as we shall see, publishers of non-narrative works, particularly, have additional areas of added value they can tap into arising from features particular to mobile devices, such as geolocation. Such possibilities will inevitably lead to big changes in the way published content is delivered and accessed; changes that will impact not only the consumer market, but also the scholarly and professional information market.

Every silver lining has a cloud, however, and it cannot be denied that the speed and scale of this change is causing disruption in all parts of the publishing supply change: for publishers, intermediaries and librarians alike.

Many institutions have invested heavily in e-resources designed to be read on computer screens, and may find themselves wrong-footed by the pace at which mobile access to information content is becoming mainstream. Even forward-looking initiatives such as Elsevier's 'Article of the Future' prototypes[1] are designed with computer-screen reading in mind. Librarians might feel that the liberation of published content from constraints of place, and the diminishing reliance on physical objects that have to be wheeled about and kept in stacks – trends which mobile delivery can only accelerate – are placing them in imminent danger

of being disintermediated. At the very least their roles will change, with a requirement for new skill-sets and knowledge.

For publishers, the commercial uncertainties of the highly competitive mobile market space – the Darwinian struggle of form factors and feature sets, the turf wars between tech behemoths like Apple and Google – are providing a series of headaches, not least of which is the challenge of cross-platform publishing.

Which devices / operating systems / app stores should they develop for? Should they take an organization-wide strategic decision about such questions (based on factors like who will succeed Steve Jobs, or what they think Google's ultimate plan for Android might be) or should they make decisions on a collection-by-collection or even title-by-title basis? What development platform or platforms should they support, and what resources and knowledge might they need to be able to take these decisions sensibly?

It is the latter of these challenges – the problem of cross-platform content delivery – that we intend to concentrate on in this article, because while it might seem primarily an issue for publishers, it also affects intimately those 'downstream' in the supply chain such as intermediaries and librarians, because it is here that we see the full import of the mobile revolution. Many information sources that currently come packaged as journals or books could soon begin to look very different. As we will see, books can now become not only e-books, but also software applications, or apps.

We hope to provide some insights here that will help inform and clarify the decisions that will arise out of these changes – not a paracetamol to take away the headache, perhaps; more a piece of Dr Kawashima brain-training. We will point up some significant trends in the mobile market, survey the technology landscape, and finally zero in on the particular set of decisions thrown up by the issue of whether it is better in any given set of circumstances to develop a native app for mobile, or to optimize an existing website.

Trends in the mobile market

Perhaps the most significant trend in the mobile market is the rapid growth of the mobile internet. Morgan Stanley predicts that internet access through mobile devices will overtake desktop traffic within five years. Gartner has an even more aggressive forecast: smartphones will surpass 1.82 billion units by 2013, says the analyst, eclipsing the total number of 1.78 billion PCs by then. According to Deloitte (May 2009), web traffic from mobiles is growing eight times faster than web traffic from UK PCs.

Figure 1 shows the publishers' problem in a nutshell. While publishing to desktop devices is

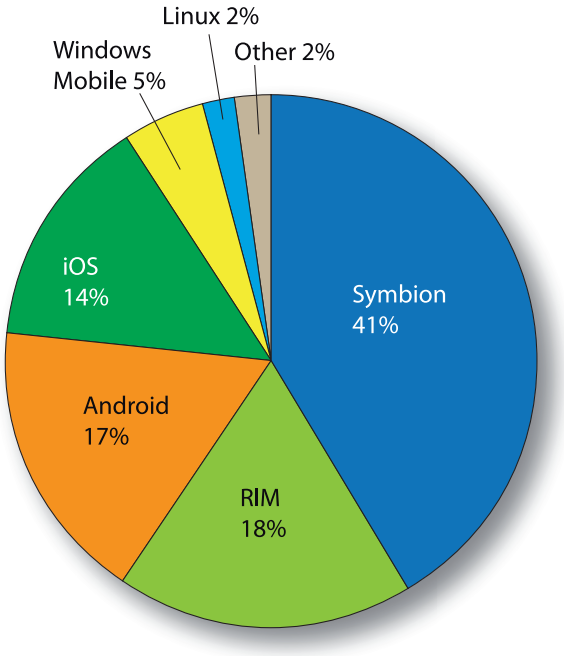

Figure 1. Smartphone OS sales 2010 (Source: Gartner)

relatively pain-free nowadays, thanks to platform-agnostic formats such as HTML, PDF, EPUB, Flash, etc. and a greater degree of interoperability between the two leading operating systems, Windows and Apple's OS X than existed in previous times, the mobile market is a far more diverse proposition when it comes to operating systems.

Not only are there a number of operating systems to cater for, but the diversity between them is far greater than is found in the desktop world. To focus on language alone, iOS, the operating system of Apple's hugely popular and influential iPhone and iPad devices, uses Objective-C, while Windows phones use .Net, and Android and BlackBerry each use very different flavours of Java. Neither are the devices they run on at all homogeneous. Screen size varies hugely between BlackBerry, the different Android devices and iPhone. And that's without factoring in tablet formats such as iPad.

Within operating systems there is further diversity. The OEMs who make the devices are always looking for ways to differentiate their brands, with the result that two devices running what seems like the same operating system can behave very differently. Android, Google's open source operating system, runs on many different devices and can look very different depending where you encounter it. Different models of BlackBerry, though made by the same OEM, are also very different to develop for.

A further level of complexity is introduced by the competitiveness and relative immaturity of the market. In this respect, Figure 1 is slightly misleading in that it shows market share for an entire year. However, during that year, there was a lot of movement. Android, particularly, increased its share considerably. Figures for Q4 would show a very different balance between Symbian, used by Nokia and Sony (41% over the whole year, but 31% in Q4) and Android (17% over the whole year, but 33% in Q4[2]). There is no clear market leader in the smartphone market, despite Apple's first-mover advantage in having produced the breakthrough device, the iPhone. The tablet/e-reader market is even more immature. Some tech analysts predict a Google/Apple duopoly along the lines of the Microsoft/Apple face-off that has dominated desktop computing, but even this is far from a done deal. BlackBerry is definitely a contender, with serious designs on the tablet market, and it would be foolish to write off Windows Mobile.

Another significant factor in the Mobile technology 'stack' - alongside devices, operating systems, OEMs and network operators (who also like to introduce elements of differentiation on occasion) – are the app stores.

Apple popularized the concept, but now faces stiff competition from a burgeoning number of app stores, which are either native to particular OSS or supplied as third-party platforms (see Table 1). The Android market, in particular, is coming up hard on the rails. At time of writing, it had already eclipsed Apple's App Store for iPhone in terms of free applications, and at current rates of growth is forecast to beat Apple into second place for overall number of apps available in late 2011[3].

Android has struggled to monetize its app store as quickly as Apple, however. Almost twice as many iPhone and iPod touch users regularly download paid apps as Android and webOS users[4].

Apple app store metrics should also be a source of encouragement for publishing. In October 2010, books managed to topple games as the number one category for apps in its store, and still at time of writing come a respectable second, with more than 57,000 book apps[5].

While the success of smartphones as e-reading devices has perhaps been somewhat unexpected, tablet devices such as iPad, BlackBerry Playbook and the rest, with their larger screen real estate and more book-like form factor, promise even more for e-reading. These will change the face of newspapers and magazines as well as e-books and e-journals, providing the opportunity, in the words of Chris Anderson from Wired, of creating 'rich, curated, long form, heavy duty, high investment media'. Hardware sales are already approaching those of e-ink devices such as Kindle.

However, all such good news also contains its share of woe, as each new device release only adds to the development headaches we have mentioned above, caused by the highly diverse nature of the mobile technology stack and the complex market landscape.

Time now, perhaps, to delve deeper into some of those technology issues – and to see what answers, if any, technology can provide to the complex challenges it has raised for content providers.

Technology: problems and opportunities

One important issue that we touched on earlier in this article is the question of what happens to

Mobile app stores	
Source: Wikipedia	
OS-native platforms	**Third-party platforms**
Android Market	Amazon Appstore
App Catalog	AmmApp
Software Store (Palm)	AndSpot
App Store	AndroidPIT App Center
App World	App Center
Download Fun/Download Catalog (Danger Hiptop/pre-2011 T-Mobile Sidekick)	Appitalism
Ovi Store	AppsLib
Windows Phone Marketplace	BloomWorlds
	Cellmania
	GetJar
	MobileRated
	Handmark
	Mobango
	Handango
	explorePDA.com
	LG Application Store
	MiKandi
	MobiHand
	Mobspot
	Mobile2Day, Smartphone.net
	PocketGear
	AndroidGear
	SymbianGear
	RimGear
	PalmGear
	Samsung Application Store
	SlideME
	Nduoa Market
	Software Store (Sprint)
	VZAppZone
	Get It Now

Table 1. Mobile app stores

published content when it migrates online. In common with other sectors of the information industry such as advertising, education and training, publishing experienced a first wave of digital enthusiasm where the focus was chiefly on like-for-like content conversion – e.g. billboards became banner ads, courses became e-courses and books became e-books – and then quickly found second wave, disruptive effects muddying the water. Text, once it is digitized and put online, has a disturbing tendency not to want to stay within the covers of a book. And readers (or as they tend to be called in this new world, users) just cannot be persuaded to behave in the same way towards the virtualized artefact as they did within the physical realm.

To illustrate this change in the interaction between content and users, and to perhaps throw a more positive light on it, I'd like to consider, briefly, a real-world example.

The *Good Beer Guide*, in its various printed editions, has long stood on bookshelves of mine or, more often, rattled around in the glove compartment of my car. But now I no longer buy it as a book. I have it as an app on my iPhone instead[6]. However, in this new incarnation it no longer appears or functions much like a book, although, paradoxically, I use it in much the same way: I hit a new town feeling thirsty, and consult the *Guide* for the nearest decent pub. It now responds to this requirement in a very different way, however. For

a start, due to the 'miracle' of geolocation, it knows where I am. I no longer need to consult an index to find my nearest pub (a whole job function, indexing, disintermediated out of the publishing process right there!), the *Guide* can present immediately to me the nearest pubs to where I am that it knows about, together with reviews. Not only that, but by interacting with Google Maps, it can help me get there. If I'm planning a journey in advance, I can search the *Guide* by address, or tube station. This sort of functionality is now so widespread in smartphone apps that we almost take it for granted, but the way in which this app delivers it reveals something significant about directories, guides and many other species of reference works: they are fundamentally databases. Putting them online enables them to interact with other databases (Google Maps, The London Tube system) to deliver added value.

There is nothing particularly special about the example I have chosen: CAMRA have not built the best app in the world, and the present writer could not vouch for whether it makes money for its publisher or not. However, the wider implications are clear: a significant amount of added value is locked up within broad swathes of non-narrative printed works that the mobile internet has the capability to release. Mobility, web services, data mash-ups and geolocation take us beyond the phase of like-for-like digitization, and into a more interesting place where an e-book need not be a pallid instantiation of a printed work, but something with its own extended life. This example of what is basically a consumer product also has repercussions for scholarly publishing. Just imagine that I am an academic and that instead of beer, it is a particular journal article or book I am after, and that it is not a town I am visiting but a university library, or an archive. It can be seen immediately that there is an implication here for those whose job is to provide access and discovery for information resources.

It is also worth noting in passing that my commercial relationship with the *Good Beer Guide* has changed through the process of its going online. Instead of having to buy a new print edition each year, I am now on an annual subscription, so don't have to stir myself to go to a bookshop in order to buy a physical volume. One click renews my subscription for another year, a transaction from which huge amounts of 'friction' have been removed. Neither, in theory at least, do I have to wait a whole year for updates. The app can update itself at any time, and the data it draws on remotely can change in real time.

Static or dynamic content?

This is not the sort of transformation one would want to visit on *War and Peace*. A novel is not a database, and neither is a historical monograph, for instance. But the *Good Beer Guide* example makes it clear that a digitized book can assume very different guises and forms online. Many publishers will be asking themselves the question when they take a title to mobile: should this be an e-book or an app? (A third category perhaps exists as well, which is becoming popular in children's books: the enhanced e-book). The basic fault line along which this decision will inevitably be made will be whether the final product is offering static or dynamic content: static content being, for instance, a PDF of *War and Peace*; and dynamic content being what we get from an app like the *Good Beer Guide*.

To date, the dominant formats in digital publishing have been PDF and EPUB, both static formats which, to varying degrees, make an e-book seem like a by-product of physical-world publishing work flow.

It is not too difficult to see why PDF is so popular: it is the cheapest form of reusable print output. Unfortunately, it is also boring. EPUB is a little more interesting, in that it allows text to be followable, and can enable search and better navigation. But while you can cite with EPUB, you cannot hyperlink. In a connected world, we would argue, this is no small failing.

Apps, too, can have their problems: they too easily produce static 'blobs' of content, hermetically sealed off from the wider internet.

As digital revenues increase to become a more significant slice of the overall pie, and mobile increases in importance within that digital slice, we can foresee the particular opportunities and constraints of publishing to mobile platforms forming an ever-more important aspect of decision-making, and coming into play at an ever-earlier stage of that process, firstly with production (where metadata is already an important issue), and eventually even with commissioning. Formatting technology will have to keep pace with this progress, with HTML5 pointing a possible way forward to lightweight XML first publishing workflows.

At the moment, however, digital publishing to mobile platforms is frontier territory. The term 'Wild West' is too often used for what must seem to many publishers like a fraught and uncertain space. Numerous issues make this so; one of which is rights – as in, how do you protect your intellectual property rights online when the available DRM systems are not only eminently hackable, but also hamper discoverability and degrade the customer experience – and another of which is the problem we began this article by outlining, the headache of publishing to multiple devices and platforms.

Cross-platform mobile development

Although there are considerable opportunities for publishers in making their content more dynamic, as we have seen, increased dynamism unfortunately tends to exacerbate the problems attendant on cross-platform development. Static content is easier to port.

Technology taketh away, but technology also giveth, however. A whole new generation of development tools has grown up to help alleviate the headaches caused by the diversity of mobile platforms, including:

- PhoneGap
- Appcelerator's Titanium
- Rhomobile
- Airplay SDK
- Corona SDK
- Adobe CS5.

Mainly focusing on the three leading platforms, iOS, Android and Symbian, though with some also offering support for BlackBerry and Palm, these tools allow developers to create native apps using common web programming languages like JavaScript and HTML5, and get back app store-ready apps without costly redevelopment.

Perhaps the most important point about these tools is that many use HTML5, the next version of the web's underlying language, potentially freeing publishers from having to grapple with proprietary languages such as Objective-C, in which far fewer developers are expert.

HTML5 is an important technology development for mobile, and promises to be a decisive factor in aiding the portability of dynamic content across platforms, obviating as it does the need for plug-ins such as Flash (banned on Apple's iOS).

However, clever as they are, these tools do not entirely take away the pain. While they handle fairly simple types of apps easily, they can struggle when it comes to features that access a device's native onboard functionality (by which I mean things like camera, accelerometer, speakers, GPS, etc.) This functionality varies from device to device, of course, making it difficult for a publisher to deliver a consistent product across all of them in any case.

To conclude, I'd like to drill down into this problem a little, examining the pros and cons of two different development routes that present themselves to content developers, and thus impact on the final form of the artefact that readers encounter.

Apps vs web

One of the key decisions to be taken in developing content for mobile is whether to create an app or a mobile-optimized website, accessed through the device's browser. Both routes have advantages and drawbacks, which it is probably easiest to lay out in tabular form (see Table 2).

Though these are all important considerations, the decision is not quite as dichotomous as this table might suggest.

Hybrid apps

Up until as little as a year ago, the choice was indeed fairly stark between these two alternatives. More recently, a third route has emerged – a hybrid app – which is enabled and made use of by certain of the new cross-platform development tools mentioned above.

The resulting app behaves like a native app, and feels like one as far as the user is concerned. Making calls to native APIs, it can access the native onboard features mentioned above just like a native app. However, it also has a browser inside it, so the app is updatable and can access remote data sources just like a browser-based app. The best of both worlds, it seems.

Conclusion

I hope this foray into the detail of issues in cross-platform content delivery has made a couple of

Comparison of web and app routes for development	
Mobile-optimized website (web route)	
Pro	**Con**
■ lower cost of development	■ internet connection required
■ fast time to market	■ speed and latency need care
■ dynamic content	■ possible monetization infrastructure
■ cross-platform HTML5, cross device	■ changes
■ leverage existing commerce infrastructure, new models	■ discovery via existing channels; may need SEO work
■	
■ leverage existing development process and tools	
■ leverage existing hosting and support	
App route	
Pro	**Con**
■ most controlled user experience	■ expense of custom development
■ use native UI for fast graphics	■ possibly reinventing the wheel
■ leverage existing distribution and monetization services; extend B2C reach	■ little potential for sharing development between different mobile platforms
■ upgrade mechanism to push new content and functionality	■ lack of ways to link apps together
	■ size of datasets bounded by device limits

Table 2. Comparison of web and app routes for development

things clear. The move to mobile computing has profound implications for the future of published information, not only in terms of how and where it is accessed, but also in how it is presented to users and how they interact with it. We are in something of a transitional phase, currently, typical of digital industries, where the dominant models are still online equivalents of physical world artefacts. The book becomes the e-book; but it is unlikely, as we move forward, that reproducing the form and 'functionality' of the codex is going to be the whole of the story for digital publishing. The superficial similarity of books masks a huge diversity of content types in published information; directories, data tables, monographs, text books, dictionaries, journals … all could show an increasing tendency to behave in different ways online, and might ultimately look very dissimilar.

The decision a publisher currently faces of whether a given print title should be turned into an e-book, an app, or even a mobile-enabled website, is indicative of the tenor of these future choices and decisions. Less than five years ago, before the invention of the app store, such a scenario would have been inconceivable. What will the next five bring?

There is an irony in the fact that users adapt quickly and readily to new devices and formats which can offer them greater speed and convenience, while companies and institutions, due to the rigidity of their internal structures and culture, often have greater difficulty in keeping up. The entire publishing supply chain is in a process of tumultuous change, which mobile computing can only accelerate. The first move in making the necessary adjustment in thinking is to grasp just how radical the scope of change might ultimately be.

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Further reading

Semantico's Discovery blog (http://blogs.semantico.com/discovery-blog/) carries regular posts on the subject of mobile content delivery, and many other issues in publishing and scholarly communication.

Issues in Mobile and Cross-platform Content Delivery, the report from a Symposium hosted by Semantico, was published in the journal *Logos*, 21 (2–1), 2010.

Reports from Distimo (www.distimo.com) are very useful in following the development of mobile published content through the various app stores.

We can also recommend the flowing blogs and websites, which regularly carry pieces relevant to the issues discussed in this article:

CrossRef Tech Blog:
http://www.crossref.org/CrossTech/

Disruptive Library Technology Jester:
http://dltj.org/

Huffpost Books:
http://www.huffingtonpost.com/books/

Information World Review:
http://www.iwr.co.uk/

LiveSerials:
http://liveserials.blogspot.com/

Lorcan Dempsey's weblog:
http://orweblog.oclc.org/

Macmillan Blog:
http://blog.macmillanspeaks.com/

Mark Logic CEO Blog:
http://marklogic.blogspot.com/

Nature.com Blog:
http://blogs.nature.com/blogs/categories/nature

nostuff.org:
http://www.nostuff.org/words/

OUP Blog:
http://blog.oup.com/

Print is Dead: Books in Our Digital Age:
http://www.dontcallhome.com/

Publishing 2.0:
http://publishing2.com/

Publishing Trends:
http://www.publishingtrends.com/

ReadWriteWeb:
http://www.readwriteweb.com/

Resource Shelf:
http://www.resourceshelf.com/

The Digitalist:
http://thedigitalist.net/

The Journal of Electronic Publishing:
http://www.journalofelectronicpublishing.org/

Wired:
http://www.wired.com/blogs/?intcid=gnav

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