

A world of learning in the palm of your hand

In just the last two years the mobile smartphone has started to be seen as the default access device to a world of information and applications. Despite the sophistication of smartphones, the technology is still in the very early stages of development, and in the next couple of years mobile broadband networks will offer transmission speeds greater than those provided in many offices and universities today. Having access to STM information in particular could be of significant benefit to people who are rarely at an office desk, but instead are on the move around research laboratories and large university campuses. Understanding the expectations of these users will be of paramount importance in providing profitable value-added services.



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Introduction

Over the last two decades the delivery of STM primary, secondary and tertiary content through CD-ROM and web technology has evolved fairly slowly and steadily. There was time to hold conferences, commission research reports and undertake pilot trials to work through the complex issues of getting added value from the technology at licence price points that met the aspirations of publishers and users. A decade ago laptop PCs were still relatively uncommon, and had quite poor screen resolution. There certainly have been some important technical developments over the last decade, especially in terms of e-book readers and the use of added-value mark-up approaches such as Project Prospect from the Royal Society of Chemistry.

The last decade has also seen the emergence of the mobile telephone as a utility device, with many people having both business and personal devices. As with the internet, most of us now cannot imagine how we coped with business and personal commitments without mobile phones. However, the mobile phone is fast becoming the default terminal device. An important reason for this is that much of the focus of IT development has been to improve office productivity, leaving employees working outside of the office, laboratory or faculty building to cope as best they could with mobile e-mail applications (apps). These employees, often

referred to as nomad employees, are working directly with customers and suppliers, and are the revenue generators for the business. The emergence of smartphones with high-resolution screens, mobile apps and location-specific information is beginning to transform the way in which enterprise information is accessed.

The publishing industry has been fairly slow to pick up on the opportunities of mobile access to information, thinking that just modifying a website to make it easier to access on a smartphone is all that is required. Smart users with smart phones are now demanding a much more committed approach from business-to-business and STM publishers. In this paper I have summarized some of the main issues that need to be on the agenda of publishers who wish to take advantage of mobile technologies.

'Mobile First'

The twelfth of August 2011 marked the 30th anniversary of the launch of the IBM Personal Computer, which retailed for \$1500. It was not the first PC but the endorsement of the desktop PC by IBM was a very significant catalyst to adoption. Over the last 30 years the office desktop has changed very little, even if the performance of the terminal devices we now use has increased quite

dramatically. Ten years after the arrival of the IBM PC, laptop PCs started to become available, and by 2008, sales outstripped those of desktops. There have been many attempts to reduce the size and weight of laptops, but the main issue has always been one of retaining an acceptable screen size.

However, by 2008, 3G mobile networks were becoming widely used and the mobile industry realized that the potential of mobile devices would be inhibited without greater network capacity, and work started on 4G broadband networks operating at 100Mbps. One of the factors in reaching this decision was the very rapid adoption of the Apple iPhone in 2008, which set a new benchmark in smartphone usability and utility. As with the IBM, PC Apple did not invent the smartphone, but the company's commitment to the concept and its marketing flair started the recent dramatic growth in smartphone adoption.

The usability and utility of smartphones is causing a major shift in both information access and information design. There is now no need to either work at a desk or carry around a laptop computer. The mobile phone is now very close to becoming the default workplace device. Indeed, Eric Schmidt, the CEO of Google, talks about 'Mobile First', where all applications are designed from the outset for mobile use, and then modified for use on desktop devices. Coupled with cloud technology, the workplace – and the library – is now wherever you want it to be. The opportunities and challenges for publishers are just starting to be appreciated, and it is exciting to see the new Library of Birmingham seeing from the outset the importance of mobile technologies¹, and the work of the Open University and Athabasca University in exploring the role of mobile access in libraries has been of great value to the library profession and to publishers.²

Mobile broadband networks

There are three important features of mobile technology that need to be appreciated in order to assess market potential.³ The first of these is the availability of broadband wireless networks.

The current generation of mobile phones make use of 3G broadband cellular networks. The 3G system must provide peak data rates of at least 200 kbit/s. However, recent 3G releases, often denoted 3.5G and 3.75G, also provide mobile broadband access of several Mbit/s to laptop com-

puters and smartphones. Coverage of these higher bandwidth services can be poor even in major cities. Speed requirements for 4G service set the peak download speed at 100 Mbit/s for high mobility communication and 1 Gbit/s for low mobility communication, such as pedestrians and stationary users. These 4G services are often described as LTE (long term evolution) services.

This brief description of the standards conceals a high degree of technical complexity, as there are in fact a range of services which differ slightly between the USA, Europe and elsewhere around the world. Because of the overall adherence to the standards, this should not present problems in handset capability, but might in terms of the bandwidth available in a specific location. Another broadband technology is Wi-Max, which is oriented towards data traffic but can also be used for Voice-over-IP communications and other voice traffic. The current deployment of Wi-Max is somewhat more advanced (only in relative terms) than 4G/LTE, but that is a situation that is going to change over the next couple of years. From a user perspective, the good news is that it does not matter which network technology is going to be used, as the fundamental basis of both options is the same. The differences will come in terms of the tariffs for the services offered, and these again are in the process of evolution. Many network operators are concerned that the current data tariffs do not take account of the very considerable amounts of traffic that the networks will have to support as enterprise applications develop in popularity.

One of the factors that could inhibit the development of broadband mobile services is the availability of sufficient spectrum at the required frequency. In both the EU and the USA it is likely that spectrum currently used for analogue television broadcasting will gradually become available for broadband services, but the balance between availability and demand is going to be a challenging one to manage for both national regulators and for the network providers.

The result is that information providers have to develop products and services which provide a good level of usability and value when used over 3G networks, and yet prepare for network speeds around ten times faster when 4G networks gradually become available. Certainly these networks will be rolled out more quickly in the USA than in Europe, but the lack of bandwidth could result in user dissatisfaction with service levels.

The publisher may get the blame even though the situation is one that they have no control over.

There is a tendency to assume that broadband mobile is a North American/European technology. In fact the rate of growth of mobile networks, including broadband, in other regions of the world is very substantial. India in particular is a very important potential market for mobile services.

HTML5 and web apps

The second important technology is HTML5. Web applications typically use the HTML4 specification and JavaScript, but HTML5 offers some significant benefits for developers and users. HTML5, like so much else in the mobile sector, is a standard that is still under development and it may be several years before it moves from a specification to being a W3C standard. The current draft was released on 11 January 2011. An important difference between HTML4 and HTML5 is that the latter supports and specifies scripting application programming interfaces (APIs). Some elements of smartphone functionality, such as geolocation, are not included in HTML5 and are the subject of other W3C development initiatives. An important feature of HTML5 is that its local storage facility means that web apps can continue to function even when disconnected from the internet by using data cached on the device before the connection is broken. However, there are still many issues with HTML5 which are only slowly being appreciated and addressed.⁴

It is important to appreciate that there are two categories of mobile app: native and web.

A native app is installed on the device and is written specifically for a type of handset (with the iPhone as a good example) to take advantage of that phone's functions.

These native apps are either

- pre-installed on the phone – these might include address book, calendar, calculator, games, maps and web browser
- downloaded for free or for a small fee from App Stores.

A web app resides on a server and is accessed via the internet. It performs specified tasks by downloading part of the application to the device for local processing each time it is used. The software is written as web pages in HTML (increasingly, HTML5) and CSS, with the interactive components in Java. This means that the same application can

be used by most devices that can surf the web and are not brand/operating system-specific.

The debate about which category of app is best will continue for some time to come. Part of the problem is that the browser implementation is not always consistent even between smartphones from the same vendor, and certainly native apps handle functions such as scrolling in a much smoother way than web apps.⁵

Location awareness

The final element that distinguishes mobile devices from PCs is the location awareness that is derived from global positioning satellite (GPS) services but which is augmented by accelerometers and barometers in the device so that not only can a user be positioned spatially in a building but even to the floor level that they are on. This means that the information presented to a user in a laboratory could be changed as they move to a library or a rest area. In a library, the mobile phone could automatically be linked to a library catalogue for location and document ordering, whereas in a laboratory the user is more likely to be looking for specific information, such as on synthetic route or a supplier of a chemical reagent.

This is important not only in providing added-value services to users but also in reducing the amount of information that has to be presented on the smartphone screen.

All PC applications assume that multiple tabs and lists can be presented on the screen, quickly scanned and then selected with a mouse or by typing in text. Using a tablet or a smartphone, the primary navigation device is the index finger of one hand, as the other is holding the device and the user is standing up. Anything that can be done to reduce the number of clicks (or prods) will have a significant impact on a good user experience and repeat business for the publisher or library.

Enhancing the user experience

The opportunity and the challenge for publishers is to assess the extent of the need for information rather than documents. It is quite easy to create mobile-optimized content, for example reflowing PDFs so that instead of the standard two-column journal article it flows as one long column. Reading journal articles on a tablet device is comparatively easy, and it is interesting to see the

number of commuters now using a tablet device to read *The Times* on the train.

In some respects mobile technology is a retrograde one, as readers are now reduced to using only a thumb to navigate the screen, and mobile printers are still in the early stages of development. There are some very significant challenges in making effective use of the screen area, recognizing that the user will almost certainly not be sitting at a desk but walking around a laboratory or between buildings on the research campus of a major pharmaceutical company. As a result, not only will location-specific information need to be presented, but commands will be given by voice and not by the fingers. A substantial amount of good practice is already emerging from the early adoption of smartphones for mobile e-commerce applications and there is much that publishers could gain from reviewing this work, especially as mobile phones may be an opportunity for the sale of individual journal articles.⁶

For publishers and for software companies, the money is not just in the subscription but in the provision of mobile apps that enhance the user experience. Developing apps is not difficult in software terms, but what is needed is a very good understanding of user requirements. These will almost certainly be different for students and recent graduates compared to more senior professionals. STM publishers have built up excellent advisory councils that include library professionals and senior academics, but will this input be enough to develop highly usable mobile apps?

It could be argued that a significant investment in apps development is not needed and that user requirements can be met by mobile website development. The redevelopment costs for websites using customized content management software developed perhaps five years ago to provide a mobile experience will be very significant indeed. Even now, CMS vendors are struggling to adapt CMS applications to be able to offer both a PC and a mobile interface. Moreover, a web page is not what a user wants in the brief period of time they will allocate to the mobile task. A good example is provided by the mobile apps developed for the airline industry. They are optimized for tasks associated with a current booking, which from their research is what users will use the mobile app for. If they want to check on tourist sites in Rome, then they will wait to use either a PC or, increasingly, a tablet PC.

Industry consolidation

There were two mobile industry developments in August 2011 that will have a significant impact on the rate of development of mobile services. Until mid-2011 there were five mobile platforms:

- Apple iOS
- Google Android
- HP WebOS
- Microsoft Windows Mobile
- RIM BlackBerry.

In August, Google bought Motorola Mobility, a leading developer of both Android apps and also handsets, and a few weeks later HP closed down its Palm mobile division along with ceasing development of the WebOS mobile application platform. At the same time, RIM are having problems matching the level of investment that Apple, Google and Microsoft are making in mobile application development. So, five have become four, with the future of RIM looking somewhat uncertain.

What is more important than the reduction in platform options is that Google's positioning on Android as an open platform now looks questionable. It is not clear how Google can remain a business partner with handset manufacturers such as HTC and Samsung while directly competing with them as Motorola. Meanwhile, the rate of apps development for Microsoft Windows is much higher than for Android, with Microsoft reaching 30,000 apps in ten months (the same time it took Apple), substantially less than the 17 months it took Android.

Add in the quality management that Apple and Microsoft bring to apps development and for professional users these two companies may look to be the preferred option. It is too early to say that the current consolidation will result in just two platform vendors but Google seems to have lost its direction and until the Motorola deal is finalized and the company fully integrated, the Google roadmap for Android may well stall.

Whose phone will it be?

Outside of senior executives, most people use their own phones for business use and claim the network charges for phone calls back from their employer. Although this is feasible for phone calls,

where a list of numbers called can be presented, mobile data services will not be able to distinguish between data downloads for personal use and those for business or academic use. There is a scenario in which the provision of a smartphone could be seen as a taxable benefit.⁷

A related issue is the management of mobile phone security. This will be much easier for an organization if it provides employees with an 'approved' phone, but that might not be what the individual wishes to use, and so they might end up with two different phones on two different networks. Another issue to consider for publishers is how authentication is going to be managed for licence management purposes. Many services rely on Active Directory (or similar) authentication across the corporate or university network, but this is not an approach that is really practical with a mobile phone. This issue of authentication then impacts on the licensing model because it may be very difficult indeed for a university to link use of a serial by Professor A to their mobile number, remembering that the last thing that Professor A is going to do is to log in to the service by entering a password using only one finger!

Learning by doing

Despite the many uncertainties about the rate of deployment of mobile phones and tablets, and the extent to which these devices will be used to access STM publications, many publishers are sufficiently convinced by the future to be making significant investments in adapting content for mobile access and developing apps which add value to the base document. Chemistry in particular seems to be emerging as an important market opportunity because of the wealth of scientific data that is embedded in each paper, and the value of a chemical structure as a means of quickly conveying information to the user. The American Chemical Society have developed a good video of the potential for mobile access to chemical information⁸ and Williams has summarised just some of the mobile apps that are rapidly emerging for chemists.⁹

In 2000, I wrote a chapter entitled 'Signposts to the Future' in *The Serials Management Handbook* in which I stated:¹⁰

'The new technology should however, bring many opportunities to the publisher who is able to think

creatively. The future lies in gaining a substantially better understanding of the requirements of users, something that neither the librarian nor the publisher were concerned about in the past, mainly because there was little to be done about finding out just what the requirements of users actually were.'

In this respect, mobile delivery of published information makes it essential for publishers and librarians not only to understand how the technology is currently being used¹¹, but to look ahead to mobile broadband networks operating at speeds greater than most companies can offer their employees inside an office building.

In conclusion

In this paper I have had to be very selective in the issues that I have covered. In my opinion mobile access to information will have a very significant impact on the way that business and research is conducted. This is supported by a recent analysis of the 4G market in the USA by Deloitte for the period 2012-2016, which suggests industry investment could be between \$25 billion and \$53 billion and that 4G networks could account for \$73-\$151 billion in GDP growth, and for 371,000-771,000 new jobs. Even taking into account just the conservative forecasts, this is a good measure of the impact that mobile technology will have on business growth.¹² Mobile apps in particular could be a new differentiator between publishers. Making assumptions about how users will want to use their smartphones and tablets to access STM journal content is not going to be good enough. Never has there been a time when user-centric research and design could make the difference between success and failure in the global mobile marketplace.

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