

On the Road Again The next e-innovations for public libraries?

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Abstract

UK public libraries are caught up in a dramatic change to the supply, access, and format of leisure, learning, and cultural resources. Rapid innovation in technology, especially web technology, drives the requirement for creative, sophisticated services for a more diverse and discerning clientele. However, the new technology, or e-innovations, reviewed in this paper, including such tools as RSS, podcasting, VoIP, DTV, gaming, and social bookmarking, cannot be considered without the major innovations behind the scenes in the systems and information architecture. The public library web environment in the UK, especially as it is contained within the local government web environment, will be challenged to make the requisite changes at the systems and information architecture level to offer seamless integration of applications and services. How much libraries want to engage with these technologies should be dictated by strong, local business cases supported by the needs and demands of their public.

As a non-reference librarian, I have what you experts may think a simple-minded way of classifying the types of information that people need to access [one of which is] the 'Dead Dog' type.

With the Dead Dog type, someone wakes up in the morning, opens their curtains and looks out. There in the street is a dead dog. What to do about it? They have an idea that someone is paid to remove dead dogs, so they log on to the Internet and type 'dead dog' and 'road' into Google. Of course, they get a few hundred thousand hits but nothing that looks like an answer. They think again. Yes! It must be the Council's responsibility. So they log on to their Council's Website and click the A-Z. And go to 'D' for 'Dead dog' or 'Dog, dead'. Try it when you get back and see if your council Website will give you an answer using this method. It won't. The Dead Dog type is information that has a straight-forward answer but which is difficult to discover. Someone in Environmental Health or Highways will go out and get the dog. But in order to get at the information you need to arrange this, you must have a good strategy and preferably some idea about how the information sources you are using are structured.

(Woods 2004)

It's All Change Here: Public Libraries, New Technologies, New Roles

For quite a few years, public libraries have had their niche to themselves, and not even bookstores were a challenge to it. As long as public libraries provided books, even videos, at low to no cost, there was no concern of competition from the private sector. Of course, there were always the budget concerns, the lean, mal-nourished years, the fights with local government for very existence. But, these problems never really posed a threat to the public library as an institution.

Quite simply, technology, especially as it affects communication and data storage and transfer, has changed everything. According to OCLC's Environmental Scan (2003),

...trends indicate a dissonance between the environment and content that libraries provide and the environment and content that information consumers want and use. Three major trends were identified in the Scan that provide evidence of that dissonance. Self-service,

satisfaction and seamlessness seem to exemplify the expectations of the information consumer in the huge "infosphere" in which libraries operate.

Most importantly, the more technology influences services and content, the more libraries will come into direct competition with the private sector. Bookstores, for example, have subverted their purely commercial objective over the past few years with the introduction of comfortable seating for reading, cafes, and book clubs. When reading, refreshment, and discussion is combined with technology, for quicker procurement of books, for internet access, for creating a community of web-based readers, the role of public libraries is directly threatened, in the real and virtual environment. And, it will be the private sector's ability to adopt technology more quickly that will allow it to dictate to libraries what they in turn should implement. The technology mentioned in this paper is a prime example: there are relatively few here that are new to the private sector, but to all but a few UK public libraries, they are uncharted territory, full of risk.

So, the solution for libraries is to plunge into all this technology in an attempt to justify their existence and fight off the competition? There is certainly the danger, when writing about new technologies and their potential in the public sector, to appear to be advocating their implementation. While the main aim of the paper is to review new technologies and their possible import for libraries, it is important to keep in mind that they should only be considered within the context of the community and local IT environment. The local business requirements of a public library authority should drive not only the implementation, but also the development of a more sophisticated IT environment to ensure seamless integration.

Indeed, the important issue may not be whether public libraries embrace the new technologies, but the manner in which they do so: simply implementing technology does not mean that it will be used efficiently or to maximum functionality. According to Clayton Christensen, who originally coined the phrase 'disruptive technology,' ... *few technologies are intrinsically disruptive or sustaining in character. It is strategy that creates the disruptive impact.* (Disruptive Technology 2006) In essence, successful implementation includes a willingness to take risks, coupled with a firm grasp of local business requirements and effective change management, much on the minds of librarians of late, as a means of offsetting the risk.

News from the Future: Technology Forecasting

There are numerous publications that devote space to technology forecasting. In fact, a set of tools has been developed to predict technologies at the end of their use, and those most likely to supplant them and to be adopted by the public. The factors that are likely to contribute to technology adoption can include anything from government support to chance. Most importantly, though, is the society or consumer's readiness to accept and use the technology (Polson Enterprises 2005). So, much of what is predicted in forecasting is based on what has already been implemented. Regardless of the technology, though, the value of the innovation is usually enhanced communication, more efficient service, especially self-service, all around

which new, real and virtual communities form. In a very tangible way, the new technologies usher in the next shift in how people communicate, how culture and values are transmitted.

Predictions from the BT Technology Timeline

For instance, BT's 2005 Technology Timeline (<http://www.btplc.com/Innovation/News/timeline.htm>) which extends to 2051, includes a range of technology based on the senses and emotions: emotionally responsive toys, smelly TV, vibration on cell phones to convey emotion; full voice interaction with PC; emotion-controlled devices. These coupled with predictions that consumers will return to the high street for personal service, and that electronic gadgets will bring on 'kitchen rage', seem to indicate that while we may want our technology to be more responsive, there may be a backlash which will drive us back to human interaction, in the real or virtual environment. (It does give 'humanoid robots' until 2051 to beat the England football team!).

In addition, the timeline makes much of the seamless integration of the virtual with the real, creating new ways of communicating and opportunities for forming new communities. We already see this type of interaction in gaming environments. From BT, virtual farming cooperatives, virtual queuing systems in hospitals, virtual windows, and 'pubs [using] technology to enhance the illusion of tradition" (!) are predicted.

The concept of the combination of the virtual and real extends to the human body and the ability of the technology to create personalised, responsive conditions: tooth regeneration, smart skin for direct human repair, computer-enhanced dreaming, thought recognition as everyday input means.

Enhanced service, simply what will make our lives easier, is the inducement to technology uptake by the public. Examples from the BT Timeline of technology which may make an impact on this level include 24/7 blood chemistry monitoring, fixed mobile convergence, automatic dialling for smart business cards, RFID replacing barcodes, HDTV over broadband, portable translation device for simple conversations etc

Some of these may sound familiar and some sound far-fetched. However, according to .net magazine (2005), *BT's timelines from the Nineties were more than 80 per cent accurate*. After all, according to an editorial in the Week, a weekly news summary publication, 15-20 years ago mobile phones alone, never mind mobile phones with web capabilities, would have seemed space age to us, as would wireless laptops and using computers as phones. (Law 2005)

So, while some of these industry predictions seem implausible in terms of their applications in libraries, we must keep in mind that applications that have begun with the private sector have made their way into the library environment: web forms; chat; RFID; digitised content; mobile phones; texting; wireless technology, to name a few. The technology that makes the most difference to service delivery is that which allows libraries a variety of

means for reaching the public, to provide expertise and access to creative, cultural, and entertainment resources. For too long, libraries, and I think this is a mistake that the private sector made initially, thought that an online presence meant the passive presentation of content, with human interaction written out of the equation. We have since learned that while the public does demand the content, and has a level of sophistication that will allow them to find and use resources on their own, they also want human interaction, interactivity, whether it be in a commercial environment or in public service. And, indeed, the industry forecasting bears this trend out.

Web 2.0

The e-innovations offered in the next section for consideration in libraries fall under what is now termed as Web 2.0. Web 2.0 has caused much confusion, not the least because we had not known there was a Web 1.0. However, according to Ivan Pope (2005), Web 2.0 represents a next generation of web tools that, in some cases, are built on tools already in use that will allow for more personalisation, more interactivity:

for example, users of Web 1.0 almost always used dial-up connections that they paid for either by time or by subscription. Web 2.0 is the child of the broadband revolution...the joy of an 'always on' connection spread rapidly as the price dropped. The advent of Open source, web applications, Google, blogging and MP3s have also opened the way for 2.0.

Essentially, the designation 'Web 2.0' augurs a major transition of how users interact in the virtual environment. It will change or should change how the public interacts with library resources and librarians, and it should change how librarians conduct business, and use their resources to create more responsive and efficient services and systems.

Web Services

Though its name may cause some confusion, Web Services (<http://www.ws-i.org>) actually refers to an industry standard or set of standards, protocols, and implementations that allow individual computers to grab information from each other, which can then be delivered to web users. (Bradbury 2005) If this sounds suspiciously like virtual networks based on interoperable systems, which libraries have struggled to achieve with their library management systems, then librarians should take heart in the knowledge that industry has had as much trouble with these types of networks. Web services technology evolved as a way to get around the problems with systems and data interoperability, by using XML, XHTML, SOAP, the Simple Object Access Protocol, and WSDL, the Web Services Description Language. While some of the usual suspects are already making use of Web Services, such as Yahoo, Google, Amazon, and eBay, other such as BBC Backstage (<http://backstage.bbc.co.uk/>) are also planning implementation.

Open Source, Open Access

Open Source generally refers to software where there is access to the code, not just to view it, but also to make changes, and to share those changes with all those who implement it. Specifically for libraries, this means moving away from proprietary systems, like Microsoft. The impetus would be cost and flexibility. (Chudnov 1999). However, while some academic libraries might

have been able to make the move, this choice is usually not one public libraries have been free to make. It is one that they cannot ignore, though, as more and more companies have been motivated to offer open source solutions.

Open Access refers to free access to digital resources, more specifically data and scholarly research that is usually held within commercial electronic resources. There is still quite a dispute over the business case and where the burden of payment would ultimately fall. Copyright is also a major 'impediment' to access, which Google has learned in its effort to digitise books. However, Yahoo is building on the Google experience by forming the Open Content Alliance (<http://www.opencontentalliance.org/>). While this dispute has occupied academic libraries mostly, there is a potential impact on public libraries and their users, as more digital content becomes freely available on the web. For example, the book initiatives themselves may have an impact on reserve collections from a budget and storage perspective.

e-Innovations: Ready, Set, Go?

*I believe that our society promotes a sort of helpless inevitability about the future, particularly with technology and innovation, a sort of "ceaseless march of progress"... I'll call this the **Inevitable Future**. Whatever's going to happen is going to happen, be it human cloning, dirty nukes, global outbreaks of avian flu, home abortion kits or whatever, and all we can do is hold on for the ride.*

*But some reflection reveals that we're not helpless at all, and that we can individually and as groups influence the future quite a bit... The da Vinci Institute believes that the future isn't predetermined at all and that what we do today can unquestionably influence where we'll end up as a race, as a society, and as individuals tomorrow, and I agree completely. I'll call this the **Influenced Future**.*

Dave Taylor

http://www.intuitive.com/blog/can_we_influence_the_future_or_is_it_predetermined.html

It is certainly true that, in terms of technology, a significant number of UK librarians feel that they are just along for the ride, and all they want to know is when they will arrive at their destination. What the BT and other predictions from the private sector tell us is that we had better fasten our seatbelts, because the ride is a long way from over. Even more specific recommendations from the private sector aimed directly at libraries indicate the watchword, almost indefinitely, is 'change': to global systems; to global access to global information; to multi-media technology signifying a shift to verbal and image-based, as opposed to print-based, communication; to smaller and smaller storage for information. (Frey 2004). As new technology, especially delivered through the web, continues to redefine communication, service, and community, libraries will be perpetually managing change not just to services, but also to their fundamental purpose in society. While community, content, and communication have always been the business of libraries, the challenge is effectively transferring services in these areas to the virtual environment, and incorporating new models for implementation along the way.

Creating and Sharing

More often than not, when we use the term 'virtual library' we think of a collection of shared files, links, or databases. This attitude, at least in the early days of public library websites, reflects a traditionalist view of the library: as custodian for print resources. But a real library is made up of more than this content, and much of the newer technology is forcing libraries to think in a more multi-dimensional way of how the range of what libraries have to offer can be represented in the virtual environment. Moreover, the introduction of technology, especially the Internet, to libraries has necessitated not just the presentation of content and services, but also the creation of content.

The significance of technology that supports creativity and the sharing of information is not just that the public has new ways of accessing learning, leisure, and cultural resources, but librarians can participate directly in this exchange. In other words, through content and service provision, librarians more directly communicate with users around the creation of content, whether it be photo-galleries, e-books, or newsletters. Examples of the technology that is beginning to push libraries in this direction include:

Mashups and Filters: We constantly bemoan the overwhelming amount of information on the web, and the impossibility of sifting through everything to find anything useful. News from the private sector suggests that the next generation web businesses will be more about mixing (or mash up) and filtering of content from a wide range of web sources, than creating new content. An example of this is Wink (<http://www.wink.com>), which harvests content from other sites with user-generated tagging (see Social Bookmarking below), in order to create 'collections' of web pages. (Schonfeld 2006)

Podcasting: Podcasting is presenting web-based resources, such as audio-books, presentations, learning materials for download to Apple iPods. These resources can be commercial, but increasingly people are creating their own content to be shared, including interviews, plays, poetry readings etc. Although MP3 players, or digital audio players, have been around for a while, Apple has energized the market with the creation of the iPod, and specifically how they can be used to create content. An example of a UK library offering a link to a podcast can be found on the Gateshead Libraries' blog ([http://www.libraryweblog.com/discuss/msgReader\\$1149](http://www.libraryweblog.com/discuss/msgReader$1149))

RSS Feeds, Aggregators: RSS, short for Rich Site Summary, is a type of formatted information, including news feeds and stories, as well as events and projects, that can be distributed to and published on other web sites. An aggregator is a tool that facilitates the subscription to, the reading, and publishing of RSS-formatted information. An example of RSS provision can be found at the National Library of Health. (<http://www.library.nhs.uk/rss/>)

DTV: DTV is basically TV broadcasting on the internet. While podcasting and RSS provides text-based content, DTV captures video feeds for publication over web sites.

Alerting Services: Alerting Services (AS), or Event Notification Services (ENS), send email messages to users to inform them of new content on a web site. Often, these services allow for personalisation, in that users can specify types of information. Some implementation of this service in UK public libraries are connected to LMS functionality.

Blogs: Weblogs or 'Blogs' are basically diary-like websites, where the most recent entries will appear first. They can range from informal, stream of consciousness entries that are not indexed to daily, formal, indexed essays dedicated to a specific subject. An example of use in a UK public library can be found on the Gateshead site (<http://www.libraryweblog.com/>). However, blogs on library sites have for the most part not had high traffic.

Wikis, Photo-sharing, P2P Filesharing: These technologies, as with the above, promote interactivity, community not just between librarian/library and member of the public, but between members of the public under library auspices or as a result of content/service libraries offer. Wikis allow for the joint creation and editing of documents online, where photo- and file-sharing allows the display and delivery of pre-existing material. Although librarians can use this technology to push content at the public, there is also scope here for libraries to create the environment in which members of the public can share information, resources with each other. For instance, librarians can help members of the public form writing or memoir groups, or mount photo exhibits on-line. Examples of these services include Flickr (<http://www.flickr.com>) for photos, Writely.com (<http://www.writely.com>) for online documents, and 30Boxes (<http://www.30boxes.com>) for social, community, and business activities.

Online Gaming:

Aside from its reputation as an obsession for children and teenagers, gaming is essentially multimedia in that it combines video, audio, graphics, text in one interface. It provides an excellent platform for libraries to create leisure and learning tools, the subject of an extensive report from Windsor and Maidenhead Libraries. (Lewis 2005).

As methods for creating and sharing content, these tools support libraries in active engagement with the public, instead of waiting passively for the public to find them in the virtual environment. Increased involvement in the creative process supports another prediction for libraries: that they *will transition from a center of information to a center of culture*. (Frey 2004). We may feel on familiar ground with this prediction: we are used to libraries as the "heart of the community"; community spaces; one-stop shops, idea stores etc etc. However, Thomas Frey, of the da Vinci Institute, provides a bit of a different

take on the potential of library as cultural environment by suggesting the installation of 'creative' space, such as blogging and podcasting stations, music and art studios.

Oral Tradition, with a Difference

It has been said that the 'baby-boomers' are the Gutenberg generation, those who grew up on the printed page, and that this and future generations are the Marconi generation, raised on images and the spoken word. This impression is certainly born out by the dominance of mobile phones and the applications that have been created and continue to be created for them. This technology has a direct impact on librarians' ability to get information to the public.

The technologies which provide libraries the most direct way of delivering information-related service include:

Instant and Text Messaging: Instant Messaging is immediate text communication through a network, such as the internet. Most chat technology is built around the concept of real-time messaging, predominantly via PCs. This is not to be confused with 'texting' or 'short message service' (SMS): text communication via mobile phones, other handheld devices, and even some landline phones. While both technologies are currently used in libraries, Instant Messaging has had wider application across libraries, because it is PC-based communication, and can be easily run simultaneously in a work environment with other applications. In addition, it is less expensive than more sophisticated, multi-functional chat software, and is used by traditionally hard-to-reach age groups. For instance, between April and Oct 2004, the Thomas Ford Memorial Public Library in the US received 400 instant messages, a majority of which came from teenagers. ("400 IM queries" 2004).

Chat: We are just beginning to see the impact this technology can have in enhancing the interactivity of the library service, specifically in the areas of *Reader Advisory* and *Enquiry and specialised research services*. The English service, People's Network Enquire (<http://www.peoplesnetwork.gov.uk>), has made this technology available not only across the UK, but also internationally. Librarians are using the tool to raise their profiles across local government and to the public. Additionally, tools that combine chat with text, voice, and presentation interface can be used for communication and training for widely dispersed staff and colleagues.

However, it is primarily used for librarian/user interaction, and not as a means to allowing users to communicate with the each other. Although there has been some effort made, especially in the area of reader's advisory, the problems, as with blogging, has been lack of use. It may be that as libraries are still perceived as a physical space, users do not associate blogs and chat with them: the public does not use a library page to meet people or discuss similar interests; they use it to get information. Whether libraries can or want to overcome this image depends on how they see their role in the virtual environment.

Bots: Bots (short for robots) need not mean Star Wars-type librarians! Bots can be as simple as software programs which can run independently and that automate certain activities. For instance, a bot can be written to make an online bank deposit each month. There has been experimentation with creating 'virtual librarian' bots, as a means to answering FAQ-type questions online (directions to the library, telephone numbers, book renewals etc). These would essentially be automated chat conversations.

Voice-over IP: The use of the computer as a telephone, VoIP, has caused controversy, not the least because of the low cost. Not only can libraries use this as a tool to increase accessibility, but there may also be positive impacts on telecommunication budgets. Current products include Skype (<http://www.skype.com>), Google Talk (<http://www.google.com/talk/>), BT Communicator. (<http://www.bt.com/btcommunicator/index>)

The Mobile Society

Although mobile technology, such as PDAs, mobile phones, laptops, and notepads, as well as wireless networks, is familiar to us, only a select number of public libraries has implemented the technology. Because the above methods for creating content and social networks require more powerful applications and convergence of functionality, new products are regularly released that convert mobile technology into mobile PCs, with the same power and storage capacity.

For example, IBM is introducing the SoulPad that essentially enables PC functionality/sessions, specifically in terms of desktop functionality and all without benefit of special software or a network connection, on a mobile device with increased storage and power. Essentially, it allows "a user to suspend their computing environment on one PC and resume it on another one, even if they have never used it before." (The Game of Life 2005).

Another development for mobile technology, broadband TV, provides formerly satellite TV programmes for viewing on a PC or laptop. Sky and BT currently offer this service. (<http://www.bt-broadband.offers-page.com/>) In addition, gaming is not just for PCs; 3G mobile phones can also be used to participate in such games as MMORPG (massive multiplayer online role playing game). (Newshound 2005)

While libraries and local government regard WiFi as the holy grail of access, their concerns about security are shared by the private sector. While there has been implementation of WiFi access in UK public libraries, there is a certain degree of difficulty, in terms of the local authority IT environment. Satellite, specifically with rGBAN, (Mount Everest 2004) is still in the game as a solution to access and mobility, as well as wireless metropolitan networks or WiMAX (<http://www.wimaxforum.org/home/>), representing an improvement over WiFi in that it provides access over greater distances. Currently, the London Borough of Lewisham is investigating its use as part of an ODPM National Project. (<http://www.egovmonitor.com/node/1448>). Local authority-wide WiFi access, including within libraries, could become more common, depending on the results of the project.

Creating Communities

People learn, work, shop, and socialize online, and for teenagers and even younger children, online is where they spend the most time. The web is at once a communication tool and a virtual global community that mirrors all of our existing social structures. As cultural, political, and civic institutions establish web spaces, they will also have to redefine their roles in the virtual society.

Many websites and services foster this sense of community, or 'affinity space,' around specific activities. As libraries have always defined themselves, now more than ever, as community spaces, encouraging web communities around traditional and new services is an extension of an existing objective.

Readers advisory/e-Books/Audio-Books:

Far from dispatching with reading and books to the tech-deprived hinterlands, the web has provided the space for communities of readers. Indeed, as observed earlier in the paper, some exciting developments merge the real with the virtual environment: Book Crossing (<http://www.bookcrossing.com>) is a website where people not only share opinions about books, but actually share the books, by leaving them for others to read in cafes, train stations, airports, restaurants, among other public places. The significance is that the print book is still the 'killer app', and the sharing, communal aspect of reading is supported with technology. The model here is a service, such as Amazon, where the main activity is commercial; buying books, among other things is what brings people to the site. However, the added value of communicating with other customers, sharing ideas and opinions, is another motivation for coming back to the site. (Berube 2005)

Not only can websites encourage the reading of print books but of e-books as well, which supply an increasingly mobile society with books at point of need. Even more so than print books, e-books, and interactive sites built around them, promote a sharing culture across a diverse community. This community not only includes traditional users, but those divorced from the physical library for various reasons: housebound, physically-challenged, rurally isolated, full-time employed, and commuters. Two major e-books suppliers, OCLC netLibrary (<http://www.netlibrary.com/>) and Overdrive (<http://www.overdrive.com>), are building impressive web-based e- and audio-book collections, which can be downloaded to any PC or mobile device, supporting Windows media player. Essex Public Libraries is one of the few, if not the only public library, offering the Overdrive service (<http://essex.bookaisle.com/>). Audible.com (<http://www.audible.com>) has the advantage of producing audio-books that can be downloaded to a mobile audio player. OverDrive has recently developed VoD, Video on Demand, television series which can be downloaded to mobile devices. While the uptake of e-books in public libraries, especially UK public libraries, is still relatively small, (owing to the very real problems of cost, software platforms, access issues, etc) there is expectation that the popularity of portable music devices, such as the iPod, has made e-books in audio format more accessible to a range of users, especially young people.

As mentioned above, the private sector still sees the value in reading and books, as evidenced by the Google and Yahoo initiatives. Another interesting development is that of personal digitisers: people are able to digitise their own book collections at home. The digitisers come with search software, web crawlers, and a copyright cop alert. (Berry 2005)

E-Commerce/E-Bay/E-Book Sales: There are numerous complaints about the commercialisation of the web, and indeed e-commerce has led to some questionable practices. However, as mentioned with the buying of books above, virtual communities have grown up around e-commerce sites, the most notable example being e-Bay. A logical follow-on from e-commerce are the communities that have evolved around ownership or use of products, such as car clubs or Microsoft users message boards. There is scope here for libraries to create e-book sales, an e-store for Friends of the Library to run etc

Social Bookmarking and Tagging: Although sharing bookmarks is not necessarily new, and creating subject indexes for websites has been an ongoing library activity, building an environment where members of the public can share and categorise links with each other as well as librarians should be of interest to libraries. An example of a free web application is de.licio.us. (<http://del.icio.us/>)

Gaming: A challenge to libraries is to offer games within the library web environment or provide the environment, both virtual and real, for gaming clubs. An example of library implementation in the UK is Halton Lea Library, home to Halton Daemons, the largest Gaming Club in the country (<http://www2.halton.gov.uk/content/tourismandleisure/libraries/>). There is even a toolkit for establishing clubs in libraries. (<http://uk.games-workshop.com/gamingclubs/>). This example illustrates how libraries can use the virtual and real environment to support social communities and networking.

MMORPG (massive multiplayer online role playing game) are games where *players will be able to select a persona and live in a simulated virtual environment* (Newshound 2005) Conceivably, this virtual city will contain citizens from all over the world, using a number of communication technology tools to interact. Interestingly, a few of these games have a 'library' or 'librarian' avatar, that can be accessed for information that may help a player make a decision. The potential interest to libraries is a total re-engineering of the library website, so that it is not a static group of pages, but a multi-media 3-D environment.

Accessibility

In planning for virtual community development, accessibility is paramount. While it is true that progress has been made in this area, much remains to be done. The progress that has been made in accessibility serves as an example of how the public sector can have an impact on private sector development: UK accessibility laws and guidelines have started to exert a

certain amount of pressure for more accessible software and services. As we have seen above, e-book providers are creating more audio content. In addition, there are products that operate from touch-screen technology. Other innovation in this area includes:

Mobile Technology: HumanWare's PDA (<http://www.humanware.com/>) which translates web information into Braille, via Bluetooth. (Braille 2006)

Digital Technology: While most talking books are still in tape cassette or CD form, digital formats are likely to become more popular. The National Information Standards Organisation has developed a new standard for Digital Talking Book. (NISO 2002) Further development of Flash, specifically Flash MX, supports animation and sound as a means to providing services and content to a wider public. (<http://www.flash-mx.com/>)

Chat: Chat technology has proved a barrier to accessibility precisely because it is text based. Screen readers and sizing provide some help, but only to a limited number of web users. OCLC's project InfoEyes (<http://www.infoeyes.org>) provides a chat room and audio facility through the use of IVocalize software (<http://www.ivocalize.com>). IVocalize is an example of web conferencing software that offers chat, audio, presentation options, especially designed for 'webinars'.

Innovations in Library Technology

There have been innovations, specific to library systems, which have made more of an impact on academic and research libraries than on public libraries. These tools provide a start towards creating a more seamless environment, by making smarter use of data and resources that already reside in public libraries and library systems:

Electronic management systems: These products not only provide better management of e-serials, but also contribute to better access to these resources.

Deep linking: Deep linking involves providing a link from within a source on one site into another source on a separate site. With such tools as Ex Libris' SFX (<http://www.exlibrisgroup.com/sfx.htm>), libraries can deep link into e-books and e-serials from an OPAC or commercial database search.

OPAC enhancement: The biggest challenge for libraries is getting more out of the data in OPACs. While libraries and library suppliers have been able to capitalize on developments in this area, commercial competitors such as Amazon have been able to take full advantage of innovations. For public libraries, the OPAC represents the biggest collection of data they own, and yet it is the 'collection' with the most barriers to access. Although some progress has been made with such products as AirPac (<http://www.iii.com/mill/webopac.shtml>), Innovative Interfaces' tool to provide mobile device access to the OPAC, enhanced catalogue record development, and especially the gradual move from UKMarc to Marc21, has proved particularly difficult for public libraries in the current IT environment.

Data planning, data mining, data warehouses, data analysis: In the age of efficiency and measurement, librarians must feel like all they do is count. So, it will be no comfort to say that new ways of looking at and using data are being offered and incorporated in LMS. (Cummins 2006) It is not simply about presenting raw counting, but using the numbers to track patterns and presenting those patterns visually. Although the positive and negative impacts of data-driven management is not within the scope of the paper, what data mining can teach us about our users and resources can certainly identify business requirements and support the requisite changes necessary in the virtual environment.

Implementing the above technologies effectively will require more than determination and money. Libraries can bolt as many of these on to their public-facing web pages as they want, and an exceptional few have, but they will languish because of their vulnerability. There are usually two major reasons for this vulnerability: the technology is not part of the business requirements and has no corresponding funds to sustain it, and the underlying architecture of most libraries and council websites still present services and content in 'silos'. In other words, knowledge of one specialised service does not necessarily lead a member of the public serendipitously to another related service or piece of information. This situation is plainly illustrated with the state of e-books implementation in public libraries in the UK currently. Of the few that have bought into an e-books collection, there are fewer if any who have catalogued them in their local catalogues. Essentially, this means that if a user is looking for a book in the local catalogue, there is no way of knowing that there may be an e-book copy (this situation is even more concerning if the e-book is the only copy the library owns).

All Systems Go? The IT Environment

New technology, especially disruptive technology, places significant demands on the service and content level, but changes at only this level of the virtual library framework can be considered ephemeral and subject to the whims of budgeting, technical constraints, and politics. Changes are needed at a much more fundamental level, at the library system and information architecture level, in order for enhanced services to be able to take hold. If the changes are made from the systems and information architecture level down (or up!), then new technology-based services and content become integrated into the architecture and therefore less vulnerable to elimination. The change, for local and public library authorities, to a more integrated IT architecture represents a major e-innovation in itself.

Library websites, and to a certain extent the government web environment in which they are contained, operate on a 'print-based paradigm' (think the A-Z indices which populate local government websites) (Maloney 2004). For users not familiar with this paradigm, and for those who have become

accustomed to powerful search engines, library and local government websites in their most innocuous form can seem rudimentary. In their most labyrinthine form, from a search perspective, they are simply a waste of time. Maloney and Bracke contend that

Library Web sites do not present a sufficiently unified interface design or level of technical integration to match current users' mental models of access. The systems have not been integrated to support users' overreaching goals or meet the expectation of seamless access that they have developed when using other Web sites (such as Google or Amazon).

Of course, libraries have a specific challenge that most local government departments do not. Local government websites are about presenting internally held and produced information to the public using one technical platform. But libraries provide access to multiple content with multiple owners using multiple technical platforms, quite a few that are remotely-stored. In other words, "...libraries often only have control of a user's experience up to the point at which they leave a library's servers." (Maloney 2004) *An effective strategy and implementation, and the true innovation for libraries, mean making 'information work harder, work smarter'.* (Lavoie 2006)

Models for Interactivity and Integration

Maloney and Bracke propose an information architecture framework that includes organisation, navigational structure, labelling, as well as functionality and content (content management systems, commercial databases etc).

The *gaming environment* also poses an interesting model from an information and technical infrastructure perspective. Users move from graphical interaction to chat to information archives all within one framework, without having to log in or out, or without the need to be conversant in various systems. They operate within a 3-D place/time environment (the game) but have access to information upon which to base decisions that is not dependent on place or time. This is all underpinned by a technical infrastructure made up of different but relational systems that perform multiple functions.

In addition, tools, such as *PHP*, create more dynamic interaction between the individual and the content. By tracking use and then automatically presenting personalised information, *PHP* not only enhances usability but interactivity. These types of tools can be especially beneficial for libraries to track reading habits, allowing them to better tailor collections, both print and on-line.

As libraries provide quite a bit of external, remotely-hosted information already, and it has become increasingly common for library catalogues to be remotely-hosted, a logically expedient (although not perhaps, politically!) alternative to government hosting might be the private sector. This brings the information from out behind the local authority servers, which affords libraries a certain degree of flexibility, self-determination, and freedom. An innovation in this area is the *Virtual Private Server (VPS)*. VPS allows libraries more control than the current method of remotely locating catalogues and

commercial resources onto the servers of the vendors that supply them. Unlike the traditional shared server, server space and resources are fixed so that library services in one area would not be affected by other service users making demands on the same server. They also offer more security, and good news for libraries, are less expensive than traditional servers. (All You Need to Know 2005).

Another industry innovation, which could offer solutions to local authority and public library web sites, is *web services technology and standards*, mentioned above. An example from industry illustrates how web services can break down silos of information:

Your site, which sells products to users across the world, would ideally give them the opportunity to view your prices in their own currency. Building a currency conversion system that monitored current exchange rates on a daily basis would take a lot of time and resources, not to mention ongoing monitoring and maintenance. But if another company offered you up-to-the-minute currency conversion as a web service, then you simply connect your software to it. The next time someone from France visits the site, it could retrieve the price for a product in sterling, send a query to the currency conversion web service across the internet and receive the latest prices in euros, ready to display on the web page. (Bradbury p32)

Integrated Digital Environment Initiatives from the Library Sector

While Maloney and Bracke are not lone voices from the library profession on the topic of creating a better, more seamless library environment, most of the push is coming either from library research organisations or from vendors in the library market.

For instance, the UK Common Information Environment (<http://www.common-info.org.uk>) with involvement from a number of sectors including libraries, museums, archives, health, and government, refers to the creation of a joined-up digital environment whereby users can seamlessly search across specialised databases stored by cultural institutions, as well as commercial and free web databases. First steps to create this environment have been the standardisation of collection and item description that is also responsive to the specific users of each sector.

Vendor Initiative for Enabling Web Services (VIEWS) is a library systems suppliers co-operative to use web services applications, technology and standards to unlock the data in OPACs and make it more accessible. (http://www.views-consortia.org/views/press_releases/1.shtml). For example, OCLC's Open Worldcat program not only allows librarians to perform global searches across diverse library systems, but has opened up these resources to the public over the web. (<http://www.oclc.org/worldcat/open/default.htm>)

Talis, in particular, is developing a product that uses web services technology to harvest data across multiple library systems from one search interface. This type of open access is reliant upon co-operation among suppliers, not the least in the implementation of the same standards and to the same level.

The product represents part of Talis' strategy to promote "Library 2.0", essentially the library version of Web 2.0. Library 2.0 uses the next generation of technology to create more responsive library systems. (Chad 2005) The technology would include *OPAC configuration, online library services, and an increased flow of information from the user back to the library.* (Casey as qtd by Crawford 2006)

Time to Get Out the Map

The pressure is already on for libraries to implement the next generation of technologies, what with Libraries 2.0 and Web 2.0. It is clear that some of the technologies reviewed in this paper have quite a bit to offer to libraries, in terms of providing greater access to resources including knowledgeable staff and better communication with the public. Because quite a few of these technologies focus on interactivity and communication, they afford a digital extension to the well-established mission of community building and service traditionally provided by libraries. But, simply taking the risk for the sake of offering something new will surely provide more fodder for budget cuts. Libraries are required to plan and budget according to local targets and objectives, and senior management often do demand business cases for the implementation of new technology. However, the existing IT, service planning, and marketing environment is usually such that new resources, whether they be bibliographic or interactive, cannot integrate effectively, may not even result in greater efficiency, and quite often are totally ignored or unknown to the public.

With a more flexible, responsive infrastructure, libraries can begin to implement at least some of the technologies mentioned in this paper, in an effective and integrated way. More, though, is required by way of implementation than putting the technology in place: libraries should look at some of the trends mentioned in the paper -- community-building; encouraging creativity; audio and verbal communication as a means of cultural transmission -- and plan the marketing, promotion and evaluation of services that build on these trends. That the commercial sector dominates society is a comfortable stereotype that excuses library passivity. Ultimately, it is the public that will determine the uptake of new technologies, not the private sector. While it is true that, initially, implementing these technologies will require risk (libraries demonstrating needs as well as fulfilling them), a profile or portrait of the total community, not just the disparate parts, goes some way to ensuring that it is a risk worth taking.

Sources (web links checked on 15 May 2006)

"400 IM queries Apr-Oct 2004 at Thomas Ford Mem. Lib...most common users?" (2004), *Library Journal*, 15 November.

All you need to know about virtual private servers (2005), *.net Magazine*, October, pp46-47.

Berry, J.N. (2005), "Living with Books", *Library Journal* 1 November, p. 10.

Berube, L. (2005), "e-Books in Public Libraries: a terminal or termination technology?" *Interlending and Document Supply*, v33(1) pp14-18.

Bradbury, D. (2005), Instant Web Content, *.net Magazine*, Issue 142, p. 31

Braille PDA wins award (2006), *Library and Information Update*, Jan/Feb p. 3

Chad, K. and Miller, P. (2005), Do libraries matter? The rise of Library 2.0, paper given at *Libraries 2.0*, November, available at http://www.talis.com/downloads/white_papers/DoLibrariesMatter.pdf

Chudnov, D. (1999), *Open Source Library Systems: Getting Started*, available at <http://www.oss4lib.org/readings/oss4lib-getting-started.php>

Crawford, W. (2006) "Library 2.0 and 'Library 2.0'". *Cites and Insights* 6(2): Midwinter, available at <http://cites.boisestate.edu/civ6i2.pdf>.

Cummins, C. (2006), "Below the Surface", *Library Journal (netconnect)*, Winter, pp12-14.

"Disruptive Technologies" (2006), *Wikipedia*, available at http://en.wikipedia.org/wiki/Disruptive_technology.

Frey, T. *The Future of Libraries: Beginning the Great Transformation*. Available at (<http://www.davinciinstitute.com/page.php?ID=120>)

The Game of Life: Pocket PCs get the Frankenstein treatment thanks to IBM (2005), *.net Magazine*, Issue 142, p.16.

Lavoie, B., Dempsey, L., and Connaway, L. (2006) "Making Data Work Harder", available at *Library Journal* 15 January, <http://www.libraryjournal.com/article/CA6298444.html> .

Law, C. (2005), "Editorial", *The Week*, 17 December, p.5.

Lewis, A. (2005), *Review of Multi-Lib Phase 1: Library service development using computer games technology*. Available at http://www.rbwm.gov.uk/community_living/documents.htm.

Maloney, K and Bracke, P. (2004), Beyond Information Architecture: A Systems Integration Approach to Web-Site Design, *Information Technology and Libraries*, v23(4) p.145+.

Mount Everest Sat Phone Skinny. (2004), available at *Human Edge Tech* 18 March,
<http://www.humanedgetech.com/story/MountEvrstsatphonskinnyMar182004.shtml>

Newshound. (2005), *.net Magazine*, Issue 142, p.12.

OCLC. *2003 Environmental Scan: Pattern Recognition*. Available at
<http://www.oclc.org/membership/escan/default.htm>.

Polson Enterprises. (2005), *Technology Forecast A Customer Validation Tool for Emerging Technologies*, found at
<http://www.virtualpet.com/pe/papers/forecast.htm>.

Pope, I. (2005), Web 2.0, *.net Magazine*, Issue 144, p28-30.

Schonfeld, E., O. Malik, and M. Copeland (2006) "The Next Net 25". *CNNMoney.com* 3 March, available at
http://money.cnn.com/2006/02/23/smbusiness/business2_nextnet_intro/index.htm

Specifications for the Digital Talking Book (2002), available at the *National Information Standards Organization's* website
<http://www.niso.org/standards/resources/Z39-86-2002.html>

Woods, J. (2004), "Ask Cymru: planning and developing a cross sectoral service", paper presented at the CILIP ISG conference *Virtual Libraries* held in Birmingham 14 September.