



Always on: Libraries in a world of
permanent connectivity

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Abstract

Mobile communication has been more widely adopted more quickly than any other technology ever (Castells, *et al.*, 2007). It represents a diffusion of communications and computational capacity into a growing part of our research, learning and social activities. It has resonated with emerging youth behavior, providing support for distinctive patterns of social interaction and group formation, information use and personal expression.

Diffuse networking changes how we coordinate our resources to achieve goals. For example, our use of time and space changes. Timeshifting is routine as students may listen to or watch lectures in the gym or on the train. The use of space to support ad hoc rendezvous and social learning is becoming more important.

As networking spreads, we have multiple connection points which offer different grades of experience (the desktop, cell phone, xBox or Wii, GPS system, smartphone, ultra-portable notebook, and so on). While these converge in various ways, they are also optimized for different purposes. A natural accompaniment of this mesh of connection points is a move of many services to the cloud, available on the network across these multiple devices and environments. This means that an exclusive focus on the institutional Web site as the primary delivery mechanism and the browser as the primary consumption environment is increasingly partial.

Students are results-oriented and value convenience. This emphasis coupled with the design constraints on some devices promotes a need to get to relevance quickly. Socialization, personalization and location awareness become very important.

Libraries have been working to develop network-ready services. Mobile communication intensifies this activity and adds new challenges as they look at what it means to be mobile-ready. This has organizational implications as a shift of emphasis towards workflow integration around the learner or researcher creates new relationships with other service organizations on campus. It also has implications for how space is used, for library skills, and for how collections are developed. We can see the impact of mobile communication on services in two ways. First, services may be made mobile-ready, as with special mobile interfaces for library services, alerting services, and so on. Second, mobilization continues the restructuring of services, organizations and attention that networking has brought about. Think here of how to socialize and personalize services; how to adapt to collection and service use which spans personal, institutional, and cloud environments; how to position and promote the library 'brand' as services become atomized and less 'visible' on the network; and more complex questions about what best to do locally and what to source with collaborative arrangements or third parties.

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Introduction

A prelude

The U.S. presidential campaign of 2008 was a milestone. I am not talking about the much discussed issues of race, gender or age. I am talking about the diffusion of digital networking. It is clear that Barack Obama was remarkably successful in mobilizing people and money through the network. At his meetings, he asked individuals in crowds to take out their mobile phones and text their contact details to his campaign HQ. The election will be remembered for how the combination of social networking techniques and the diffusion of connectivity through mobile and other devices allowed Obama's campaign to scale effectively.

Mobile communications, according to Manuel Castells, *et al.* (2007), is the fastest diffusing technology ever. It is not surprising then that we can suggest rapidly accumulating milestones. Here is a random and very recent selection:

- The importance of crowdsourced photographs at significant events;
- The large volumes of votes to TV shows like *American Idol*;
- The appearance of the Apple App Store;
- The ability to deliver rich applications to an increasing number of devices or the appearance of versions of enterprise applications for mobile devices (for example, think of the Pandora app for the iPhone or SAP CRM on the Blackberry); and,
- The Blackberry, iPod, iPhone, and Asus Eee PC.

Until recently, we have thought about the *mobile* in *mobile communications*; more important maybe is the general diffusion of *communications* capacity and its resonance with particular patterns of behavior, consumer choices and lifestyles [1]. As network infrastructure becomes more widespread, communications and computational capacity diffuses through more of our research, learning and consumer behaviors. We are not only looking at increasingly permanent connectivity, but connectivity through devices that have rapidly improving storage and processing capability. People can store thousands of songs, take photographs, and find their specific location on the Earth's surface. In these remarks, I take mobile communications to refer to a general diffusion of networking capacity through the fabric of our lives. This changes our experiences and expectations as creators, sharers and consumers of information.

In this vein, I was struck by some remarks by Trip Hawkins, the CEO of Digital Chocolate and the founder of leading games publisher Electronic Arts, in an interview at the Web 2.0 Summit in 2007 [2]. He is talking about games in a mobile environment, where Digital Chocolate is active.

"In my opinion traditional content is dead ...", he said, and he went on to characterize traditional content as "about a playback and immersive experience and which involve a business model where you pay a fee for the privilege of escapism and checking out" (Hawkins, 2007). These traditional forms include reading and cinema experiences, and he suggests that participation in those media has leveled out. He contrasts this with a new type of content and associated experience, which is growing:

"... where the consumer is increasingly going to spend their money is on social value which is enabled by content where the content isn't for sale for its own sake — the content is there to enable improvements in your social life." (Hawkins, 2007)

Digital Chocolate is a developer of games for mobile phones. Depending on your point of view or cultural formation, this characterization might be plausible or startling.

This type of divided response is common in our current environment, where there are so few settled assumptions about direction, and varied patterns of behavior across generations, countries or economic groups.

One clear development is a blurring of our social, business, learning and educational lives as the pattern of our communication and interaction across time and space changes. For example, the Blackberry has raised the expectation of anywhere, anytime availability in some work environments. Think of this in institutional terms. This blurring raises interesting questions about how libraries are 'present' to their users, and how their users see the library. The position of the library as a functionally integrated, discrete presence, whether on the Web or as a physical place, becomes diffused through various manifestations (a physical place to meet, a toolbar, a set of services in the course management system, a FaceBook application, a set of RSS feeds, office hours in a school or department, and so on). It also changes the relation between the library and other service providers on campus as organizational boundaries track less well to learning and research behaviors. As more activities move onto the network, and as the network becomes more diffused through mobile communications, then workflow and information management become pervasive issues which prompt interesting questions about how academic support services are best configured.

For example, in his book about VLEs (that is, learning or course management systems), Weller (2007) talks about the changing, and sometimes politically difficult, relationship between the library and e-learning developments. This not only throws up questions about where resources are managed or what technical interfaces are required, but also about responsibility and purpose, and about contribution to broader pedagogical practice. A similar convergence can be seen as university research support systems interact with information systems (expertise databases, support for research assessment or publication profiles, advice about citation and presentation, data curation, repositories for research output dissemination, and so on). This involves greater interaction with research practice and behavior.

This interaction with research and learning practice becomes at once more critical and more complex, as the 'formal' systems offered by universities jostle alongside the bricolage of personal environments that are created with social bookmarking tools, RSS aggregators, search engines, communication with colleagues, and so on.

In this way, a discussion about mobile communications, especially when seen in the context of the broader diffusion of network communications, soon touches on many fundamental issues: pedagogy and cognitive approaches; organization and structures; lifestyles and social preferences. However, in this introductory piece, my purpose is to be merely *suggestive* about *medium term* issues for *libraries*. I will say something about mobile communications and library services in very broad terms; more specific treatments can be found elsewhere [3].

I will start in this section with some brief comments about two pervasive themes: generations, an inevitable topic, and networks, increasingly supporting the milieux of work and learning. I will then look at some of the ways in which our behavior is being reconfigured in a network environment, before closing with a short discussion of library issues.



A note on generations

In their global review of mobile communications, Manuel Castells and colleagues (2007) make a strong connection between younger generations and mobile communications, arguing that they “reveal more quickly the potential uses of the technology compared to people of an older age.” [4] They further argue that there is a structural match between the characteristics of youth culture and the capacities of wireless technology, and that this resonance helps explain the rapid diffusion of the technology. They summarize by saying that youth culture has found in the mobile phone an appropriate tool to express its demands for “‘safe autonomy’, ubiquitous connectivity, and self-constructed networks of shared social practice.” [5] Other characteristics they discuss are networked sociability, where social relations are increasingly selective and self-directed; the formation of a collective identity alongside the strengthening of individual identity; the importance of consumerism; and the focus on entertainment, games and media.

‘Safe autonomy’ refers to their contention that while people are becoming more autonomous at a younger age, they retain financial, emotional and other dependencies on family and others. Mobile communications support this autonomy within an ‘always on’ communications safety net. In her book about changing student behaviors and the academic library, Susan Gibbons (2007) reviews the literature around the ‘net generation’. Although her emphasis is a little different — on the sheltered and protected lives many children lead — she points to a similar conclusion. The mobile communications safety net makes parents continuously present to many students. She talks about ‘helicopter parents’, only a call away, and to the practice of turning to parents and others by phone for support with assignments. Interestingly, she suggests that for this reason the library now focus more induction efforts on parents.

Connaway, *et al.* (2008) also note that some graduate students rely on parents as sources for advice about information resources. They also note the results-oriented focus of current students, their multitasking, their desire to figure things out for themselves, a focus on convenience, and a preference for current resources.

The focus on consumerism, entertainment and games in these discussions highlights another important transformation. This generation is familiar with Facebook, Flickr, iPod, and xBox or Wii. It is sometimes suggested that this will raise expectations when they go to college or to work environments. And in some cases it will. Equally interesting in the long term, however, is the shifting balance of innovation and investment as general retail and consumer consumption of computing and network services increases. As computing and communications diffuses into the general population, so does the demand for new products and services. For this reason, developments in the consumer and retail space will increasingly outpace those in enterprise or educational contexts, and many enterprise or educational services will have substitute or rival products in the consumer space (Stokes, 2008). Think, for example, of what is happening with e-mail, where people may use their Gmail account in preference to an institutional one. Or think of discussions around personal learning environments, where it is recognized that students now have a rich set of social networking, content management, coordination and other services available to them outside of the university environment. The university, library, or work environment can no longer expect to provide a more sophisticated digital environment than that which is available in the general consumer space; in fact, the formal learning or work environment may appear increasingly clunky beside the social networking and consumer sites which increasingly set our expectations.

This creates complex service and sourcing choices. For example, do you build an internal social network for new students? Or do you piggyback on one of the social networks they already use?



The diffusion of networking

This congruence between young behaviors and the capabilities of mobile communications has been a factor in accelerating diffusion. An increasing part of what we do is potentially network-aware, and much is potentially sharable and shared. Eric Schmidt, CEO of Google, discusses the shift:

“It’s pretty clear that there’s an architectural shift going on. These occur every 10 or 20 years. The previous architecture was a proprietary

network with PCs attached to it. With this new architecture, you're always online, every device can see every application, and the applications are stored in the cloud." (Schmidt, 2007)

Our online activity is increasingly diffused across multiple applications and multiple devices. As Schmidt suggests, this pushes more applications and data to the cloud: in other words, to shared network services which are then visible across these devices. This broad vision is increasingly shared; for example, Microsoft's Live Mesh initiative aspires to provide a framework for synchronizing and sharing across devices, applications and files, locally and in the cloud. This diffusion and concentration is a general pattern on the network. As the network diffuses into general behaviors, we see more peer-to-peer communication, creation and sharing of data, blogs, wikis, and feed aggregation. At the same time, we see the concentration of computational capacity and data in large network applications — for example, Google, Wikipedia, Yahoo, Facebook — where network effects drive scale and gravitational attraction.

What does this mean? First of all, when the network is always available, or always potentially available, the boundary between 'mobile' and fixed dissolves into multiple connection points, each with its own grade of experience. These connection points may come to be more similar: consider how the iPhone has changed expectations (there were 50 times more Web searches to Google from the iPhone than from any other mobile handset in 2008 up to April [6]). Or, again, consider the drive to move business applications to smartphones, the network-aware Kindle book reader, or the growth in popularity of ultra-portable notebooks. However, it is likely that different grades of experience will remain common, and for some interim period at least, quite important. A cellphone provides a different grade of experience to an xBox, or to a powerful desktop with a large screen. An experience which includes complex transactions and multiple choices is not easily transportable across consumption environments, and it is increasingly common for providers to develop parallel sites specialized for mobile users. It is also increasingly common to develop apps targeted at particular devices. Think of apps created for the iPhone or BlackBerry, for example. Some interesting correspondences emerge here. For example, writing applications for mobile devices and for other 'service composition environments' (Facebook, Myspace, iGoogle) imposes similar constraints: scope for interaction and screen real estate is limited; it is important to do a small number of things well [7].

Second, much of our current model of network information and communication behavior is based on the desktop as a consumption target and the organizational website as the delivery target. However, it appears that the desktop (or laptop) and the Web site may no longer be the sole focus of attention, and a model which focuses almost exclusively on them looks increasingly partial in a world of diffuse network capacity, on the one hand, and cloud-based resources, on the other. We increasingly have a 'mesh' of entry points: PC and phone, of course, but also DVRs, cameras, navigation systems, and consoles. We increasingly use a range of shared network level 'cloud' services: for search, for social networking, for content and information, for communication. Providing service in this environment is very different than in one where the model assumes a personal desktop or laptop as the place where resources are accessed and used and the institutional Web site as the place where they are delivered.

And third, this has an impact on how we build applications. The organizational Web site is also changing: rather than a destination in itself, it is a container combining and processing resources and making them available to multiple consuming devices. The BBC has a nice characterization of direction from the Web site point of view.

"From a conceptual point of view, the widgetization adopted by Facebook, iGoogle and netvibes weighed strongly on our initial thinking. We wanted to build the foundation and DNA of the new site in line with the ongoing trend and evolution of the Internet towards dynamically generated and syndicable content through technologies like RSS, atom and xml. This trend essentially abstracts the content from its presentation and distribution, atomizing content into a feed-based universe. Browsers, devices, etc therefore become lenses through which this content can be collected, tailored and consumed by the audience." (Titus, 2007)

Syndication, synchronization and feed-based integration are important patterns in this environment. Consider for example the synchronization across iTunes, a desktop and an iPod, or the podcasting experience, or the increasingly pervasive use of RSS or various alerting services.



Some reconfigurations

Communication

As mobile communications diffuse networking into more of what we do, it reconfigures our relationship with time, space and other people, just as earlier networks did. Affordable air transport shortened the distance between home and college; now they are a phone call or text apart. Selective social networks live alongside face-to-face interaction in new ways. For example, individual students may participate in multiple communicating groups: short-term as in a particular class on a particular day, or longer term as with family or old school friends.

Continuous connectedness supports a sort of incremental social synchronization as plans, schedules, arrangements, locations and progress can be shared and coordinated across these communicating groups. Arrangements to meet, decisions about what to buy, discussion about shared work can happen on the go and at any time, as colleagues and friends are a phone call or a text away.

This continuous communication means that communication occurs while people are in particular places, also interacting in face-to-face ways with people around them. And we are seeing variable tolerance for the interference of settled behaviors by newer behaviors, as when people talk on their mobile phones in the supermarket aisle, theater, or train. We do not have clear norms here, meaning that expectations may need to be managed, as happens in some cases on trains with a quiet carriage (or in the library).

As network communication becomes more pervasive, and takes place on a variety of devices, we see higher level services emerge. For example, we see services like Dopplr (<http://www.dopplr.com/>) which help coordinate travel, and we see a variety of niche and general social networking activities which support selective networking, communication and coordination. Some of these are currently niche — Twitter (<http://twitter.com/>) or Jaiku (<http://www.jaiku.com/>), for example — and may or may not fade. Some that we cannot now predict will emerge. At the same time, new communication and content services aimed at mobile users continue to appear. There is a major push by sites — BBC, Facebook, Google, for example — to provide access to current mobile devices, and to prepare for a mobile world. And new services proliferate: see MusicID from AT&T (<http://www.wireless.att.com/learn/musicid.jsp>), which provides a service that identifies music for you based on a 15-second sample. New businesses are emerging based on integration or coordination needs in this reconfigured environment. Examples are Boopsie (<http://www.boopsie.com/>) and Rave Wireless (<http://www.ravewireless.com/>). Boopsie indexes content from providers and makes it available in mobile-friendly ways. Rave Wireless provides services to meet communication needs across whole campus populations through various infrastructure services. These include alerting, security, and various information services (video, shuttle bus locations).

However, although communications capability is diffusing, it does not result in a uniform communications environment. An institution cannot necessarily rely on one vehicle — e-mail or texting, for example — to reach everyone in a timely way. This accounts for the title of a recent article by Rave Wireless' Raju Rishi (2007) in *Educause Quarterly*: "Always connected but hard to reach." He talks about how students will choose the communication channel that best suits them "in the moment", and this will vary with situation and communication group:

"Understanding the impact that time-and-place shifting has on students' preferred communication channels and their priorities will help colleges and universities claim space on their students' busy communication radar." [8]

And it raises unexpected pragmatic issues. Gibbons (2007), for example, notes the increased expense of communicating with students: they often have to communicate using long distance calls, because students do not change their mobile's 'home' since they still regularly communicate with family and friends from their 'home' environment.

Patterns of creation and consumption

There are three general developments in terms of consumption. First, there are significant resources targeted at mobile users: games, certainly, but especially music and videos. People *listen* while commuting or exercising. They *listen* and *watch* when travelling. Again, time and space shifting are noticeable, as where a desire to listen to or view a lecture in the student's own time — on the train or in the gym — creates an interest in video and podcasts.

Second, recent discussion of social networks has highlighted the importance of 'social objects': the shared interests around which people affiliate, such as photographs, movies, music, and holiday destinations [9]. Social objects become integral to communications activity, and providers think about how their resources might benefit from social engagement. Where resources are abundant and attention is scarce, the filtering that social approaches (and the use of analytics) provides becomes more valuable. Pervasive networking supports this trend.

This leads into a third issue. A recent report from Microsoft Research discusses the concept of value in relation to human-computer interaction. In some interesting examples drawn from mobile communications, it discusses how usability may be a less important value than the augmentation of real experiences. For example, they talk about how taking pictures can enrich an experience:

"Other studies show that, just as capturing images can enhance the moment, so mobile phones are being used as a new means of sustaining, embodying and creating social networks. ... What mobile phones allow for is the creation and sharing of new 'digital currencies' that bring people together." (Harper, *et al.*, 2008)

Here are some general observations:

- *Media*: Communication patterns alter consumption patterns. Mobile consumption may be focused on situationally relevant resources — facts or answers to questions; video or audio; the ability to manipulate resources on cloud services, to save, share, bookmark. In the desktop model, the user could look for resources, navigate, move around, explore, move between multiple menus. And we have become used to this when thinking about presenting resources. As the interaction experience moves to multiple kinds of device, the challenge is different: the expectation is to get to relevance more quickly, to do a small number of things well, to understand individual needs. Convenience is key. In this context, resources will be increasingly socialized, personalized, and location-aware, and

the mobilization of usage data (analytics) is a growing focus.

- *Socialized*: People connect and share themselves through 'social objects' (music, photos, video, links, or other shared interests) and it has been argued that successful social networks are those which form around such social objects. We are becoming used to selective disclosure and selective socialization through affinity groups within different social networks. Together, these experiences have created an interesting expectation: many network resources are 'signed' in the sense that they are attached to online personas that we may or may not know, whose judgment and network presence we may come to know. Think of social bookmarking sites or Amazon reviews, for example. People are resources on the network, and have become entry points and connectors for others [10].
- *Analytics*: Of course, behavior is important in another way also. We leave traces everywhere, and these traces are increasingly being mobilized to rank, relate and recommend based on shared interests and behaviors. This trend is intensifying, because the ability to present relevant or personalized materials is valuable. Think of the importance, for example, to Netflix of making good recommendations: it turns directly into dollars.
- *Personalised*: While personalization is a general trend, it is probably more critical in a mobile environment given the need stated above to get to relevance quickly. This points to the importance of creating and sharing profile information (let me tell you what I am interested in), analytics (collecting data about my choices and behaviors), and socialization (crowdsourcing relevance judgments, and mining associations and relationships).
- *Location-aware*: An infrastructure for location-aware services is being put in place. The combination of geotagged resources (whether these are restaurants, libraries, or physical items) and location-aware devices is making a range of services possible. An obvious case is search results organized by proximity to the searcher.
- *Synchronization and syndication*: Resources are received, created and shared across multiple environments. Think again of music or photographs, which may move in different directions between services in the cloud, desktop, and multiple devices.
- *Cloud*: All of this discussion points to more services in the cloud. Collection and social services of course, but also content transformation or other services which facilitate use in this environment. Increasingly, it does not make sense for institutions to replicate functionality that is best found with specialist providers.
- *Changing attention patterns*: The network style of consumption — particularly mobile consumption — calls forward services which atomize content, providing snippets, thumbnails, ringtones, abstracts, tags, ratings and feeds. All of these create a variety of hooks and hints for people for whom attention is scarce. It has even been recently suggested that this pattern of consumption is rewiring our cognitive capacities (Carr, 2008). Regardless of the longer term implications, it is clear that people need better clues about where to spend their attention in this environment, and that this is one incentive for the popularity of social approaches. This attention scarcity is apparent also in the academic environment where a bouncing and skimming style of consumption has been observed (Nicholas, *et al.*, 2006). Palmer, *et al.* (2007) talk about actual 'reading avoidance'. Researchers may survey more material, but spend less time with each item, relying on abstracts and other content clues to avoid reading in full.

Space and time

As a pervasive network provides support for communication and shared working, these can be lifted out of physical shared space, and pursued when convenient. Shared space is important, but may need to be available in different ways: consider the role of Starbucks as a form of on-demand space for *ad hoc* rendezvous. Connectivity is also important as a way of reclaiming time: consider the provision of wireless network by Google on buses ferrying employees from San Francisco to work in Mountain View, or the bursts of activity in airports or in other enforced intervals (Economist, 2008b). Here is the *Economist* quoting William Mitchell:

"The fact that people are no longer tied to specific places for functions such as studying or learning, says Mr. Mitchell, means that there is 'a huge drop in demand for traditional, private, enclosed spaces' such as offices or classrooms, and simultaneously 'a huge rise in demand for semi-public spaces that can be informally appropriated to *ad hoc* workspaces'. This shift, he thinks, amounts to the biggest change in architecture in this century. In the 20th century architecture was about specialized structures — offices for working, cafeterias for eating, and so forth. This was necessary because workers needed to be near things such as landline phones, fax machines and filing cabinets, and because the economics of building materials favoured repetitive and simple structures, such as grid patterns for cubicles." (*Economist*, 2008b)

Social/work/leisure

Participation in a shared communications space blurs boundaries between work, social interaction and leisure. This is related to our altered relationship to time and space, as it becomes possible to engage in different types of activity wherever we are and at whatever time. This may be both liberating and stressful, and poses interesting questions for service providers tied to 'office hours'. If assignments are prepared at two o'clock in the morning, should reference services be available at those times?



Some issues for libraries

Introduction

So, what about libraries, and academic libraries in particular? Think of the library as an articulation of four elements: *place, collections, people and expertise, and systems and services*. In a pre-network age, these were very much vertically integrated around the collection. Place existed to house the collection and permit its use. Expertise existed to organize and interpret the collections, and systems existed to process, store and make those collections available. These contributions continue to co-evolve in a network environment, but there is also some unbundling as different trajectories are pursued.

For example, as the role of physical collections changes, and as university needs shift, the library is looking at how library spaces can support flexible, socially directed working styles of mobile communicators, providing configurable spaces which support learning and rendezvous. Interestingly, as discussed above, their communication patterns are changing how students think about space and how they use university social spaces.

Or think of collections. The library is used to providing rather than adapting: resources are provided pretty much as they are published. The library may aggregate and filter, but it has tended not to atomize, recombine or reformat. Of course, the short loan or reserve collection has moved in this direction, providing materials which are more adapted to particular learning needs. As VLEs or course management systems have emerged, other campus partners have also been providing materials — in various ways — which are adapted for particular courses: for example, links and chapters. This puts some pressure on the library to move up the value chain, and to provide materials which are more specifically adapted to learning requirements. This would be, of course, in addition to continuing to provide collections which support more open-ended exploration and discovery.

Here are five general observations before some more specific discussion.

Services. As a growing proportion of library use is network-based, the library becomes visible and usable through the network services provided. On the network, there are only services. So, the perception of quality of reference or of the value of particular collections, for example, will depend for many people on the quality of the network services which make them visible, and the extent to which they can be integrated into personal learning environments. Increasingly, this requires us to emphasize the network as an integral design principle in library service development, rather than thinking of it as an add-on. The provision of RSS feeds is a case in point. Thinking about how something might appear on a mobile device is another.

Switch. This network service orientation highlights the switch role of the library. This is in line with general industrial trends. For example, Prahalad and Krishnan (2008) write about a new business dynamic to drive innovation. On the one hand, they suggest that a focus on a standard product for an undifferentiated consumer is being replaced by a personalized experience and co-creation of value with the consumer. In addition to emerging social network services, they point to numerous other examples, such as Unilever's Pond Institute. On the other hand, they point to the vertical disintegration of companies and the sourcing of critical components from many suppliers. In fact, effective supply chain management has emerged as an important competitive competence. They argue that the personalization of experience and the ability to effectively source capacities with multiple resources is central to the ability to innovate. This dynamic is familiar to libraries, but it is interesting to see it highlighted in this way. Increasingly, the library will have to meaningfully synthesize a range of products and services from multiple sources, specialize them for particular users and uses, and then mobilize them into a personalized, socialized individual user experience [11]. There are not routine ways of doing much of this now. The library faces increasingly complex sourcing decisions, while at the same time it is not clear at what level socialization/personalization should happen.

Sourcing. Sourcing decisions are getting more complex as the service environment diversifies. For example, I asked above if an institution should look at building a social network to support new students, or should it use an existing service. Here, as in so many other cases, we are in a transitional phase. How much will the library need to build, how much can be sourced by the library from third parties, and where will alternative services emerge which can be directly consumed by students or academics? Should a library begin to try to specialize collections of electronic resources for particular courses? Or build profiling and other infrastructure to support better personalization? Or should they wait and see what the market provides? Or look to library or educational providers, or others, to create collaborative services? Or try to build specialized services on top of Flickr, or Facebook, or Delicious?

Socializing and personalizing. Libraries have experimented with socializing services, inviting tagging, reviews and other contributions. The library may not be the best level for this as they may not have appropriate volumes of use, or users may not perceive the incentives that motivate participation in other environments. There has also been some experiments with personalized library environments. In each case it is likely that approaches which mesh with broader initiatives, at the campus level, or within some larger service level, will be more common. The University of Minnesota provides an example of the former where the library is working with student records systems to develop a concise representation of student academic interests (e.g., course enrollments, degree programs) which can then be automatically matched with relevant resources and services [12]. An example of the latter is where institutions are beginning to expose images on Flickr to benefit from the community Flickr has built.

Expectations. Unlike other organizations, the library has limited flexibility in what it offers: it supports the research and learning needs of its institution with whatever materials are requested. It cannot simply turn off categories of provisions (print materials or e-books) because it would rather not deal with them anymore or they present particular delivery challenges. This means that there will always be challenges of provision. These are highlighted in a network environment, as it is not possible to provide many things network-ready, and it is not possible to provide even more things mobile-ready. There are also variable expectations. Students are results driven; they want relevant, tailored, and fit-for-purpose materials; they may want to easily copy and share. The library wants to meet these expectations, as well as supporting

other needs.

Services and systems

We can think of two ways in which a discussion about services is framed. First, how do you 'mobilize' existing services to work better with the variety of network consumption patterns which are emerging? And second, how does this changing network environment restructure some of the ways in which we think about and provide service? I will consider each of these in turn.

Here are some of the ways in which we see libraries already adapting with mobile-ready services. Kroski (2008) provides examples of some of these and other services.

Reference/enquiry: Libraries are offering services through a range of communication vehicles such as chat, instant messaging, texting, and e-mail. Should the reference desk take phone calls from people in meeting or study space in the library? Data from an ongoing study of Virtual Reference Services indicate that even where people are physically in the library they may prefer to use chat reference than seek out a face-to-face encounter [13]. Again, convenience and workflow integration are important.

Collections to go: Audio- and e-books are available in various ways. As discussed already, user lifestyles make these attractive. In some cases, devices are lent to play the material.

Presentation and visibility: Videos and podcasts describing or promoting particular library services, covering library events, and so on are becoming more common. Often, these are made available on network level sites — YouTube, iTunes — where they are more visible.

Alerting: RSS is becoming pervasive. Text message and e-mail alerts are also more common. People may be told about events, about the status of their interactions/requests, and availability of staff. I quoted Raju Rishi above on the difficulty of reaching students through one channel. This is another interesting example of new service providers emerging to address needs in this reconfigured environment.

Syndication: Libraries have begun to push applications and content into the diffuse network environment of their users. RSS feeds, widgets, and Facebook applications are becoming more common.

Mobile sites: Some libraries are specifically designing for mobile access. This imposes an interesting and valuable discipline. The mobile site needs to be much simpler than the typical library site, and it is a useful exercise to think what is best to present there. Here is an example from North Carolina State University [14]. Note the status of the bus again (Offline Status). The 'computers' link lets you know the availability of computers in different areas of the libraries.



Figure 1: North Carolina State University, mobile site, at <http://www.lib.ncsu.edu/m/>.

Communications and referral: We are now familiar with staff in retail environments being 'wired up' for constant communication. Such micro-coordination support may also be useful for library staff.

Booking: Rooms, equipment, and consultation may be booked over the network. Availability may be checked. This becomes more important in the 'micro-coordinated' lifestyle described earlier.

Note-taking: Cameras are now common, and can potentially be used in a variety of approved and unapproved ways. Rather than writing down the details of an item found in the catalogue, a photograph of the screen can be taken. Photographs of pieces of text or images may save copying or writing, and can be shared quickly. In time, of course, this type of activity will become more sophisticated as cameras can read encoded data associated with items and allow more sophisticated services.

So, how does an environment where networking is diffusing through research, learning and communication behaviors

potentially reconfigure services in the near future? Here are some thoughts:

Institutional resources and timeshifting: There has been a growing emphasis on managing institutional assets: learning and research materials, e-prints, and other research and learning outputs. We can see this interest now being extended to audio and video resources, capturing lectures, events and induction materials to cater to mobile users. This matches general timeshifting behaviors where watching lectures on the train or listening to a talk in the gym are routine. Managing the capture, accessibility and continuity of these resources over time is not yet a routine activity, nor does it have a clear organizational home.

Synching and portable collections: The iPod and related devices have accustomed us to carrying large collections around and periodically docking to synch up between devices and services. People now load textbooks, theses, books, video, and music onto drives of various types. We also have reserve collections for particular courses. A model in which a student receives a collection tailored for their courses and periodically synchs it either with an institutional service or a service in the cloud is increasingly feasible. Again, the balance between personal, institutional and cloud is one that crops up in various places.

Engaging with personal collections: People use a growing array of services to manage their digital lives. Although some are local to their devices, a growing number are on the network. Think, in different contexts, of Zotero, Delicious or Connotea; Flickr, YouTube or Slideshare; Google Docs, Scribd or Zoho. Microsoft, Google and Yahoo, as well as others, will continue to aim to provide a framework within which people manage their resources, communicate, and build their online identity. Two thoughts come to mind. One I have already mentioned: some of these resources may be important to the institution, which may want to provide backup services to ensure their continuity. The other is increasingly interesting: how do library resources play in these environments? Can I link to individual catalog records, journal articles or e-books? Can I mix library resources with those in my personal collections? Are library resources RSS-ified?

Specializing: Resources will become more specialized for particular uses, users and user environments. This is a general trend: it is heightened by the convenience and relevance requirements of variously networked users. There is a growing expectation that resources should match the context of use: a particular course, for example. This may involve content atomization, into chapters and images. Resources benefit from declaring more about themselves: what they are about, what they are suitable for (level of treatment, intended audience, etc.). This is especially important in a mobile environment and points to the importance of abstracts and other evaluative information, as well as to the potential benefits of personalization or socialization. And resources may need to play on certain devices, to be linked to, or be subject to other requirements. They may need to be 'ready' to participate in whatever learning environments are used on campus.

Such specialization represents a general issue in an increasingly networked learning environment. It also raises more specific questions around the intersection between the library and the generation of learning materials.

Collections

Access to collections was discussed above, as access is increasingly a network service issue. What about management of collections? I will highlight three issues here.

First, there is the issue of management of print collections. The related issues of network use and repurposing of space have heightened awareness of the opportunity cost of managing print collections: what is not being done because effort and resources are going into a library resource which is releasing progressively less value in active research and learning practices? This is prompting more thinking about 'collective collection' issues: how do you begin to think about managing at the aggregate or group level (consortium, state, country)? We can see this thinking coming through in mass digitization initiatives, shared off-site storage, and initiatives like the U.K. Research Reserve [15] which are seeking to reduce the overall volume of materials held by considering what is required at a system-wide level (in this case the national level). This is a major issue with interesting policy and service ramifications.

Second, there is the issue of licensing external collections. As the types of things that we want to do with collections diversify, such as providing reserve collections, or consolidating and adapting resources, rights issues become more complex. This is an area where we may see more services emerge, both to clear rights and to provide value-added combinations. And as libraries subscribe to such services, or to streaming media and other services, it raises the question of what, if anything, the library actually 'adds' to its collection beyond the licensing of it.

Third, there is the issue of the continuity of personal and institutional collections. There are two issues here. First what about those resources which are managed outside the library or institutional ambit? So, if a department begins to use SlideShare [16] to make presentations available, does the university want to copy them to some persistently managed university environment? The same issues arise with classes which use Flickr to manage pictures as part of their coursework. Or what about the collection of university podcasts on iTunes? And second, does the institution assure continuity over time of its own digital assets as these proliferate? The continuity of the electronic journal literature, which libraries typically license rather than buy and locally manage, and individual library responsibilities towards that continuity is a matter of active debate. The issue comes up in relation to other resources: for example, does the library now pay extra to store local copies of materials from a streaming service? This leads us to a broader question, which goes beyond my intentions here: what is the library collection in an environment where licensed, personal and institutional collections mingle in use?

Space

Library space has been a major preoccupation in recent years as institutions have thought about how best to cater for

social learning, to accommodate related endeavors (writing center, centers for digital scholarship, specialist advisory services), and to deal with print collections.

Spaces increasingly cater for *ad hoc* rendezvous, for flexible meetings, and for communication alongside more traditional 'study' space. In addition, there is a need for facilities for recharging, for synching with the 'cloud', for copying/sharing media. Access to specialist or high-end equipment also becomes a potential service, as does lending of accessories or laptops.

People: Presence

In some ways, the challenge for libraries is to make themselves invisible, by delivering services into user workflow in networking environments. We also know that users of library services on the network do not always associate them with the library as provider (Connaway, *et al.*, 2006). However, libraries must also demonstrate value in the context of growing competition for resources. This suggests that as their network services grow in sophistication it is important for the library itself, its people, to be more visible. Here are some examples.

Marketing: Library services are going to have to continually adapt to evolving network practices. This makes marketing a central activity, not understood narrowly as promotion, but rather as the evolution of products and services based on a structured investigation of changing needs. Assessment is also critical, to understand how well services meet those needs.

Physical presence: As users interact with services on the network, library staff needs to be more personally visible. This is partly a matter of being accessible in the variety of ways people communicate (e-mail, texting, etc.). And it is partly a matter of personal engagement in the life of the university: on committees, in teaching, in collaboration. It is interesting to see a growing interest in librarians taking office hours within departments, so that they are visible on the ground in the physical flow of conversation and casual encounter.

A 'signed' network presence: As I noted above, we are used to seeing 'signed' resources: reviews, ratings, social networking profiles, bookmarks. People have become entry points on the network, and signature is important. Think of library Web sites. They tend to be anonymous. Often, it is not straightforward finding appropriate contact points: there may not be photographs, or communication options are limited (office hours, IM, texting, e-mail, phone). Library services are not always associated with people. How often do subject pages, for example, carry a name and contact information who can be consulted?

Connaway and Radford (2007) note how students are sometimes reluctant to use virtual reference because they do not want to interact with somebody who remains anonymous or who they do not know, even if it is a library service.

Being present in student's network environments requires tact. Not all intersection points are equal: it may be less appropriate for the library to use some channels than others. Libraries are exploring, for example, how best to use social networking sites. They want to be available in important venues, while avoiding the 'parents at the party' syndrome.

Expertises: Libraries are broadening their expertise as they develop a better understanding of how to cultivate a network presence which is valued by their users. This extends to greater engagement with learning and research practice, an appreciation of how to construct network resources, dealing with marketing and assessment issues, and an understanding of the balance between university and publisher interests in IPR. An area of growing interest is support for reputation management as the network identity of individuals and institutions becomes more important. This intersects with research skills (citation, consistent naming) and search engine optimization.



Conclusion

I have discussed mobile communications in the context of the broader diffusion of networking into the research, learning and social lives of our users. This resonates with communication and group behaviors of students. And it reinforces the general emphasis on convenience: as resources become more abundant we see that students and researchers are concerned about how they 'spend' their attention. This poses challenges in how current services are provided, but also points to a reconfiguration of these services to better coordinate library resources in support of new patterns of information behavior. Examples are the use of physical space; working across personal, institutional and 'cloud' environments; and the mobilization of services into where users organize their digital experiences.

Much of my discussion has been open-ended, looking into the medium term, and I have not suggested answers for many of the questions I posed. Here are some examples.

- **A complex systems environment:** I have discussed how the emergence of network consumption across a variety of devices and environments, coupled with a user desire for convenience and relevance, presents a challenge for current service infrastructures. This is in an environment of abundant substitute or alternative information resources and scarce attention. The library cannot expect its users to build their workflow around the library; it must reach out into the workflows its users are creating on the network. This means providing a higher level of network- and mobile-ready services than now exists. This presents significant challenges for library systems and collections regimes. Currently, they are providing a thin layer over two sets of heterogeneous resources. One is the set of

legacy and emerging systems, developed independently rather than as part of an overall library experience, with different fulfillment options and different metadata models (integrated library system, resolver, knowledge base, repositories) (Dempsey, 2008). Another is the set of legacy database and repository boundaries that map more to historically evolved publisher configurations and business decisions than to user needs or behaviors (for example, metadata, e-journals, e-books, and other types of content, which may be difficult to slice and dice in useful ways). How much work should the library do locally to address needs (adding tagging systems, mobilizing sites, atomizing and remixing content, personalization, etc.)?

- **Sourcing decisions:** This leads into a second issue. It is always tempting to talk about transition. However, this is misleading as it suggests a stable end state. It is probably more reasonable to talk about continuous change. In such an environment it is important to focus effort where it will have most impact, and not to needlessly duplicate effort or to work on solutions which may be overtaken by other work. What should be managed or developed by the library? What should be sourced collaboratively with other libraries? What should be secured from third parties? Related to this is thinking about how best to leverage other campus environments (learning management systems, student record systems) or external network services used by students and researchers (Flickr, Zotero, Facebook).
- **Library value:** The library has a visibility and brand challenge. On the one hand, services need to be available which integrate well with personal and other work environments, and consequently, may be less visible to the user. At the same time, the continued competition for resources means that the library needs to be as visible as possible. This is not easy and calls for heightened marketing engagement and local political skills. The library needs a brand which is meaningful and engaging, which communicates its value, and which transcends the caricatural impression many have based around the building and print collections.
- **The user experience:** Users increasingly expect socialized and personalized environments. As I have discussed, it is not clear what role individual libraries should have here, nor how some of this might be achieved.

We are still working on organizational and technical responses to these and other questions. 

About the author

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Notes

¹ This point is also made by Manuel Castells in: M. Castells, 2007. *Mobile communication and society: A global perspective: A project of the Annenberg Research Network on international communication*. Cambridge, Mass: MIT Press. I have found this volume helpful in developing the general remarks here. I have also benefited from "Nomads at last", an *Economist* special section (10 April 2008) as well as the useful review of trends in S. Gibbons, 2007. *The academic library and the net gen student: Making the connections*. Chicago: American Library Association.

² "Edge: Gaming moderated" by Morgan Webb with Trip Hawkins and Robert Kotick from Web 2.0 Summit, San Francisco, 18 October 2007, at <http://blip.tv/file/441160>.

³ For more detail about current technologies, mobile services, and library applications see Kroski, 2008, and International M-Libraries Conference, *et al.*, 2008.

⁴ Castells, *et al.*, 2007, p. 167.

⁵ Castells, *et al.*, 2007, p. 245.

⁶ *Economist*, 2008a.

⁷ I owe this observation to my colleague Bruce Washburn, author of the Worldcat iPhone application at <http://www.apple.com/webapps/searchtools/worldcat.html>.

⁸ Rishi, 2007, p. 8.

9. The following has links to relevant work: Lorcan Dempsey. 'Some thoughts about egos, objects and social networks,' Lorcan Dempsey's Weblog (6 April 2008) at <http://orweblog.oclc.org/archives/001601.html>.

10. I owe the phrase 'people are entry points' to Dan Chudnov. See also this interesting presentation at the CIC Library Conference, Minnesota, March 2007, which reinforced for me the importance of 'signature'. Cody Hanson, "Next Generation Librarians: Visions of Our Future," at <http://codyhanson.com/CodyHansonCIC032007.ppt>.

11. The expression *synthesise–specialise–mobilise* is Robin Murray's see R. Murray, "Library systems: Synthesise, specialise, mobilise," *Ariadne*, issue 48 (30 July 2006) at <http://www.ariadne.ac.uk/issue48/murray/>.

12. Personal communication from John Butler, AUL for Technology, University of Minnesota Libraries, 4 August 2008.

13. Personal communication from Lynn Silipigni Connaway (29 July 2008) based on unpublished analysis of telephone interviews in the *Seeking synchronicity: Evaluating virtual reference services from user, non-user, and librarian perspectives* project, at <http://www.oclc.org/research/projects/synchronicity/default.htm>.

14. North Carolina State University Libraries, Mobile site, at <http://www.lib.ncsu.edu/m/>.

15. <http://www.rluk.ac.uk/node/85>.

16. <http://www.slideshare.net/>.

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