QR Codes – using mobile phones to deliver library instruction and help at the point of need.

Abstract:

Though true location aware devices such as GPS enabled phones are becoming more common (e.g., the latest iPhone includes GPS and compass) developing services that "augment" reality is unrealistic for most libraries due to time; money and technical constraints.

There is an easier option though – using small printed codes, such as QR codes, around the library that link to resources and information appropriate to their location.

QR (Quick Response) codes are a matrix codes, like a two dimensional bar code. They can be read by mobile phones with integrated cameras, with a small application installed. Some mobiles come with the application ready installed, though it can also be download for free from the internet and installed on PDAs, smartphones and other mobile devices.

At the University of Huddersfield we have used QR codes to deliver context appropriate help and information to blur the boundaries between the physical and electronic world. We've developed mobile friendly materials to deliver information skills materials directly to our users at the point of need, linked by QR codes on printed materials and on appropriate locations in the physical library.

This article outlines the practical uses we've found for QR codes and gives preliminary results of how they've been received by our library users.

Keywords: mobile learning, mlearning, QR codes, mobile phones

1

2 This article is an extended version of a paper to be delivered at LILAC 2010 by the author.

3 QR Codes – using mobile phones to deliver library instruction and help at the point of need.

1 Introduction

> *"Knowledge of the end user's location will be used to deliver relevant, timely, and engaging content and information. … these services can help reduce confusion, improve the consumption experience, and deliver high-quality service options."* (Rao & Minakakis, 2003)

This vision of the near future discussed how commercial services could use mobile devices that are aware of the users location (through triangulation from cellphone masts, or using GPS – Global Positioning System) to provide location specific content to their users. This is now becoming mainstream reality, for instance when I start the Google Maps application on my mobile phone it knows roughly where I am (even without using GPS) and can tell me problems on the roads nearby that might affect my journey, or display information on nearby businesses. Increasing numbers of mobile phones (such as the latest iPhone and some that run the Android operating system) include both GPS and a compass to give a reasonably accurate idea of position and the direction the phone is pointing. These sorts of applications blend my physical experience of walking down the street, or driving my car, with elements of the virtual, not creating a "mash-up" (normally a mix of data or applications from different sources*)* just of different data sources, but one that includes the physical world as an element within those data sources. They make context specific information available to use at the point of need, enriching our experience and, as the quote above says, giving us information that is relevant and timely and helping to reduce our confusion. Systems such a Layar (http://layar.com/) and Acrossair (particularly their "find your nearesttube station" app - http://www.acrossair.com/apps_nearesttube.htm) aim to make this sort of augmented reality mainstream for modern smartphones.

Some University campuses are experimenting with these ideas, such as Durham University's Technology Enhanced Campus project (http://tel1.dur.ac.uk/wiki/), using the campus's WIFI network to triangulate users position if they install a mobile client onto a WIFI enabled phone or PDA (Batty and Kyaw, 2009) with the aim of providing personalised and location specific information to students on campus.

However, in the typical library today, the most likely source of context specific information will be printed materials on a notice board or table near the location that help may be needed. There simply isn't the space to put even highly subject specific instructions and help next to the physical materials themselves within a library. Where that help is in the form of online materials such as webpages; online tutorials; videos and audio files there may be no easy way of finding that they exist from within the appropriate physical location of the library.

As Lincoln (2002) says,

> "*Users are changing. For the first time in history, users interact freely and comfortably*

> *with two realities: the physical and the virtual.*
> We think of users as real people, in a real, tangible world, just as we have always thought of libraries as real buildings, with real books and journals—a very physical, tangible reality. But users are now sometimes, for all intents and purposes, virtual people, interacting with virtual services and virtual and digitized libraries and materials. Increasingly, as users learn to navigate the virtual world on their own, they also wish to navigate the physical world self-reliantly"

In library services today, particularly within Higher Education, we've made great strides towards meeting these users in the virtual world with an array of online help and resources. However, while real people may exist with multiple virtual identities concurrently with their "real" physical identity, our online resources too often seem to exist in their own world, often disconnected from where they may be needed in the virtual world, let alone the physical. There seems minimal embedding of these online resources within the physical world, to help users *"navigate the physical world self-reliantly*" with the help of context specific information they can access themselves.

We provide teaching in information skills where possible to staff and students at times often determined more by basic timetabling issues than the current need of students, hoping that the online help and tutorials we provide are picked up by students at the time and place of need more in hope than expectation. If this online help could move from only being available from a fixed computer to being easily linked to and displayed from appropriate places where students study, then we have the opportunity to deliver information skills materials to the real point of need, when students are actually searching for information and moving around the physical library.

Though true location aware devices such as GPS enabled phones are becoming more common, developing services that "augment" reality is unrealistic for most libraries due to time; money and technical constraints.

There is an easier option though – using small printed codes, such as QR codes, around the library that link to resources and information appropriate to their location.

QR (Quick Response) codes are a matrix codes, like a two dimensional bar code. They can be read by mobile phones with integrated cameras, with a small application installed. Some mobiles come with the application ready installed, though it can also be download for free from the internet and installed on PDAs, smartphones and other mobile devices.

They can prompt a mobile phone to display encoded text; go online to URLs stored in the QR code; ring a phone number; start a text message; or import contact details (vcard). They follow an international standard (ISO/IEC18004) meaning that the many different (normally free) applications that create and decode these QR codes are interoperable. Other mobile devices such as netbooks or laptops often come with integrated cameras. These are equally able to install QR readers and use QR codes.

At the University of Huddersfield we have used QR codes to deliver context appropriate help and

information to blur the boundaries between the physical and electronic world. We've developed mobile friendly materials to deliver information skills materials directly to our users at the point of need, linked by QR codes on printed materials and on appropriate locations in the physical library.
Whereas Walsh (2009) recently outlined some potential uses of QR codes in libraries, here we move from the potential uses to outlining below some of the practical uses we've found for them, how we've promoted them and give preliminary results of how they've been received by our library users. It will then briefly discuss how we may take forward the idea of the using mobile phones to subvert the boundaries between the physical and virtual library to provide information skills instruction and help at the point of need.

2 Promotion of QR codes:

One of our major challenges was increasing awareness of QR codes within the university, in particular within our population of library users. At the time we started the project we ran an exit survey, asking everyone who left the library a simple question. We showed them a picture of a QR code and asked "Do you know what this is?". At the start of the project only 8% of the 163 respondents answered positively.

This is broadly similar to a survey at the University of Bath early on in their experiences of QR codes, where 12.6% (*Ramsden and Jordan, 2009)* knew what a QR code was, though their survey also found that 93% of their students owned a mobile phone with an integrated camera (the basic requirement for decoding QR codes) and that for the majority of the top 10 phones identified there was a QR code reader available.

The percentage of staff who knew about QR codes was perhaps even lower, so we first of all ran training session and staff briefings on QR codes (sample briefing can be found at Walsh, 2009: http://librarymobiles.blogspot.com/2009/09/qr-codes-staff-presentations.html) in the Summer of 2009 before we tried to promote them to our users.

During the Autumn term, 2009, we starting promoting them to our users. Instead of producing "worthy" handouts, leaflets and posters, we instead ran a competition containing limited amount of information, but instead requiring them to use QR codes to enter a competition to win a £100 voucher towards a new mobile phone. The competition codes formed a treasure trail where 10 "secret words" were hidden around the library, together with clues as to where to find further "secret words". To be entered into the competition they needed to text seven of these hidden words to a number advertised. At the time of writing this article only small numbers of students had submitted entries, though the competition still had several weeks to run.

We relied on taking advantage of the natural curiosity of our students, as well as providing a nice monetary incentive, to try and draw people into installing an appropriate application on their phones (if they didn't already have it) and explore the library to find these hidden codes, as well as the many non-competition codes. The small number of competition entries suggests that this is not enough and that perhaps we need to make more explicit the benefits of using QR codes.

At the start of Spring term, January 2010, the exit survey was repeated, with a significantly increased awareness of QR codes, showing that although the competition attracted few entrants, the promotion of the codes had worked somewhat. In the January 2010 survey, 22% of the 306 respondents responded positively. Interestingly, an additional 11% volunteered that they had seen them within the university (or on the library catalogue) but weren't sure what they were for.

As a follow up we will be promoting QR codes to students in a more direct, explicit way. We intend to staff a series of stands promoting what QR codes are and their benefits. Most importantly, at these stands we will provide help to install QR readers onto users' own mobiles as well as demonstrating them on ours. Our results so far suggest that this step, the finding and installing of a reader, is the main barrier to their use, so we hope that helping a number of students over this barrier may increase usage as well as awareness of QR codes. An illustrative quote about QR codes from a focus group on the subject of mobile technologies in the library was:

> *"Doing things like this, competitions, to get people to just sort of experiment with it is probably the right sort of thing to do to make people aware of how it works and make them realise they can use it. It is the sort of thing that people have to be made aware of for it to work."* Focus group participant, November 2009.

3 Uses for QR codes:

The uses for QR codes at the University of Huddersfield Library can be split into the following categories: Linking to electronic resources; linking to instructional videos; linking to useful website for further information; containing contact details; and as a way as storing information for future reference. The following sections explain the uses we found under each of these categories.

4 QR codes to link to electronic resources

We find that many of our users are unaware of the wealth of electronic resources we purchase. They expect a good range of print materials to be available in the physical library and often use electronic materials freely available on the internet, but don't automatically associate the library with easily accessible, high quality, electronic resources. We particularly find with some of our students who may have used print journals in the past rely on browsing through print journals to find articles of interest. We also find that if all the copies of a text book are on loan, students rarely realise that an electronic version may be available.

To deal with some of these deficits in awareness of the sources of information we have available, we have linked to some electronic books, journals and videos from the appropriate physical locations in the library.

For books we selected a small number of electronic books available through one of our suppliers that provides them in PDF format, which should be more accessible from mobile devices than those that require a proprietary reader installed or run through a browser. We put next to the physical books a laminated copy of the book cover on one side, with QR code linking to the

electronic version on the other. A link to our webpage explaining QR codes was also provided.

On the boxes containing back copies of journals, together with the stands containing current copies, we put QR codes that took users to our link resolver, searching our electronic holdings and linking to the appropriate electronic journals where available.

On shelf ends where audiovisual materials were held we put QR codes linking to Unitube, where we record television and radio programmes, plus increasing numbers of lectures, electronically.

Only half the electronic books linked to had been accessed at all by QR code, with usage ranging from just 1 access to 16 times. Usage of journals was equally low, with only codes being scanned only 22 times in the Autumn term 2009.

5 QR codes to link to instructional videos

We regularly create and signpost videos as part of our information skills training, most of which are available through our webpages. However, these are rarely obvious to our users at their point of need. As part of this project we converted some existing videos to more mobile friendly formats and created some new videos and linked to them from context appropriate locations within the library.

For instance, a video explaining how to search for legal journal articles was linked from a shelf end containing legal journals; a video demonstrating the print credit machine was actually on the print credit machine itself; and a video tour of one of the floors was linked to from the entrance door to that floor. Further videos were linked to from physical handouts to augment the text and pictures within the printed guide, providing more in depth help as well as offering an alternative format to suit differing learning styles.

The videos were initially linked to only by QR code, though were freely available on the internet, so may have been "stumbled across" by some users. The usage figures for their first three months do give an idea of how many viewings they have had, as we expect the primary access route to be via QR code until we promote the videos more widely. The tour of one of the floors was the most popular, with 140 viewings of this video. The two other videos that had some usage were how to search for legal journal articles (29 viewings) and how to use the print credit machines (21 viewings).

We did believe that videos linked by QR code would be a convenient way of our users receiving information skills tuition when and where it was needed, but the usage does not suggest that our users agree! Some student feedback in library focus groups (November 2009) on the use of podcasts and vodcasts in formats suitable for mobile devices seemed quite negative, with even a student who had watched our online videos saying: *"I've streamed a couple of the videos on my laptop, everyone's used to going on YouTube and everything and videos playing, but I probably wouldn't download one"*. There were also several comments regarding the potential cost of streaming videos from a phone, showing the cost of connecting to the mobile web is still an issue.

6 QR codes to link to further information on the internet

In addition to the use of videos as virtual learning materials link to from context appropriate locations, we also used a range of internally produced and externally recommended webpages. QR codes to these links again appeared on shelf ends and in printed guides. It allowed us to signpost some useful instructional resources to our users as well as alternative information sources.

Examples included linking to the Office of Public Sector Information (OPSI) website (where legislation can be found) from the shelves that contain our print holdings of legislation; linking to our referencing webpages from our referencing handout; and linking to short mobile friendly quizzes from a range of handouts to allow users to test and reinforce the knowledge gained from the print resource itself.

None of these included a way of tracking usage through the QR codes, so we will have no information on whether they have been used, or seen as useful, until later evaluation.

7 QR codes to contact the library for further help

Sometimes the most information literate approach to a problem is to ask a knowledgeable person. We have such a range of ways to contact the library for help, that our users may not always know the appropriate person to ask or how to contact them. To help, we put QR codes linking to the student IT help phone number near photocopiers and printers (that our student IT help support); QR codes linking to our “Text a Librarian” service near library catalogues; and ones containing subject librarian phone numbers in subject guides, making it quick and easy for our users to link to appropriate help at the time of need, as well as store that information in their mobile phones for future use.

8 QR codes to store information for future reference

The first application for QR codes we introduced was on our library catalogue (http://webcat.hud.ac.uk). We’ve found that sometime our users have the skills to find books on the library catalogue, but perhaps are not information literate enough to know what information they need from the catalogue screen to find a book. As a result they may write down incomplete information from the screen and become frustrated when they fail to find the item.

There has been suggestion that increasingly library users are taking photographs of the catalogue screen using their mobile phone before looking for a book, perhaps as they find it easier than writing down the details, or possibly because they may be aware of the problems above. We therefore automatically generate QR codes on the library catalogue that link to a version of the live catalogue record for each item. When a library user finds a useful item over the catalogue, they can scan the QR code and take full, accurate details with them while they look for that item within the physical library. This is close to the actual practice of some of our students, while providing a better service through the QR codes.

The usage figures for the library catalogue QR codes back up the idea that this reflects students’

behaviour, with these codes having by far the most usage. To date (End of January 2010), the catalogue QR codes have been scanned 242 times, with 125 scans during Autumn term 2009 (September to December).

9 Summary

We've tried various different uses for QR codes, from providing contact details, to pushing quite detailed information skills tutorials in mobile friendly formats. Usage has been disappointingly low for all of these, though with assessment of the project still under way, it is too early to say for certain why.

Preliminary results suggest, however, that our students find even a fairly low barrier to entry (downloading a free, readily available application) too much. They need convincing from the start that any new service will bring them concrete benefits before they will investigate how to use that service. So even a low barrier becomes insurmountable unless their interest and enthusiasm is engaged by a high perceived benefit. Even the chance to win £100 was not seen as sufficient incentive for large number of students to install QR readers onto their phones.

Some general focus groups held in the library during November 2009 summed up the general feeling amongst students towards QR codes as *"Has potential. But...."*, listing various potential frustrations that this sort of technology may have, including being too complicated; having too many things to go wrong; and the fact that few people can use them without choosing to install an additional application. Comments ranged from the very negative but though provoking *"why bother?"* to *"if we could give a device to every student it would be really useful"*, recognising the massive perceived barrier of installing a reader onto their own phones, over and above the barrier of simply knowing what QR codes are. There was an element of hope for QR codes, however, with the negative comment *"I don't think enough people can use them, unless you have an iPhone or one of those really smartphones, it's not really going to happen"* being fairly representative of those that see QR codes as impractical at present due to the nature of phones in current use. As smartphones become more widespread and it becomes easier to install applications, this objection will reduce in importance.

Our assessment is concentrating therefore on perceived benefit of the different ways we have used QR codes. If their use in one or more particular ways was seen as having significant value, above and beyond the delivery of those services in more conventional ways, we will focus on these uses in particular, along with trying the get a "critical mass" of QR codes in the library and around the campus as a whole, so their use is seen as both of value and the norm within the university. We can then expand again into a range of uses if a significant proportion of our university population ever does start to carry devices with QR readers installed.

10 Possible Future directions

There are many ways we could go further in this idea of providing location appropriate help to students at their point of need, particularly to deliver information skills training. We suspect

however, that with installing a free QR reader being too much of a barrier to most, that we need to be very careful we do not spend time developing the use of QR codes or more technologically complicated alternatives such as Bluetooth or WIFI triangulation; or augmented reality style applications, that provide any perceived barriers to widespread use.

We may extend the use of QR codes if our users identify for us those usages that have real value for them and can act to overcome this resistance to investigating, let alone overcoming, the perceived barrier of installing a free application to their mobiles.

The other alternative we are investigating will depend upon significant funding being available. This is to take more advantage of the RFID systems in place within the University library. All active users of the library use the RFID tags embedded in their staff or student cards, as well as in all our physical stock. Even non library users often use the RFID tags in their student cards to get into building and rooms around the university outside of core hours. It's therefore a technology that the majority of the University's members are already using. However, we don't currently use the technology to take advantage of the wealth of information that is available to us and present help and support to students. Behind every tagged book is data showing what other editions of that book might be available; what other items have the same or similar subject headings; what people have borrowed after that item; and much more. Similar information is available from student cards, we know what course they are on; what books they have on loan; whether they are using our electronic resources; and information on the behaviour of other students on their course currently and in the past.

Using RFID to connect our users and physical stock to the wealth of data we hold could allow us to present suggested reading; electronic resources they may find useful; information skills materials that might help; people who may help; colleagues who may be working in similar areas (for staff and researchers); and much more, all through technology that our users are comfortable using already. It would require significant investment in time to develop these services and equipment to display this personalised information in a convenient, accessible way, but is something we are interested in pursuing in the future.

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12 QR Readers / generators

BeeTagg - www.beetagg.com
I-nigma - www.i-nigma.com
Kaywa - www.kaywa.com
Neoreader - www.neoreader.com
Nokia Barcode Reader - http://mobilecodes.nokia.com/
QuickMark - www.quickmark.cn/
Upcode - www.upc.fi/en/upcode/
Zxing - http://code.google.com/p/zxing/wiki/GetTheReader

Also, see Percentmobile QR code picker (visit this site on your mobile phone and it shows 3rd party compatible readers) - http://www.tigtags.com/getqr