QR codes: Using mobile phones to deliver library instruction and help at the point of need

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

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Abstract

With the rise of smartphones that contain integrated GPS (Global Positioning System) chips, increasing numbers of devices are aware of their own location. For most libraries, however, taking advantage of this functionality to introduce services which "augment reality", that is overlay physical reality with a virtual layer of information in users own devices, is unfeasible.

An easier alternative to full augmented reality is to use QR (Quick Response) codes in places that link to location or context appropriate information and resources, using information embedded in the codes that is translated and acted upon by a mobile device such as camera phone. QR (Quick Response) codes are matrix codes, like two dimensional bar codes, that are easily readable by the majority of camera phones using a freely downloadable or occasionally pre-installed application.

Within the library 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 have developed mobile friendly resources to deliver information skills materials directly to our users at the point of need, linked by QR codes on printed materials and in appropriate locations in the physical library.

This article outlines the practical uses we have found for QR codes, gives preliminary results of how those have been received by our library users in our pilot study and highlights the reluctance of many students to engage with this technology, which may need further investigation. It also looks forward to the potential use of alternative technologies such as RFID to deliver similar types of information at the time and place of need that may not share similar barriers to entry with QR codes.

Keywords

mobile learning, mlearning, QR codes, mobile phones, context appropriate information literacy, location aware devices

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 and Minakakis, 2003, p. 61)

Rao and Minakakis discuss how commercial services could use mobile devices that are aware of the user's location (through triangulation from cellphone masts, or using GPS – Global Positioning System) to provide location specific content. 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 about 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 types of applications blend my physical experience of walking down the street or driving my car, with elements of the virtual, creating a "mash-up" (normally a mix of data or applications from different sources*)* that includes the physical world as an element within those data sources. Mobile technology makes 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. Systems such a Layar[1] and Acrossair, and particularly their "find your nearest tube station" application[2], aim to make this sort of augmented reality mainstream for modern smartphones.

Some University campuses are experimenting with these ideas of tracking a user's location and delivering context appropriate information. For example, Durham University's Technology Enhanced Campus project[3] uses the campus's WIFI network to triangulate users position through the use of a mobile client onto a WIFI enabled phone or PDA with the aim of providing personalised and location specific information to students on campus (Batty and Kyaw, 2009).

However, in the typical library of today, the most likely source of context specific information will be printed materials positioned near the location where help may be needed, although limited space may limit the display of highly subject specific instructions and help next to the physical materials. Where help is in the form of online materials such as webpages, online tutorials, videos and audio files there may be no easy way of accessing this information from within the appropriate physical location of the library. As Lincoln (2002, p. 11) 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 the library services of today, particularly within Higher Education, we have made great strides towards meeting these users in the virtual world with an array of online help and resources. However, while real people may have multiple virtual identities existing concurrently within their "real" physical identity, our online resources often seem disconnected from where they may be needed in the virtual world. In addition, there seems to be minimal embedding of these online resources within the physical world, to help users "navigate the physical world self-reliantly" (Lincoln 2002, p. 11) by providing context specific information they can access themselves.

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1 http://layar.com [Accessed 9th April 2010]
2 http://www.acrossair.com/apps_nearesttube.htm [Accessed 9th April 2010]
3 http://tel1.dur.ac.uk/wiki [Accessed 9th April 2010]

Academic librarians offer teaching in information skills to students at times often determined by basic timetabling rather than their academic needs. 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 would have the opportunity to deliver information skills materials to the real point of need, that is 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 employ augmented reality technology is unrealistic for most libraries due to time, money and technical constraints.

One way of circumventing this problem is to use small printed codes, such as QR (Quick Response) codes, around the library that link to resources and information appropriate to their location. Like a two dimensional bar code QR codes are matrix codes that can be read by mobile phones with integrated cameras. Some mobiles come with the application already installed, though it can also be downloaded for free from the internet and installed on PDAs, smartphones and other mobile devices.

QR codes 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) that makes the many different (normally free) applications that create and decode these QR codes interoperable. Other mobile devices such as netbooks or laptops often come equipped with integrated cameras. These are equally able to install QR readers and use QR codes.

Within the library 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 the electronic worlds. We've developed mobile friendly resources 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 was supported by the Teaching and Learning Innovation Project Fund of the University, intended to support innovative and inspiring projects to drive forward the University's Teaching and Learning Strategy (University of Huddersfield, 2008). As such it is a pilot project, intended to investigate the potential uses of QR codes within the Computing and Library Centre prior to any such technology being embedded within the teaching and learning culture of the University. The results of the project will be fed back to the University as well as to the wider community to help inform how the University could potentially and most effectively use QR codes as part of normal teaching practice.

Whereas Walsh (2009) recently outlined some potential uses of QR codes in libraries, this paper offers practical applications for these codes, including their initial promotion to the student population, and gives preliminary results of how they have been received by our library users. Some discussion on how we may take forward the idea of using mobile phones to further breakdown the boundaries between the physical and the virtual library concludes this paper.

2. Promotion of QR codes

One of the major challenges we faced was increasing the awareness of QR codes within our population of library users. At the time we started the project (May 2009) the library ran an exit survey where we showed the students a picture of a QR code and asked them whether they knew what it represented. Preliminary findings showed that only 8% of the 163 respondents that participated in the survey answered correctly.

The results of our survey resemble the findings from a similar survey conducted by the library at the University of Bath where only 12.6% of the students knew what a QR code was, though 93% of these 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 owned by the students surveyed there was a QR code reader available (Ramsden and Jordan, 2009).

The percentage of our service's staff who knew about QR codes was perhaps even lower, so we first of all ran training sessions and staff briefings on QR codes in the summer of 2009 before we tried to promote them to our users[4].

During the autumn term in 2009 we started promoting QR codes to our users, focussing on our on-campus student population. Instead of producing explanatory handouts, leaflets and posters, we ran a competition worth a £100 voucher towards a new mobile phone to encourage the use of QR codes within the library. In order to participate in the competition the students needed to follow a treasure trail of QR codes and interpret the clues that led to the discovery of all the 10 'secret words' hidden around the library. To qualify for the prize a minimum of seven of these hidden words needed to be correctly identified and submitted. At the close of the competition, only a few students had submitted entries. However, a quote about QR codes from a focus group nominally unrelated to this project, but addressing student perceptions of the Library's use of mobile technologies in general, illustrates lack of awareness as a reason for such a low take-up:

> 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.

In addition to the monetary incentive we relied on taking advantage of the natural curiosity of our students 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 the strategies we adopted to encourage students to engage with QR codes are not enough and that perhaps in any future competition we need to make more explicit the benefits of using these codes.

At the start of spring term in January 2010, the exit survey was repeated and the results showed a significantly increased awareness of QR codes, 22% of the 306 respondents responded correctly demonstrating that although the competition attracted few entrants, the promotion of the codes had worked to some extent. Interestingly, an additional 11% in this exit survey who could not identify the QR code commented that they had seen QR codes within the university (or on the library catalogue) but weren't sure what they were for. This increase in awareness across a short period of promotion (one academic term, or roughly three months) suggests that increasing awareness may be a slow process, but an initial impact may be achieved in a short period that can then be built upon.

Our results of the exit survey so far suggest that this step, the finding and installing of a reader, is the main barrier to the use of QR codes. As a follow up to these results, the library intends to promote QR codes to students in a more direct and explicit way by making available a number 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 the use of QR codes on the mobile phones of the library staff in the hope that helping a number of students over this barrier may increase usage as well as awareness of QR codes.

3. Uses for QR codes

The piloted uses for QR codes at the University of Huddersfield Library can be split into the following categories: links to electronic resources, instructional videos, useful websites for further information, directly containing contact details, and as a way of storing information for future reference. The following sections explain the uses we associated with each of these categories. They include any data we have collected on the usage of each application of QR codes, though the number of actual users of QR codes was too small to generate significant data on the usefulness

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4   http://librarymobiles.blogspot.com/2009/09/qr-codes-staff-presentations.html [Accessed 9 April 2010].

of the different applications of codes to particular users.

3.1 QR codes to link to electronic resources

We find, through the questions asked of our professional staff and the experience of lecturers, that many of our users are unaware of the wealth of the electronic resources made available by the library. 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 also find that some of our students, who may have used print journals in the past, rely on browsing through print journals to find articles of interest. This applies to mature students returning to study and to younger students who in their previous academic work may have been exposed only to the printed information environment.

This lack of awareness extends to e-books, as the large numbers of requests for text books that are out on loan seems to suggest that the students are not aware that electronic versions of these books are readily available. To address this problem we have used QR codes to link some electronic books, journals and videos to the appropriate physical locations in the library. For example, we have selected ten electronic books that are available in PDF format as these are more accessible from mobile devices than those that require a proprietary reader installed or run through a browser. All the books selected were course text books in our Law collection because they are all available in a small self contained area of the library and are heavily used by a discrete group of students. To highlight the availability of electronic copies a laminated copy of the book cover together with a QR code linking to the electronic version are located next to the physical copy of the related item. For those users who are unfamiliar with QR codes there is a link to the library webpage giving an explanation of these codes. A similar approach is employed for journals, placing the QR codes on the boxes containing back copies of journals and on the stands containing current copies. These codes take the users to our link resolver, searching our electronic holdings and linking to the appropriate electronic journals where available.

Figure 1: QR code

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

Despite our efforts, findings from the pilot show that only half the electronic books 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.

3.2 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, in the past the availability of these videos has not been obvious to our users at their point of need and as a result one aim of this project

Figure 2: screenshot of our link resolver

was to convert some existing videos to more mobile friendly formats. We also created new videos linking to these from appropriate locations within the library.

For instance, a video explaining how to search for legal journal articles is linked to from the shelf containing legal journals, a video demonstrating the print credit machine is actually on the print credit machine itself, and a video tour of one of the floors is linked to from the entrance door to that floor. Other videos are linked to physical handouts in order to complement the text and pictures within the printed guide and provide more in depth help while at the same time offering an alternative format to suit differing learning styles. We do not yet know what sort of videos will be the most useful to our users, as the study so far has focussed on the willingness to interact with QR codes in various ways, rather than the detailed impact of different types of videos.

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 these videos have had, as we expect the primary access route to be via QR code until we promote them more widely. The tour of one of the floors was the most popular, with 140 viewings of this video. The other two videos that had some usage in this three-month pilot were 'How to search for legal journal articles' (29 viewings) and 'How to use the print credit machines' (21 viewings). Our usage figures only show how many people had started to view each video, not how many had viewed them to the end. We hoped that comments would be left by people viewing the videos, helping us work out which videos were most valued, but none had been left to date. Our mobile friendly videos are now hosted on YouTube[5] and it is hoped that the familiarity of this service, along with the ease of comment making may increase the amount of feedback we receive about these resources.

We believe that videos linked by QR code should be a convenient way to provide information skills tuition to our users when and where it is needed, but the low usage on the "instructional" style videos of searching for journal articles and the print credit machines suggests that our users have not yet taken advantage of this type of provision. Feedback generated by library-led focus groups with students (November 2009) on the use of podcasts and vodcasts in formats suitable for mobile devices seems to suggest a reluctance to access videos "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". One possible explanation for this is the potential cost of streaming videos from a phone, showing the cost of connecting to the mobile web is still an issue. The ease of access to such media through QR codes (saving the sometimes difficult task of typing a URL on a mobile phone) does not seem to make the users more likely to engage with media such as videos. This general reluctance to engage may disappear as smartphones penetrate the market more fully, turning engagement with the mobile web and audiovisual media more mainstream.

3.3 QR codes to link to further information on the internet

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

Examples include links to the Office of Public Sector Information (OPSI) website (where legislation can be found) from the shelves that contain our print holdings of legislation, links to our referencing webpages from our referencing handout, and links 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 include a way of tracking usage through the QR codes, so we currently have no information on whether they have been used, or are seen as useful. If the project extends past the

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5 http://www.youtube.com/user/hudlibrary [Accessed 14th May 2010]

pilot stage, into the next academic year, we will again consider how to assess future use and impact of the QR codes.

3.4 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. In addition QR codes linking to our central "Text a Librarian" service are located near the library catalogues and while the codes containing subject librarian phone numbers are found in the subject guides. This makes it quick and easy for our users to link to appropriate help at the time of need and enables them to store the information in their mobile phones for future use. Text a librarian queries have not increased during the pilot of QR codes, so although we have no way of tracking the usage of these codes, it is unlikely that these codes have had much impact.

3.5 QR codes to store information for future reference

The first application for QR codes we introduced was on our library catalogue[6]. From experience, we've found that sometimes 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 the item on the shelf. As a result they may write down incomplete information from the screen and become frustrated when they fail to find the item, as illustrated by the fact that a common query at the help desks is for help to find books where incomplete information is held by the library user. There have been suggestions 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 problem referred to here. 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 in 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 example illustrates the clear benefits of QR codes in providing a better library service that directly addresses the difficulties faced by our students. The usage figures for the library catalogue QR codes illustrate that to date (end of January 2010), the QR codes contained in catalogue records have been scanned 242 times, with 125 scans during autumn term 2009 (September to December). Although with a population of 23,000 students at the University, the usage seems relatively low, it is still a good basis to compare future use with the pilot stage of the QR codes project.

4.0 Summary

We've tried various different uses for QR codes, from providing contact details, to offering quite detailed information skills tutorials in mobile friendly formats. Usage has been disappointingly low for all of these, compared with the overall student population, though with the assessment of the project still under way, it is too early to say for certain why. The data is insufficient to draw substantial conclusions, though findings raise issues about the use of QR codes that may be applicable to other new innovative services, particularly those using mobile technologies.

Preliminary results suggest, however, that our students find even a fairly low barrier to use, such as downloading a free, readily available application onto their camera phone, a hindrance. They need convincing that any new service will bring them concrete, easily perceivable benefits before they will investigate how to use that service. So even a low barrier becomes insurmountable unless their interest and enthusiasm are motivated by clear benefits. The chance to win £100 was not seen as sufficient incentive for large number of students to install QR readers onto their phones, though the

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6	http://webcat.hud.ac.uk [Accessed 9th April 2010]

competition and publicity did effectively raise awareness of this unusual technology. Future publicity should perhaps explicitly show examples of direct benefits to help overcome this barrier.

The general feeling amongst students towards QR codes can be summed up as "Has potential. But....", listing a number of problems associated with this sort of technology such as being too complicated and having to deal with technical difficulties when things go wrong. Comments ranged from the very negative but thought provoking "why bother?" to "if we could give a device to every student it would be really useful", recognising the 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, illustrated by the 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. This perhaps reflects limited ownership of smartphones, along with the current perceived cost of accessing the mobile web. As smartphones and associated application stores become more widespread and it becomes easier to install applications, this objection will fade away and the general environment may be more favourable to the use of such codes.

Our assessment of QR codes in this article focuses on the benefit offered by the different applications of QR codes. Rather than continue with such a diverse range of uses we will focus on a few key areas. It is expected at present that this will mean using QR codes for the library catalogue. We will also make increasing numbers of our library videos mobile friendly available, linking to them, where appropriate, from QR codes. These two key uses can then expand into a wider range if a significant proportion of our university population does start to carry devices with QR readers installed.

4.0 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, although at present the installation of a free QR reader seems to be too much of a barrier to most of our users. We need, therefore, 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, if they 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, as long as they are willing to overcome 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 active advantage of the RFID systems in place within the University library. The author is presenting at the emtacl[7] (Emerging Technologies in Academic Libraries) conference in April 2010 on this topic which will be followed up with a peer reviewed article.

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 comfortably using. However, we don't currently use the technology to take advantage of the wealth of information that is available to us in order to 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 and whether they are using our electronic resources.

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7 http://www.ntnu.no/ub/emtacl/ [Accessed 14th May 2010]

Using RFID to connect our users and physical stock to the wealth of data we hold could allow us to present personalised or context specific information and help to users within the physical library. This could include 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) thanks to 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 it is an initiative that the library at Huddersfield believes is worth pursuing in the future.

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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