

**Applying mobile information and communications technology to countryside access**

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# Applying Mobile Information And Communications Technology (ICT) To Countryside Access

By John Walmsley and Lynn Crowe

## 1 Introduction

In the last few years there has been a huge surge in mobile telephony, both in terms of the capability of the technology and its uptake by the general public. Two years ago Deloitte (2013) reported that a staggering 72% of UK consumers owned a smartphone. Research by Cisco (2014) shows that mobile data traffic alone in 2013 was nearly 18 times the size of the traffic of the *entire* internet as it was in 2000.

Smartphones have functionality such as GPS, touchscreens, and cameras that make them potentially highly suitable for outdoor recreational activities. However, there are all sorts of potential barriers to use in this sphere, not least the vagaries of network coverage especially in rural and upland areas, and practicalities such as operating the devices in the cold or wet.

Despite the challenges, successful implementations have recently started to emerge for promoting high quality walks and rides, navigation, interpretation, and to support specialist activities such as rock climbing and geocaching (Figure 1). Now therefore seems to be a good time to assess the state of art for mobile ICT, and its future potential.

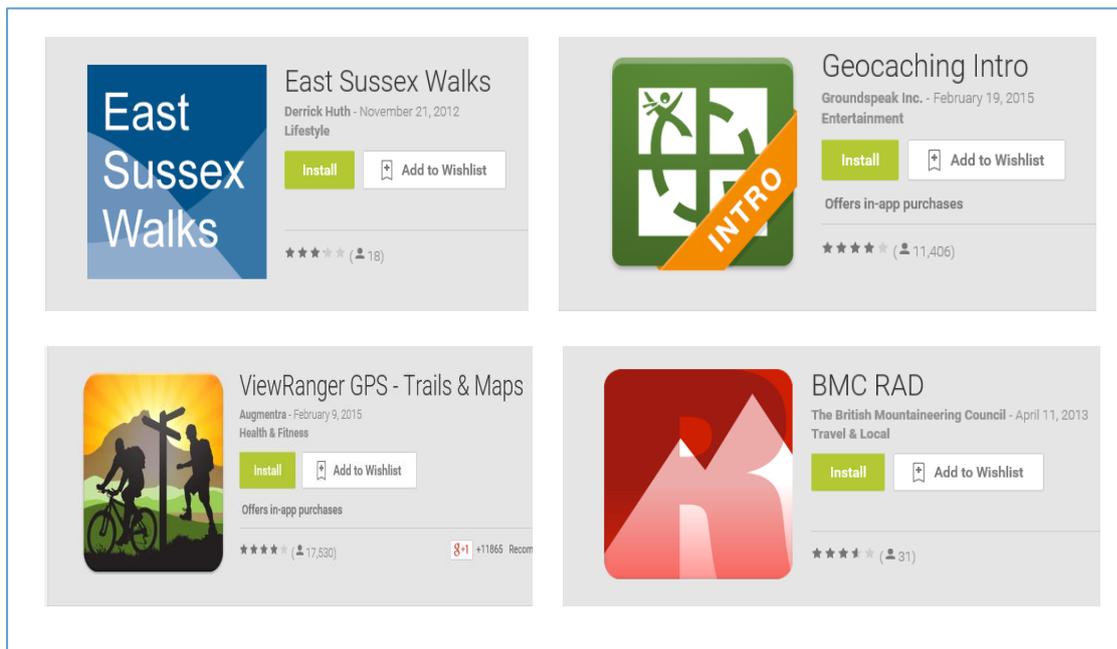


Figure 1 – Apps for outdoor recreation

The dissertation endeavoured to answer this research question:

**Can mobile ICT improve user experience for countryside access activities, and if so, how?**

The subject was approached by applying learning from Technology Acceptance Theory to existing case studies and also to an assessment of a practical project carried out in partnership with the Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT).

Technology Acceptance Theory has evolved from the field of Social Psychology and seeks to explain how innovations succeed or fail to achieve widespread adoption.

The case studies were evaluated to see what lessons could be derived from initiatives where mobile ICT has already been used in related fields in an outdoor setting.

The project with BBOWT involved setting up two walking trails at the Thatcham Nature Discovery Centre in which interpretational material was made available to visitors via their smartphones. The objectives here were to find out if users would readily engage with the natural environment and its management through such a medium, and to encourage visitors to walk a little further than they otherwise would.

## 2 Results and Analysis

### 2.1 What does Technology Acceptance Theory tell us?

Technology Acceptance Theory provided a firm platform for the rest of the research. Behavioural models dating back to Davis (1986) have become very successful in studying the way in which technology succeeds or fails to achieve widespread use. These models pointed to **Perceived Usefulness** and **Perceived Ease of Use** as being paramount determinants of the attitude of users to new technology, and thus their take-up at work or in the home. For a voluntary activity such as outdoor recreation, there is none of the compulsion to use mobile technology as might be the case of the work place, and it is therefore not surprising that **Enjoyment** (or lack of it) then also shapes users attitudes to use. This leads to models like Figure 2 which comes from a study of using mobile devices for contextual information in two European National Parks.

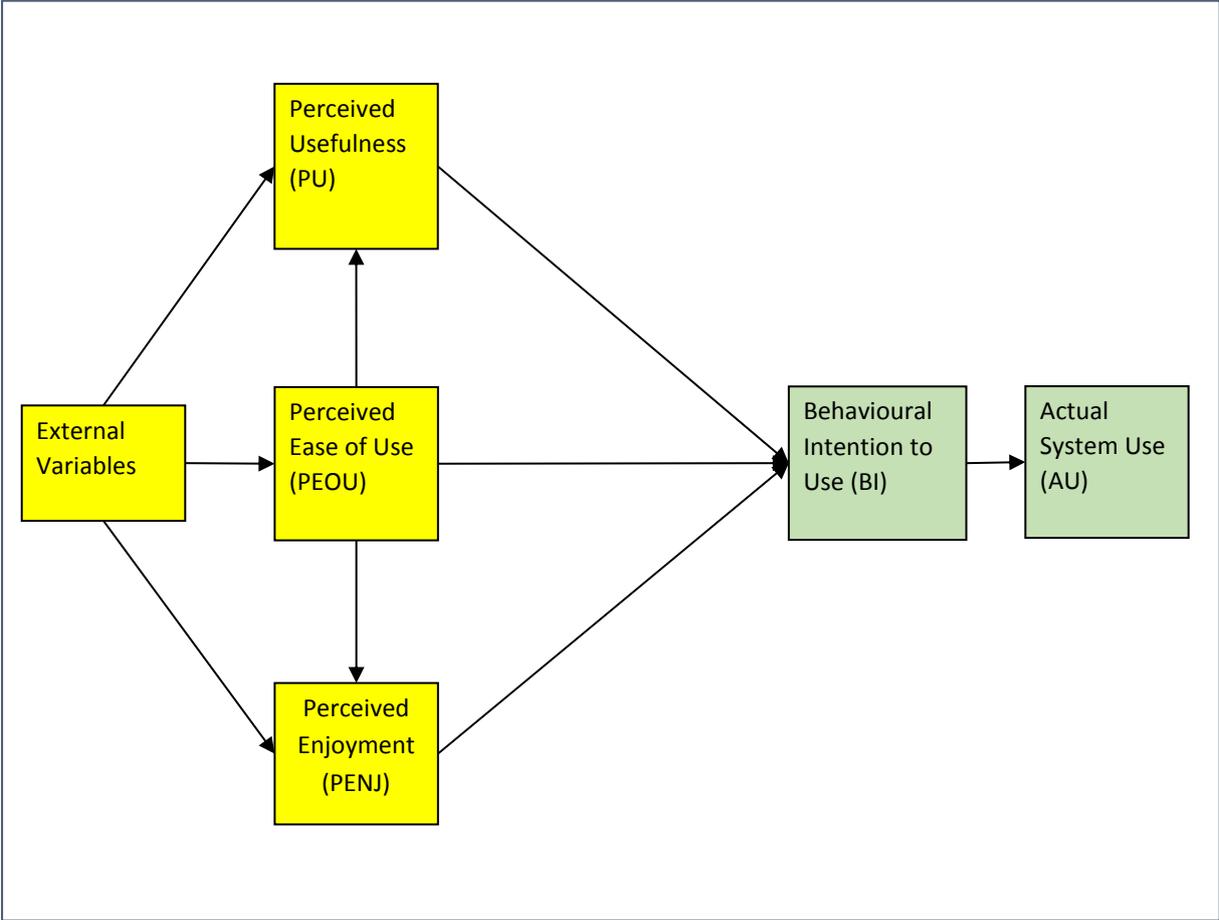


Figure 2 – Technology Acceptance Model (Dias 2007)

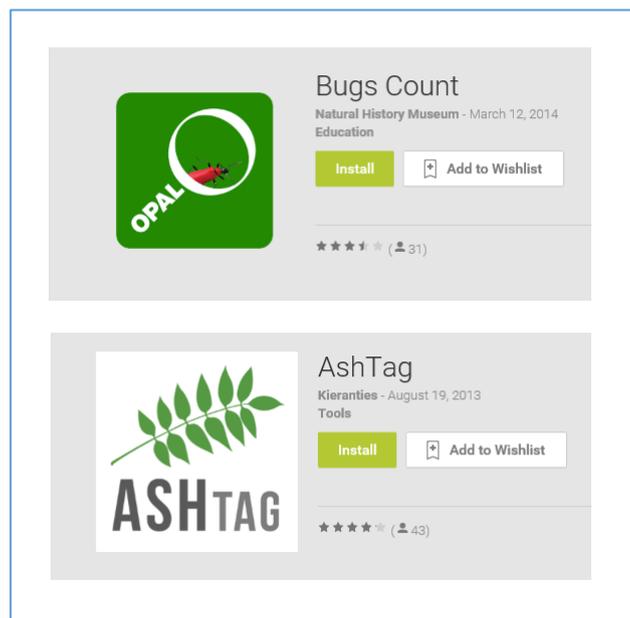
## 2.2 What did the case studies reveal?

Innovation and practice in some related fields which involved outdoor use of mobile ICT seemed to be ahead of the relatively small (but growing) number of initiatives that were targeted at outdoor recreation for its own sake. Historical heritage, tourism, and citizen science initiatives were cases in point.

A qualitative examination of such case studies, by internet based research and telephone interviews with some of their initiators, found some common themes:

There was evidence of the same 3 parameters from Technology Acceptance Theory being involved in influencing the success or failure of the scheme. For instance, the complexity of an app will adversely affect users' perceptions of **Ease of Use**. Similarly, a screen full of content that does not relate directly to what users at a particular location can see with their own eyes is not going to be rated by them as **Useful**. However adding interactive content or facilitating sharing via social media is likely to enhance users' **Enjoyment** of using their smartphone for outdoor recreation.

Some citizen science apps demonstrate exemplary simplicity and purpose (Figure 3). Readers might wish to try for example the Opal Bugs Count App which has given the Natural History Museum a wealth of data and has inspired a new generation of nature detectives.



**Figure 3 - Citizen Science Native Apps**

One especially important aspect of app design emerged that did not have any direct parallel in Technology Acceptance Theory. This was the maxim “Content is King”, which came out very strongly in telephone interviews conducted with other practitioners. Content must be engaging and have a clear purpose. No amount of brilliant technology can compensate for a badly presented and uninspiring subject.

Another talking point with the same practitioners was whether mobile ICT was a replacement for traditional methods such as information boards. There was a strong consensus that it was a mistake to think in terms of mobile *versus* traditional, and much better to think of them as complementary methods. The trail markers on the Canal and River Trust's Lune Valley Aqueduct Trail (Figure 4) are a good example. The text and picture captures the visitor's attention, and

further material can be viewed by scanning the QR (Quick Response) code or holding smartphone near the NFC (Near Field Communications) symbol in the top right hand corner. In this way there is something for everyone.



Figure 4 - Lune Valley Aqueduct Trail Marker

## 2.3 What was learned from the Thatcham Project?

### 2.3.1 Take a virtual walk!

Before coming to the results of the Thatcham Project, readers are invited to experience the two trails for themselves. This can be done without a visit to Berkshire. Instead, a virtual tour can be made by scanning the QR codes superimposed on the maps in Figure 5 and 6. The Appendix to this article contains instructions for scanning, as well as details of a smartphone simulator for readers who do not have a smartphone.

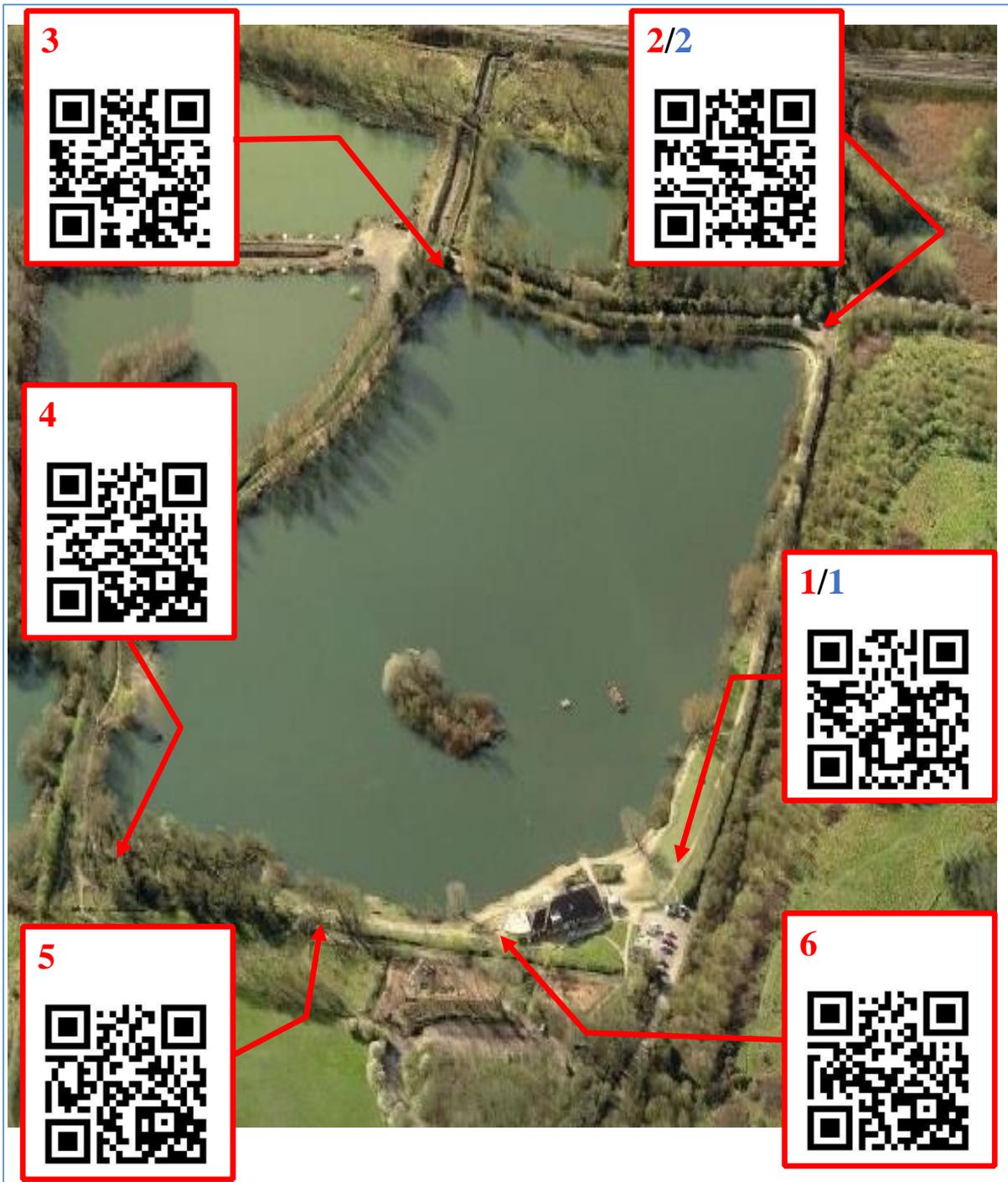
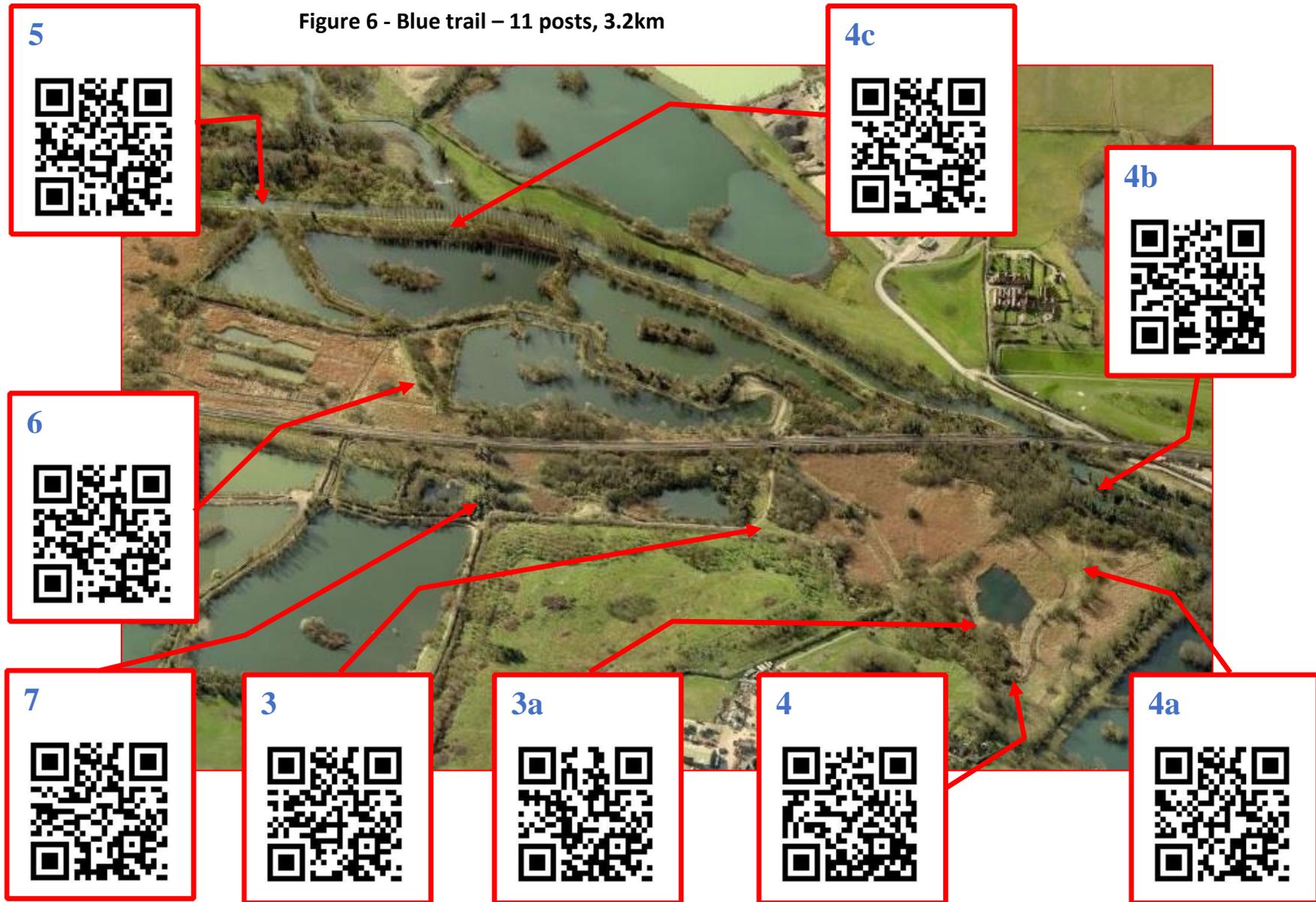


Figure 5 - Red trail – 6 posts, 1km (adapted from Bing Maps)

Figure 6 - Blue trail – 11 posts, 3.2km





### 2.3.2 App and content design

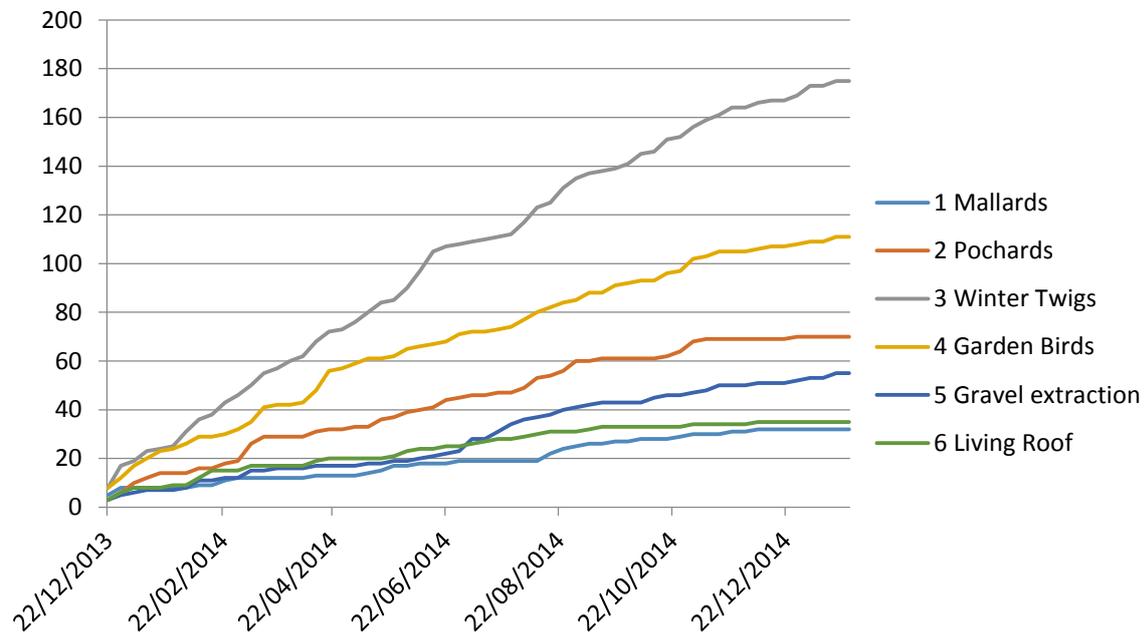
Combining some of the lessons learned about app and content design from the case studies together with the views already held by interpretation and communications professionals in BBOWT gave a useful set of rules for the Thatcham Project, and would be appropriate for many other situations too. These were:

- Assume a visitor attention span of no more than 30 seconds.
- Use no more than 150 words of text per web page as initially displayed.
- Only vertical scrolling of web pages is allowed, and even then it should not be necessary to scroll down more than once.
- Do not require the user to zoom in or out to find or read content.
- Do not require any text input from the user.
- Content should be mainly pictures and text. Avoid video.
- Avoid clutter. Items on the screen need to be limited to those that are actually essential.
- On-screen controls (e.g. buttons, drop-down boxes) must be large enough to be reliably activated in adverse weather.

### 2.3.3 Results: User statistics

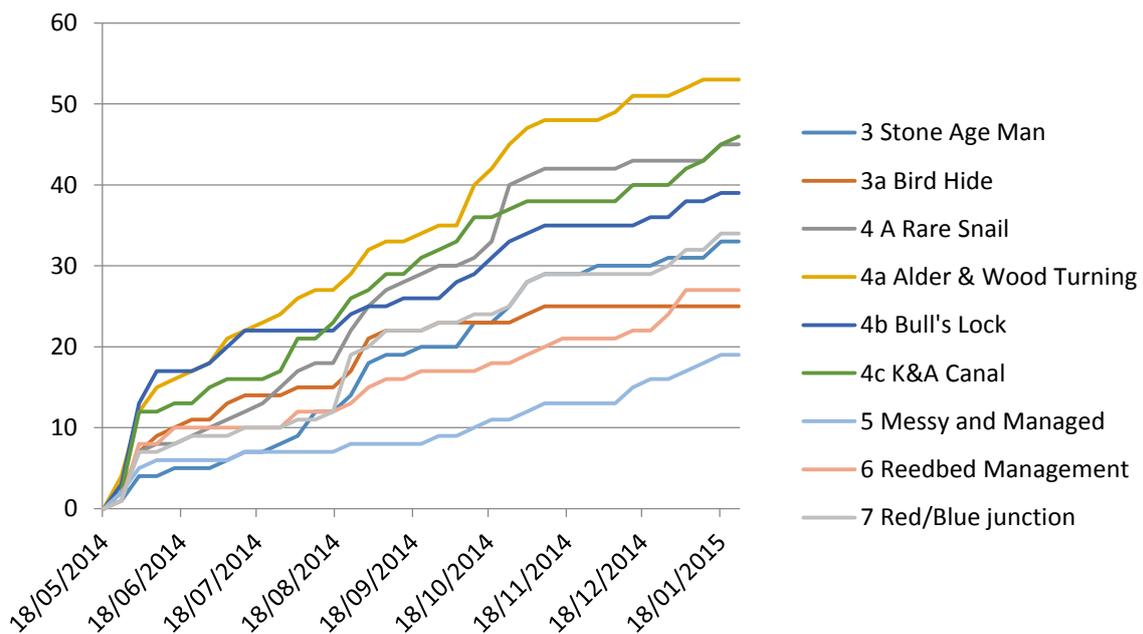
Usage of the different trail posts is shown in Figure 7 and 8. 'Unique Page Views' means the number of web pages that were accessed by customers during a visit i.e. a QR code scanned several times by one person only counts as one unique viewing.

## Red Trail - Cumulative Net Unique Page Views (mobile only)



**Figure 7 - Red trail usage**

## Blue Trail - Cumulative Net Unique Page Views (mobile only)



**Figure 8 - Blue trail usage**

The most eye-catching feature of these graphs is the huge variation in page views from one post to the next. The idea of a trail that people will follow in sequence in its entirety did not fit the facts at all at Thatcham, even for the Red Trail where the route is highly constrained. It seems that engagement with the trail was generally of an opportunistic nature, as and when visitors spotted a trail marker, rather than a being a planned activity in response to the advertising in the visitor centre and on social media. Opportunistic behaviour implies that it is unlikely that the objective to persuade people to walk a little further than they might otherwise was achieved.

A further counter-intuitive issue was that on the Red Trail the posts nearest the visitor centre were getting the lowest number of hits whilst those furthest away had the highest. There may be just too many visual distractions near the visitor centre for people to notice the trail markers which were deliberately made to be visually unobtrusive (see Figure 9).

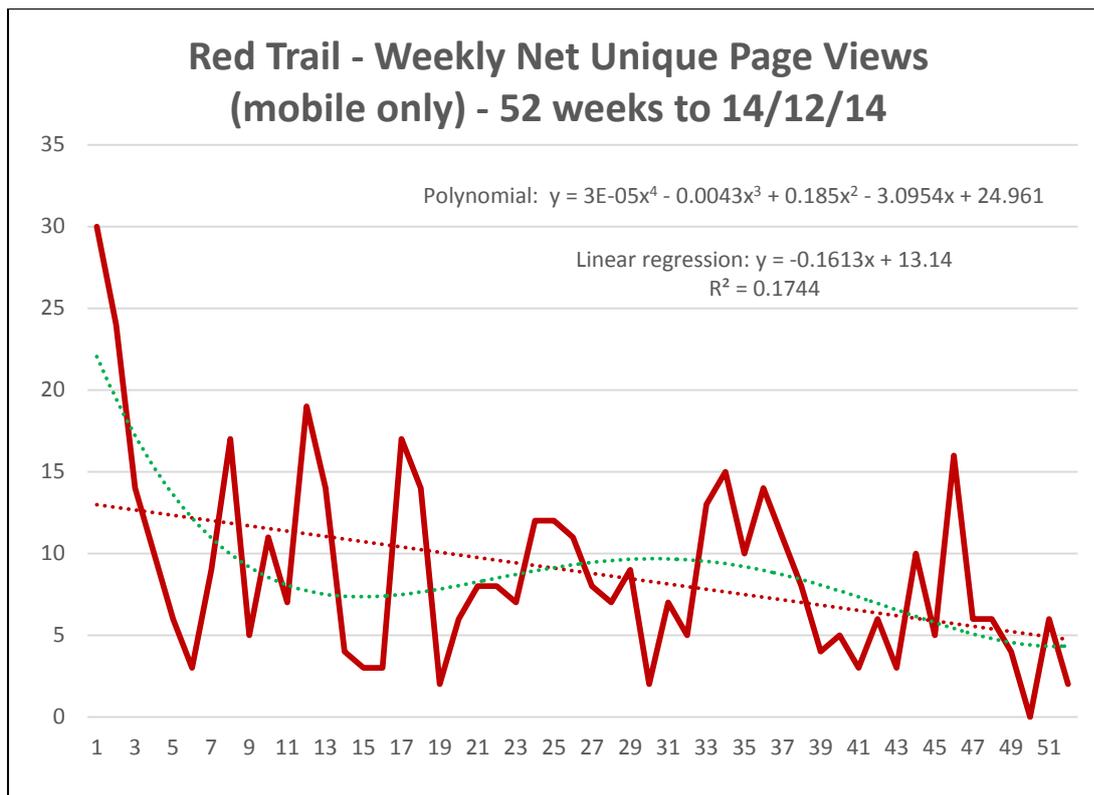


**Figure 9 – Scanning a QR code in the Reedbeds Nature Reserve**

With hindsight it might have been better to have made the trail markers larger and to have given more of a clue to their purpose, perhaps in the style of the Canal and River Trust’s Trail seen earlier (Figure 4).

### 2.3.4 Trends

A quantitative attempt was made to understand any trends in the usage data. The general pattern (curved green line in Figure 10) was an initial surge of interest by visitors to something novel at the site, followed by variation that was conditioned by weather and school holidays.



**Figure 10 - Weekly usage for red trail**

Another question was whether the trails would be a one-hit wonder or would hold longer term interest for visitors. This is easiest to answer for the Red Trail where there is now over a year's worth of data. This enables seasonal variation to be discounted from the statistical analysis by applying simple linear regression on a 52 week timeline to see whether visitor numbers were rising or falling overall.

A decrease in use can be clearly seen in the dotted red regression line in Figure 10, and was still present albeit at a lower rate of decline when data for the first 3 weeks after launch was removed and a further 3 weeks of more recent data added to the end.

Some kind of decline over time would be expected for any form of interpretation and, although overall usage was lower than had been hoped, nevertheless it is clear that the trails continue to hold interest for a proportion of visitors to the site.

Demonstrations of the technology with some non-visitors elicited mainly polite interest, but served to show that mobile ICT is not for everyone. Many people just want to get on with their walk and get away from the trappings of modern life for a while.

One particular advantage of mobile ICT methods for interpretation is that it is easier and far cheaper to refresh a walking trail with new content than would be the case with traditional information boards. This was demonstrated during the project, once when a factual error was discovered and corrected in minutes, and also by creating seasonal variants for one post where the theme alternated between "Winter Twigs" and "Trees and Leaves", in both cases involving a tree identification task for visitors.

### 2.3.5 Visitor feedback survey

Invitations to visitors to give feedback were provided on the webpages associated with each of the posts along the trails. A low return rate made it impossible to validate the Dias technology acceptance model (Figure 2) for the Thatcham situation in a statistically robust way. However the individual survey returns (examples in Figure 11 - 13) were still interesting and indicated generally high levels of satisfaction.

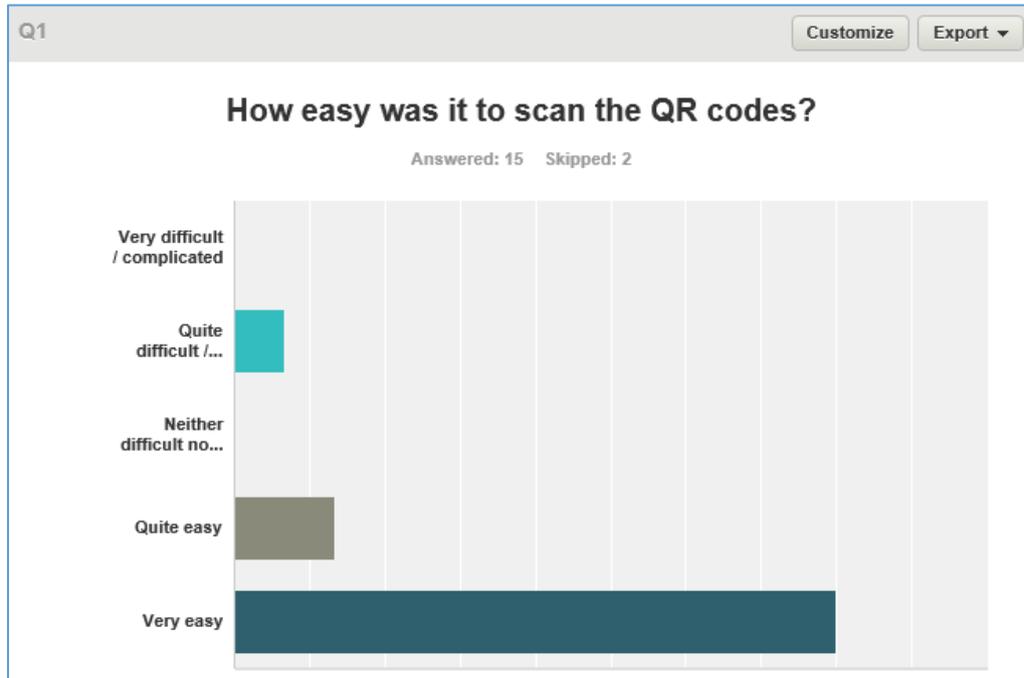


Figure 11 – One of the survey questions assessing Perceived Ease of Use

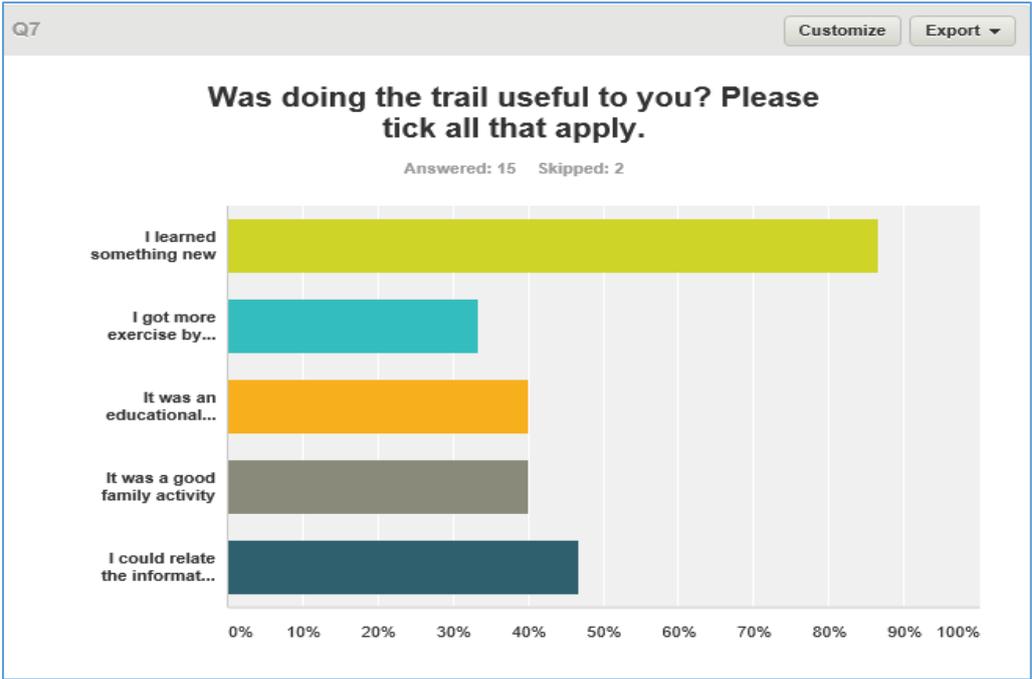


Figure 12 - Survey question assessing Perceived Usefulness

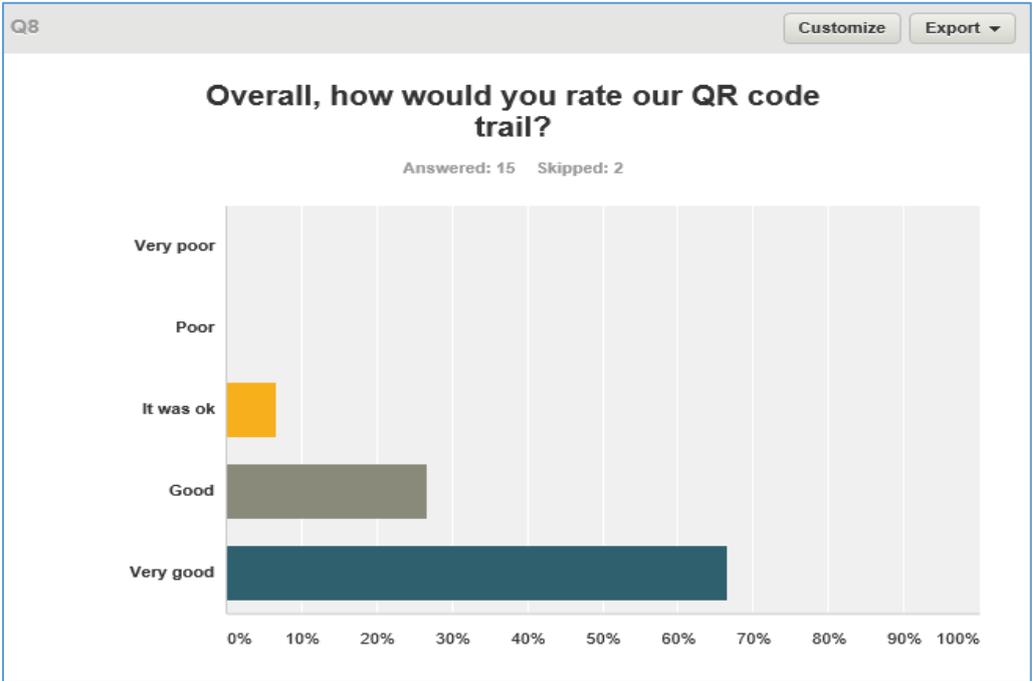


Figure 13 - Overall visitor satisfaction

## 3 Conclusions

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### 3.1 Applying mobile ICT to countryside access

A number of themes emerged in this research that suggest what underpins successful implementations of mobile ICT.

The first theme is that the overarching principles of Technology Acceptance Theory are just as relevant to mobile ICT as they are to other technologies. Apps need a very definite focussed purpose, something that users will perceive as genuinely useful. In contrast, something that attempts to provide a broad brush source of information is too general and not likely to succeed. Ease of use is paramount; anything that is fiddly, complex, or counterintuitive, will inhibit take-up in a much more significant way outdoors than indoors. Enjoyment of the user experience is important too; it needs to complement the real world countryside or wilderness experience, and inspire the user.

The second theme relates to presentation. Attention spans are notoriously short for any kind of broadcast or internet media. Designers of heritage apps understand this very well and they emphasise the importance of a short and punchy presentation. This principle is equally applicable to almost any kind of mobile ICT support for outdoor recreation.

Finally, high quality content is necessary to grab the attention of users, and it must be relevant to their exact location and what they can see with their own eyes. The technology should be an enabler that facilitates a sense of place, and an engagement with the natural environment.

### 3.2 The future

There is no doubt that the technology will improve in the future, thereby easing some of the challenges and limitations. Rural mobile coverage is set to improve with operator and government initiatives (e.g. UK Government 2013c). Data rates are going up as 4<sup>th</sup> generation (4G) technology gradually replaces 3G. Devices are becoming more capable all the time, and even one of the most troublesome issues of outdoor use will get easier when low reflectivity screens transition from military technology into consumer electronics.

Wearable technology is coming too (Figure 14), with products like Google Glass and smartwatches. There will be no more fumbling in a pocket to retrieve a mobile device, and all commands will be issued by voice activation, making the device much easier to use in an outdoor setting.



**Figure 14 - Wearable technology (Google image search)**

### 3.3 Who wants to use a smartphone for outdoor recreation?

Although usage of the Thatcham QR code trails was lower than hoped, nevertheless those that did so indicated that they had a positive experience. The success of navigational apps like Viewranger also attests to solid commercial demand for well-designed ICT products for outdoor recreation.

It is highly likely that demand will increase in time because smartphone ownership is highest in older children and young adults, the generation that has never known a world without the internet (OFCOM 2014). As this cohort passes into middle age, uptake of mobile ICT for countryside access should expand.

In summary, applying mobile ICT to outdoor recreation is not a cure for all ills, but it does have a useful role to play in promoting responsible outdoor recreation and encouraging people to value the natural environment. As time goes by it will become an increasingly useful channel of communications and information to help protect our precious natural heritage.

## 4 References

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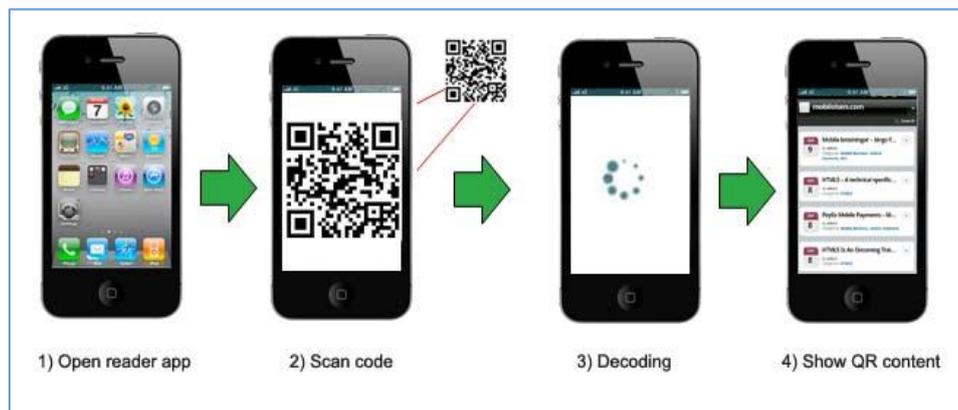
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## 5 APPENDIX

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### How to scan a QR code using a smartphone

Go to the App Store or Play Store on a smartphone or tablet, search for 'QR reader', and download a free app. Then scan a QR code as shown in Figure 15.



**Figure 15 – How to scan QR codes (Google image search)**

### PC-based smartphone simulator

Readers using a laptop or desktop PC (or a tablet device) can click on the links given in <http://www.walmsleyi.co.uk/3.html>. Each link corresponds to a QR code trail marker at the Thatcham Nature Discovery Centre. Readers will see a simulation of the user experience on a smartphone. The 'smartphone' works rather like a real one. Its display can be scrolled up and down, and the buttons (e.g. to reveal the answers to the quiz questions) can be activated just by clicking them.