The use of mobile devices to carry out Blaise surveys at the Office for National Statistics

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1. Introduction – Why start to investigate now

ONS uses Blaise for all its social survey data collection. At present, interviewers on all surveys are equipped with a laptop to enter data. It has been a goal for ONS to take advantage of hand-held technologies for some time now for both household surveys and the International Passenger Survey (IPS). On the IPS data are collected via paper and input into Blaise via laptop (CADE). IPS interviews are carried out at ports, airports and international rail stations where data are very often collected on the move. For household surveys this must be taken into a household, set up and switched on before interviewing can take place. The use of hand-helds was first investigated over ten years ago but ONS felt that the hardware was not advanced enough to use. The prospect of Blaise 4.8 and the BASIL component, and the development of smaller, lighter, more powerful and more suitable hardware have made ONS look again at alternatives to laptops. In addition to improvements to the software and hardware available, there are also increasing demands on the types of data collected and the speed required from data collection to dissemination, which has contributed to this review.

2. Use of mobile devices in other organisations

2.1 Public sector

ONS produce many statistics for the United Kingdom (UK), requiring data from England, Scotland, Wales and Northern Ireland. When a survey requires Northern Ireland data we work in conjunction with the Northern Ireland Social Research Agency (NISRA). When working with NISRA the Blaise questionnaire is developed by ONS and sent to NISRA. They then make any necessary changes to the questionnaire to fit with their systems.

NISRA stopped using laptops four years ago and started to use tablet PCs. The first tablet used was a Fujitsu Stylistic which is no longer in production. NISRA currently use an HP TC1100. Once again, this device is no longer in production. NISRA is currently looking into replacement hardware.

Tablet PCs are preferred by NISRA as they consider them to be easier for interviewers, they are lighter than laptops and easier to carry. They also reported that some of the Blaise modelib features are very useful when using tablet PCs. e.g. the optional calculator screen

When NISRA moved its field force to use tablet PCs as opposed to laptops all interviewers had a two day training course. For new interviewers they found that training new interviewers in the use of tablet PCs is easier than laptops. Since introducing tablet PCs at NISRA, they have experienced less breakages.

2.2 Private sector

Mobile devices are being used for survey data collection in both the public and private sectors. Nowadays, in the UK, large, typically market research companies are doing more social surveys. This means they are carrying out longer, more complex questionnaires. Many of these research companies are using mobile devices. At IPSOS-MORI over 50 percent of their UK revenue is now gained from social research as opposed to market research.

The MORI part of IPSOS-MORI is currently using a Motion Computing tablet PC (some older Fujitusu tablet PCs remain in the field). The IPSOS part is using a Dell Laptop.

3. Prospective use of handhelds within ONS

3.1 The UK Census

The next UK Census is in 2011. The census form is a very short, simple form. Census Division within ONS are investigating whether the Census can be carried out using a mobile device. In addition to being used as a data collection device, Census enumerators could possibly use the hand-held for up-to-date case management of returned Census forms.

3.2 Door-step introductions and short surveys

Using a hand-held device, interviewers could perform easy and quick door-step surveys. These surveys could collect basic household information or could be used to carry out doorstep sifts to identify which adult is required for interviewing (on an individual household). This method would relinquish the need for interviewers to enter the respondent's home.

There are separate issues with carrying out doorstep surveys – a practice which is not encouraged at present due to security issues and confidentiality. It is not thought safe for interviewers to openly carry hardware in the street. It is also against confidentiality rules to ask some questions at the doorstep as opposed to in the respondent's home.

3.3 English Housing Conditions Survey (EHCS)

The EHCS comprises 2 parts. The first part is the household interview. Following this a surveyor visits to collect additional information on the condition and structure of the house. Currently this information is collected on paper. The data collection process involves the surveyor moving from one room to the next so using a laptop is not suitable. The data are then transferred from paper to Blaise. With a tablet PC or hand-held device the data could be input straight into Blaise.

3.4 International Passenger Survey (IPS)

The IPS carried out at ports, airports and international rail terminals to record people travelling in and out of the UK. Due to the high volumes of people travelling through these terminals, interviews are carried out on paper while interviewers are on the move and then transferred to Blaise. If hand-held technology were introduced time could be saved if the data entry process is removed. It would also lead to less people required on a

shift which will save money. At present 1 shift involves 3 interviewers interviewing and one coding (4 in total). If data collection input took place at the time of interview there would no longer be a requirement for an additional coder.

IPS interviewers use a room based at an airport in which to record the answers to a laptop. The survey is coming under increased pressure to give up these areas so they can be used as retail space by the airport. The Eurotunnel terminal currently at London Waterloo is moving to a newly built terminal at a different location in London where there has been no provision made for IPS interviewers

3.5 For all social survey data collection

In the future, as has been shown at other organisations, the whole of the ONS's social survey data collection could be carried out via a mobile device. One argument is that with the latest or more up-to-date technologies, interviewers look good, feel more professional and are seen as such if they are using the latest technology. Interviewers also feel more confident that they can 'sell' a survey.

4. Hardware options

There are three main types of mobile device which were identified. These are (1) hand-held, or PDAs; (2) a hybrid laptop and (3) a Tablet PC.

4.1 Hand-held or Personal Digital Assistants (PDA)

PDAs are typically hand-held instruments used for basic PC tasks such as checking emails, keeping track of calendars and can facilitate the use of some Microsoft functions such as MS Word and MS Excel. Compared to a PC, PDAs have very small screens. They are built to be lightweight and to fit in an individual's hand. It was thought that these small sized hand-helds (up to 8cm x 28cm) would be too small for ONS interviewers. There are also problems posed by questions either with a lot of text (or help text) or with a number of answer categories as they would not fit on the screen and scrolling on the screen would be required. This is against current ONS screen standards although other standards would require development for a smaller screened device. Options sought would include a different set-up of the questionnaire including less on-screen options and only one question per screen.

In addition to the small screen sizes, PDAs have minimal memory (32 – 128 MB) which would not be suitable for ONS surveys with large help or external files. PDAs are useful for some tasks, such as case management for census enumerators, or for very simple questionnaires and doorstep sifts, but it is not seen as a solution for all survey types.

4.2 Hybrid Laptops

A hybrid laptop can be used either as a traditional laptop or the screen, attached to the keyboard by a hinge, can be rotated so the device can be used as a tablet. Hybrids are built with the same screen size as a traditional laptop (approx 285 x 244mm).

Due to the presence of a keyboard which can not be detached, hybrids tend to be too heavy to be used for long periods of time when standing up (approx 5kg). Although hybrid laptops are available with accessories, such as shoulder straps, to aid the

interviewer when the device is being used in its tablet form, due to the weight of the keyboard element of the device, the extra weight does not allow for long-term continual use in the field, such as a two hour IPS shift. There are worries over how strong the hinge which joins the keyboard and screen are, which could lead to field breakages.

4.3 Tablet PC

Tablet PCs are available as lightweight devices (compared to laptops and hybrid laptops) at 2.5 – 5kg depending on screen size and battery life. The battery carries most of the weight in a Tablet PC. An in-built battery will last only around 2 hours but additional 'booster' batteries can be fitted which will extend battery life to up to 7 hours but also adds weight. To recharge the battery the unit must be plugged into a mains terminal. Due to the type of battery, to recharge 85% of its life takes approximately 2 hours. To recharge the last 15% takes another 2 hours. (approximately 4 hours in total). In almost all cases tablets can be attached to keyboard to perform as a desktop.

Tablet PCs come with a range of screen sizes (A5 up to A4 size). They also can be fitted with accessories, such as straps, to aid in their use for long periods of time. They can also be set up to use as desktop PCs.

When in the tablet form, a special 'light pen' is used to operate the device. When typing words or numbers, a device will usually have handwriting recognition software available as well as pop-up virtual keyboard which can be used to enter characters. ONS have concerns over how elderly interviewers will be able to operate a light pen – a training need, and also how respondents would react to the light pen as part of any self-completion modules.

4.4 Requirements

In deciding what we thought would be good hardware to trial; firstly, we took advice from other organisations (see above). Secondly, we asked some IPS interviewers what their requirements are. Lastly we had a set of office requirements:

1) Weight:

Weight is a very large consideration for any chosen device. A typical non-stop IPS shift would be up to two hours. Ideally the weight should be less than 1.6 kg.

2) Screen size

The bigger the better! (Given other constraints such as weight) The smallest would be around 18cm x 12cm. We can trial smaller screen sizes and need to investigate screen layouts and font sizes; e.g. one question per screen versus multiple questions per screen.

3) Robustness

These devices will be used in the field and must be fairly robust. They must be heat and rain proof, scratch resistant and anti-glare. Any device would require a strap and case.

4) Price

ONS would like to pay no more than £800 per unit (approx $1500)

5) Hard Disk

Minimum 40GB

6) Battery Life

An IPS shift lasts two hours before a break followed by another two hour shift. A household interview for some ONS household surveys may take upwards of three hours. At least four hours standard battery life is required.

7) Minimum System requirements:

Blaise 4.80 requires Windows 98 SE or higher, Windows NT 4.0 or higher, a Pentium III or better processor, and a minimum of 64Mb of system memory (128Mb recommended).

4.5 Short listed options

Due to the very small screen size of the PDA and the weight of the hybrid PC, it was decided to trial a tablet PC. Below is a short-listed set of devices which were considered by ONS.

	1. HP Compaq TC4400	**2. Motion LS800**	**3. Motion LS1600**	**4. Motion M1400**
Dimensions (WDH)	285 x 244 x 44mm	227 x 170 x 22mm	296 x 245 x 18.7mm	296 x 240 x 22mm
Weight	2.2kg	2.2lbs	3.1lbs standard battery 4.1lbs extended battery	1.2kg
Hard disk	60GB	30GB or 60GB	30GB or 60GB	20 GB
Processor	2.0GHz Intel Core Duo	1.2GHz Intel Pentium M	1.6GHz Intel Pentium M	1.1GHz Intel Pentium M
Screen display	1024 x 768 pixels	8.4" display	12.1" display	12.1" display
Operating System	Windows XP Tablet Edition	Windows XP Tablet Edition (Vista ready)	Windows XP Tablet Edition	
Battery life	232 mins	29 WHr standard battery 57.7 WHr with extended battery	38.5 WHr standard battery 78.5 WHr with extended battery	263 mins
Other comments	Laptop mode			USB ports VGA connector Networking ports
Price	£999	From £1034	From £1092	£1300

	5. Lenovo T60	6. Fujitsu Siemens ST503x	7. Fujitsu Siemens ST5112	8. Psion iX104C
Dimensions (WDH)	27.4 x 3.3 x 26.7mm	324 x 220 x 24.9mm	324 x 220 x 24.9mm	284.5 x 209.6 x 40.6mm
Weight	1.71kg	1.6kg	1.6kg	2kg
Hard disk	80GB	40/60/80GB	60/80/120GB	40/80 GB
Processor	1.66GHz Intel Core Duo	1.2GHz Intel Pentium M	1.2GHz Intel Core Duo	1.1GHz Pentium M
Screen display	12.1" display	12.1" display	12.1" display	
Operating System	Windows XP Tablet Edition	Windows XP Tablet Edition	Windows XP Tablet Edition Windows Vista	Windows XP Tablet Edition
Battery life		6.5 or 10 hours	6.5 or 10 hours	3 to 5 hours
Other comments	Laptop mode Touch screen display Bult in modem	Built in modem USB ports Networking ports	Built in modem USB ports Fingerprint sensor	USB ports
Price	£1660			

5. Trialling Blaise on different devices

Due to short amount of time between instigating this project and writing this paper, at the time of writing this only one device has been trialled, although we plan more in the future. The device trialled was a Fujitsu Siemens ST503x. In addition to this trail industry representatives visited ONS to demonstrate hardware.

ONS currently uses Blaise 4.6 as its production version of Blaise. We trialled adapting a current Blaise 4.6 questionnaire for use on this device followed by a trial using the BASIL tool – part of Blaise 4.8.

5.1 Using existing Blaise 4.6 questionnaires

The first trial involved taking an existing survey questionnaire and running it on the tablet with no changes to screen layout or adapting answer options. ONS interviewers currently have the mouse activated which can be used for features such as the date picker. This feature is easy to use on a tablet using a light pen.

The majority of the questionnaire worked well on the tablet. Enumerated types are simple to answer and it is straightforward to move onto the next question. In landscape the questionnaire looks exactly as it does on the usual laptop. Problems arose if the screen was changed to portrait (this can be switched off). This resulted in some questions looking bunched and untidy.

A couple of issues with using the Blaise questionnaire in its exact form were with external file look-ups and String answers. If a look-up table did not find the correct answer in the look up at a first guess, it might be difficult, and time consuming to find the correct answer. The interviewer has an option to either scroll through the look-up to find the right answer, or re-enter the text to be used as a look-up to find a match. Both of these were not straightforward with the light pen. Similar to the look-ups, interviewers

require training for how to quickly and effectively use tablet keyboard with the light pen or alternatively activate and use the character recognition tool. If these are not mastered it could add to interview length. Although these are flagged here as issues, they can be overcome with interviewer training.

Another potential difficulty is using the ONS Question by Question (QbyQ) help. This interviewer aid can be used by pressing F12 on the key pad (or an option with the light pen). Once it is available, it is hard for interviewers to use the light pen to navigate the help and find specific sections. This is due to the small font used in the QbyQ help and the number of options, or 'button presses' to reach the desired help page.

5.2 Adapting 4.6 to run on a tablet

Due to the small number of problems encountered when running the Blaise 4.6 questionnaire on the tablet, only a very small number of changes were required to layout. There are instances where rather than having String answers, enumerated answer categories could be derived but, it is more the case that different interviewer training is required to familiarize interviewers with the practice of using light pens. If necessary radio buttons could have been enlarged (as long as the question could remain on one screen) but generally using the large screen question text size was not an issue.

5.3 Using Blaise 4.8

The release of Blaise 4.8 gave us an opportunity to test BASIL on a tablet. Although BASIL is essentially a tool for the internet it was thought that it could also be used for a social survey on a tablet due to BASIL's greater flexibility in terms of layout. We first ran the Statistics Netherlands supplied example BASIL questionnaire to get a feel of how the questionnaire worked on a tablet. We were very impressed with how easy it was to navigate and the freedom with which it is possible to customise the questionnaire.

The next step was to create our own BASIL questionnaire. First attempts at this were made by adapting the Statistics Netherlands code. Unfortunately this did not work for us without having the underlying understanding of how BASIL worked. In this case we started building a BASIL questionnaire from scratch and have now developed a short questionnaire in BASIL for use on a tablet. This questionnaire worked very well on the tablet. Visually the questionnaire looks good and extra features such as the menu facility allows for easy navigation around the questionnaire. Other advantages of BASIL are the easy 'next page' and 'previous page' buttons and obvious buttons to access question help.

BASIL is useful for short social surveys, as in this trail but the programming is longer than for standard Blaise. It would therefore be a heavy investment to upgrade all ONS social surveys to use BASIL. It would not be preferable to have surveys using different methods of data collection on the field.

6. Interviewer Training

HQ field staff were consulted when choosing a device to trial. These field representatives highlighted two main areas to test when deciding if a device was suitable for use in the field: i) interviewers ability to enter data given the potentially different screen sizes and layout of questions and ii) interviewers ability to use the device for long

periods of time while standing up – i.e weight and use of accessories. Plus the ease with which the device can be adapted to be used as a PC for home use as in administration data or coding.

6.1 Entering data into the device

At ONS we try to avoid the need to have any screen scrolling during a Blaise interview. It is therefore a need for the screen size of any instrument to be large enough to hold the information in a font size that is easily readable for the interviewer.

After ruling out the very small screens used on PDAs we looked at the Motion LS800 (227mm x 170mm), about A5 size and the normal laptop sized tablet (296 x 245). Although the LS800 is lighter and easier for an interviewer to carry and handle, it was felt by the ONS field managers that the font size is too small. It was decided that a larger screen size is required for any mobile device.

It is accepted that if ONS were to upgrade interviewers laptops to use tablet PCs training would be required for all interviewers. The main area of testing will be around the use of a light pen as opposed to a keyboard operated device.

6.2 Carrying the device and interviewing

Two large concerns with the interviewer's ability to use the device were the weight and battery life. Interviewers are required to interview for a two hour IPS shift (with breaks) or, if necessary, for a 2+ hour interview. A tablet on its own does not weighs around 1.6kg. Most devices will have a standard, built in battery with a life of 2 – 4 hours. It is possible to have add-on batteries which will make the device last longer in the field but will also add on weight. With some devices the weight can be disproportionate on the device and can make handling it very difficult. The Motion tablets however have a flat battery which maintains equal weight distribution across the device.

There are a range of accessories available to help hold tablet PCs when being used in the field. These aids include hand and arm straps which help to not only grasp the instrument but also to distribute the weight across the person to make the device seem lighter. Despite these accessories, there is a risk that using the device for long periods of time could result in a lot of strain for interviewers, especially around the neck and back areas. Any use of a tablet device would require a full-scale field test. Tablets would be useful for short door step interviews and household interviews where the interviewer can sit and rest the device but perhaps not for IPS interviewer shifts.

7. Conclusion

Different devices are more suited to different types of survey. A smaller hand-held device such as a PDA may be of use to an IPS interviewer in that an IPS interviewer works long shifts standing up and carrying out a short interview. However, the IPS interview contains large text answers and large look-ups (such as country travelling from \ to) which do not suit the small screen of a hand-held device. Other considerations are the potential increase to the length of the interview. IPS interviewers can very swiftly carry out and interview on paper and make notes in pencil to be written up later on. This is not possible using a light pen.

Household surveys are more suited to the larger tablet type PC which can also be used for doorstep surveys and respondent selection. There are, however, security issues with openly carrying expensive hardware to peoples households as opposed to a laptop in a bag or laptop case.

There is very little pressure from interviewers to change our current hardware. The main reason is on cost grounds for IPS interviewing. At present there is very little doorstep interviewing carried out which require a device to be used on the doorstep.

In addition to operating Blaise on the tablet, other aspects of the survey require testing. Interviewers currently manage cases and carry out pay claims via the laptop. These elements will also require testing on a tablet PC.

This paper investigates very early ONS trials at using devices other than laptops. A lot more investigation is required as to how they will operate in the field and how interviewers will cope on the different surveys. One conclusion we can draw is that Blaise is flexible enough to be used on a tablet PC.

8. References

David Hill, Deploying Blaise to Tablet PCs for Mobile Use, 2006

Michael W Gerling, A new look into portable electronic devices for field data collection in the National Agricultural Statistics Service