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## **Historic Boundaries of Britain (HBB)**

### **JISC Final Report**

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## Executive Summary

This project aimed to extend and improve a major historical digital resource which has a proven track record in functionality, accessibility and usability. The website 'A Vision of Britain through Time' already attracts around 80,000 unique users per month and this project was designed to increase the usefulness of this website by adding political units, maps and statistics to the existing system.

The website itself was redesigned to improve the user experience, adding an area dedicated to learning materials. These include tutorials on how to use the website, where the information came from and how it has been used in the site and finally how users can go further in their own research. Changes to the site were not just to provide access to new content, but also to make it easier for new users to understand. This involved a new high-level navigation system and a completely re-worked gazetteer of "places", partly based on our computerising an Ordnance Survey gazetteer from 1953.

The historical maps section has been completely reworked. The original site treated historical maps as GIS content, providing access to the maps only as parts of large "mosaics", generally covering the whole of Britain. The new site provides improved access to the mosaics via a new viewer that lets users zoom in and out, and pan around, without constantly loading new web pages; this uses an open source toolkit called OpenLayers which is modelled on Google Maps. However, the new interface is designed to be a true digital map library in which the original maps can be searched for using standard publication information, and viewed with all their marginal information. This involves a search interface which allows the user to "design" the map they want by selecting the appropriate area on a zoomable map; maps in our collection that cover the same area are then listed, with relevance ranking based on how closely the area they cover resembles the map the user has created. Users can then view selected maps in a second quite separate viewer, although they can then switch to the mosaic viewer.

The new map library does of course also feature extended content. The original system mainly consisted of three sets of one inch to one mile maps of Great Britain. We have added a large library of digitised maps showing administrative and parliamentary boundaries, funded by JISC. We have also added a smaller library of British military maps of the whole of Europe, funded by a European Union project. This last addition was possible partly because our whole geographical architecture has been revised to cover Europe, not just Britain. That makes possible future projects to cover Ireland and so provide equal coverage of the whole of the United Kingdom.

The inclusion of information on parliamentary constituencies and election results has not involved major architectural changes. The system already defined nine statistical themes and "political life" is a tenth. We already listed many different kinds of territorial units, and constituencies are another; and just as we held and mapped census data for local government units, the new system holds and maps election results for constituencies. Our launch publicity emphasises the election result data as the most newsworthy aspect of the extended site, but in fact aims to re-launch the whole resource. The constituency boundaries are being made available via EDINA, while our work on the election data has been a collaboration with the UK Data Archive, so while *Vision of Britain* is an on-line reference resource not a download site, UK academic researchers needing download access are fully provided for.

Although this project has built on the existing *Vision of Britain* site, this does not mean it lacked innovation. Rather, we have overhauled the site as a whole. The new map library is arguably the most innovative interface to a large digital map collection anywhere. Our work to merge information on constituencies, election results and boundaries into a single body of information has been both rigorously scholarly and technically innovative.

## **Background**

This project was planned as an extension to the Great Britain Historical GIS (GBH GIS), a major digital resource assembled over nearly two decades. Our original mission was to create a systematic geographical framework for Britain's demographic, social and political history, and adding electoral information is another major step towards completion. This project was designed to fill significant gaps in our coverage by mapping the political boundaries, creating new digital geographies. These new vector boundaries for constituencies were expected to relate to administrative and electoral geographies, building on existing information as well as creating new data about individual units and their relationships. The project also envisaged creating an image library encompassing our collection of historic boundary maps giving a full record of our sources. This library also provides a record of the boundaries of several geographies not currently covered by vector mapping, including sanitary districts and petty sessional divisions.

## **History**

Since 1994 the GBH GIS has been funded by a series of distinct grants totalling c. £1.6million. Even with limited formal existence it is widely recognised as pre-eminent in its field. The previous work can be characterised into two distinct phases. Between 1994 and 2000 we were a classic GIS-based project, creating vector boundary mapping and computerising historical statistics for the units we were mapping. From 2000 to 2004 we were the second largest university-based project funded under the New Opportunities Fund's digitisation programme. We created the "A Vision of Britain through Time" (Vision of Britain) website which required and funded the creation of a completely new information infrastructure to replace the existing relatively conventional GIS system. The site was designed to appeal to a wider audience by broadening the digital collection. We added three descriptive gazetteers (5m. words), census introductions (3m. words); a library of British travel writing (1.5m. words); historical topographic and land use maps; and a gazetteer of British administrative units organised as a formal ontology/polyhierarchic thesaurus, featuring 51,992 units, 64,208 names and 179,670 relationships between them. Even though the digital boundaries created during our earlier work was linked to these administrative units, no work was done to extend them and the maps scanned under this funding did not provide useful boundary information.

## **Need**

This project focused on filling the three remaining major gaps in our boundary mapping. By scanning the administrative area maps we have created a digital record of several important extra geographies for minimal cost, additionally documenting our sources as fully as possible. These include; ancient districts such as Wapentakes, hundreds etc.; petty sessional divisions, the nineteenth century building blocks for constituencies; sanitary districts, the main sub-county reporting units in the 1881 and 1891 census; urban wards, which gain increasing importance for breaking down statistics for large urban units (e.g. Manchester) in the second half of the twentieth century, but which are currently unavailable in digital form pre-1981. Constituency mapping will allow us to present the historical election statistics properly, of great and obvious importance. The pre-existing Vision of Britain framework will permit users to find which historical constituency was covered by a location by simply typing in a place-name or clicking on a map.

Potentially Vision of Britain has a large contribution to make to university research, teaching and learning and knowledge transfer activities. This cornucopia of local material matters to historians, sociologists, political scientists and so on and is unique in its ability to help users access their area of research via location. Our impact ranges from supporting advanced statistical research on mortality trends for the ESRC's Health Variations programme, and assisting the Environment Agency, to being listed as one of the top twenty web sites for British genealogy, reflecting the web site's popularity as a resource for British history, attracting about 80,000 unique users per month. This project has enhanced the overall Vision of Britain resource and, by funding a new server, will help sustain it.

## Aims and Objectives

### Aims

The aim of this project was to create a comprehensive digital library of historic administrative area boundaries for Britain through a combination of scanning historical maps and creating vector boundaries for selected geographies. The central focus was boundaries for Parliamentary Constituencies, which we are then using as a framework for presenting all British election results between 1832 and 1970, and selective data up to the present day. Instead of creating a completely new vehicle for dissemination, three existing channels have been utilised which already have a long history of co-operation; EDINA's UKBORDERS system, the UK Data Archive and our own open access Vision of Britain web site.

### Objectives

- To scan and geo-reference the St. Catharine's House (Office of National Statistics' London offices) Historic Map Library collection. These range from Ordnance Survey administrative area maps at scales between one mile and four miles to the inch, dating back to a set for 1888 to pre-1850 one inch to the mile maps with parish and district boundaries added by hand.
- To digitise the maps in the Reports of the Parliamentary Boundary Commissions, 1832-1954 as the definitive sources for the six sets of constituency boundaries which do not already exist in digital form.
- To extend the existing administrative ontology at the heart of the GBH GIS to identify constituencies, their variant names and their relationships with units at other levels, so providing a framework for vector boundaries, election results and possibly other information.
- Develop the web interface of Vision of Britain allowing the addition and integration of the Parliamentary and Electoral data into the existing data structure.
- To create a teachers pack or study guide for use by Higher and Further education lecturers detailing the best ways to use the site in a variety of disciplines.
- To digitise British Parliamentary Election Results 1832-1970 compiled by F.W.S. Craig. We will be collating, checking and sometimes enhancing existing computerised transcriptions in collaboration with the UK Data Service.

Craig covers data up to 1970, however further data was collected from various sources to extend the dataset to the present where possible.

- To create eight online tutorials each based on a different historical theme for use by Higher and Further education students, academics, non-specialists and the general public. They will each focus on a particular theme and source material and explain how to find the content on Vision of Britain and the more general background to the topic.

After completing the first 4 tutorials it was decided to substitute 2 out of the 4 remaining tutorials with some video tutorials on how to use certain parts of the site.

- To digitise Scottish administrative boundaries mapping which are mostly sets of four maps covering the whole country at a scale of four miles to one inch.

Less digitisation of Scottish mapping was achieved than was originally planned because 2 of the 4 sets are still in copyright and a response on a request for permission to use these was not forthcoming from the Ordnance Survey. Conversely, we also digitised the Ordnance Survey 1953 *Gazetteer of Great Britain*, containing 35,729 entries; although this is not as comprehensive as the 1:50K gazetteer licensed from the OS via EDINA, it is free of copyright entanglements.

## Methodology

Map scanning was conducted at 400 dpi, and the majority of these images were scanned as 8-bit colour images because they consisted of boundary lines in a limited number of colours superimposed on mono-chrome base maps. The maps which were held in large bound volumes were scanned by contractors using a specialist A1-size book scanner. Certain maps in bound volumes had to be unbound and preserved by a specialist conservator. Once the preservation process had been successfully completed, these maps together with less precious individual administrative map sheets were scanned using our own A0 roller scanner. Process meta-data and basic sheet identifiers were captured during the scanning process in both cases. Records covering operator metadata were kept which were used as a check list against images and each was signed off as scanning operations were completed. Delivery of scans from the specialist contractors occurred via postage of a number of portable hard drives.

Image cropping, resolution modification, and geo-rectification was all conducted by the GBH GIS team. This was achieved by overlaying the new maps over pre-existing geo-registered Ordnance Survey *New Popular* edition one-inch sheets published in the 1940s. Although this reduced the accuracy a little, they are still more accurate than the two and four miles to the inch scales of the new maps and have the benefit of producing an end result which is out of Ordnance Survey copyright. The creation of meta-data for geographically-located images (geo-tiffs) revealed a technical constraint. When using the various image processing software it transpired that these applications cannot cope with geographical content and simply eliminate it. To counter-act this, we ensured every geo-tiff had a corresponding world file containing its geographical data which was used together with the ordinary tiff to re-create the geo-tiff once all image processing operations were complete. This was done using open source GDAL tools and a purpose written script.

Constituency Boundary construction was planned as a process of marking up existing parish tables to indicate which parishes belonged to which constituencies at the dates of the Boundary Commission Reports. This was done, but with limited success in urban areas and more generally in 1832. Planning for 1868 and 1884 was different as the parish relationships in the reports are listed in petty sessional divisions which are not currently included in our gazetteer. It was envisaged the boundaries would be constructed by merging a parish coverage into the constituency units. Initially we took the parish coverage for 1881, and merged the parishes to become constituencies checking details from the raster maps. Where there was a large discrepancy between the raster maps and the parish vectors new vectors were created following the raster lines. Once this initial coverage for 1885 was complete we then created constituency boundaries for the two earlier Boundary Commissions by overlaying this 1885 coverage over raster maps for 1868 and 1832. Where there were significant differences the parish coverage for the nearest census year were used to get accurate boundary lines for the parishes from which to build the new constituency vectors. There were problems with maps missing for large parts of Wales at all these dates, but detailed cross-checking against the constituencies list in Cheffins' *Parliamentary Constituencies and their registers since 1832* and the maps given in Pellings' *Social Geography of British Elections* allowed accurate boundary mapping to be done. Scotland also proved problematic as there were only raster maps for a single year, again cross-referencing against the books indicated there was little change occurring in the Scottish constituencies. For the twentieth century constituency boundaries the parishes in the marked up parish list were compared against the parish coverages and then merged to create new constituency coverages.

Our original plan was to construct digital boundaries for the periods before and after the 1832 Reform Act from the “ancient parishes” mapped by Roger Kain and Richard Oliver of Exeter University, and published by the UK Data Archive. Unfortunately, a commercial license entered into by the University of Exeter has limited dissemination of anything derived from their work, and the publication is now available from the UKDA only to academic users. We therefore decided we should end our use of the “Exeter” boundaries. Our constituency boundaries for 1832-67 are now based on our own parish mapping for 1871. We are now working on enhancing those 1871 parish boundaries to be a new set of “ancient parish” boundaries which can be more widely disseminated than the Exeter boundaries. That work is being funded by a new commercial agreement, granting exclusivity only for a fairly narrow purpose. Our new constituency boundaries for the pre-1832 period will be based on these new parish boundaries, which does mean a delay. However, they are not needed to present any of the election result data and they have always been seen primarily as providing a framework for information from much earlier periods.

The master list of constituencies was created from a series of MS Word files supplied by the British Library, representing the original source file for Richard Cheffins’ book. The data were cross-checked for internal consistency, and also checked against the constituencies listed in the Craig election data. Answers were sought from the British library to eliminate discrepancies arising from the information in the book itself.

## **User Engagement**

The existing ‘Vision of Britain’ website already had a help form and an email address for users to pass on their comments and queries, and both have been used regularly since the creation of the site. Where users have identified suspected errors in existing data we have investigated, and where they proved to be correct we have amended the data to provide a cleaner version of the system for the re-launch. In the past the team has often received requests for specific types of data, in particular political and election data has been requested by other academics and this project will satisfy that demand.

Initial user testing for the functionality and usability of the existing vision of Britain site was carried out with focus groups of second and third year geography students in early January 2008. Comments from the current team together with an initial evaluation conducted by the web designers were combined with the results from the observation testing of the students to influence decisions on the way forward. Discussions were also held with the History of Parliament project and the House of Commons Library on the usefulness of the content being digitised. The authors of the study guide have also given us a considerable amount of feedback on the content of the site, and this has led to a considerable amount of work being done to improve the quality of the parish-level information, especially cross-checking between census data and information in the administrative gazetteer/ontology. The site is already very “findable” through search engines, but aspects of the site re-design linked to the improved “places” gazetteer are further improving this. In particular, the new gazetteer includes a formal hierarchy of “place”, enabling the new site to list 10-15 “lower level places” on each place page, and so lead search engine spiders directly down a hierarchy of place; they currently have to work their way down the separate hierarchy of administrative units, which is of course a formal legal hierarchy which cannot be optimised for their use.

We are also embarking on a marketing campaign to draw attention to the project. Submission of articles to various peer-reviewed journals and presentations at conferences for the academic audience and the production of a new newsletter explaining all the changes and new features on the site will be sent to an expanded contacts list including all the local record offices in Great Britain. We are employing a publicist to help us with more general publicity. She will be writing articles and getting press coverage leading up to the formal launch event for the site re-launch to be held in June.

## Implementation

The project start-up, involving appointing staff and acquiring equipment went fairly smoothly, if a little slowly due to administrative processes; we were greatly helped here by having part of the team already in place for an earlier project funded by the European Union, although over-runs with that project did lead to some delays. The formal project plan was also created, detailing the specific tasks and responsibilities of individual team members. Identification and setting up of individual contracts with suitable sub-contractors took longer than initially envisaged, but was satisfactorily concluded eventually and work proceeded on target. The external map scanning contractors encountered problems with delivery. We had proposed setting up a secure file transfer system, but in practicality the size of the images meant the security protocols of the University system blocked this kind of transfer. Instead the images were loaded onto portable hard drives and sent through the post satisfactorily. The problems with the delivery of these images meant the in-house work could not proceed on these concurrently with the scanning process. However, the punctual completion of the conservation work, in-house map scanning and subsequent image editing work meant the programme of work could be rearranged to complete these activities in the gap in the schedule. Mapping the Scottish units has been completed for the available maps, however two sets of maps were unavailable as they are still under Ordnance Survey copyright and though permission was sought to use these, no response was forthcoming.

Two different approaches were used in creating the new boundary data. Firstly merging existing parish polygons to form their containing political units, and secondly by marking up parish lists to indicate which parish belonged to which containing unit and then linking them together in a coverage. In both cases raster map scans and reference books were used to corroborate the data. These boundaries were inserted into the gazetteer infrastructure, together with the election results to produce national maps of the election results. The election statistics themselves was gathered, cross-checked and in some instances re-keyed to cover concerns over accuracy. To supplement the Craig data, which we had permission to computerise up to 1970, we collated further election results, with some success. This data has also been added to the system.

A new places gazetteer was created by merging the existing places gazetteer created from the administrative unit gazetteer with the 1953 Ordnance Survey gazetteer text. This significantly extended the listing which links place-names with administrative units and thereby vastly increased the likelihood of matching 'place-names' typed in by users with the official history of the place they were interested in. Originally we had planned to also include the geo-names dataset as well. However attempts to incorporate this particular dataset did not go well as there was not enough of a match between the units in the existing places list and the geo-names listing for the United Kingdom and eventually it was decided to omit this dataset.

Eight on-line tutorials were planned, but we decided to reduce this to six, partly because they proved to be a major call on the time of the project director and manager, and partly so that we could instead create three video guides instructing users in the operation of different parts of the site. The other planned teaching resource was the "Teachers' Pack", which changed substantially. Firstly, initial problems finding external authors led to an increase in budget, but we are very happy with the pair of authors who then took the work on: Mike Winstanley is a Reader in Local and Regional History at Lancaster University, and Alan Crosby is an experienced freelance author and editor of the *Local Historian*. Secondly, it was re-named a "study guide". Thirdly, it was initially planned to contain c. 20,000 words and available as a PDF or a printed resource. The external authors actually wrote more than double the expected word count and therefore this guide was divided into three sections detailing the actual use of Vision of Britain, more general information on the data behind Vision of Britain and very general information on how to do further local history research. Due to the length this resource will now be available only as three downloadable PDF's. All this material has been collated into a new learning resources section of the site so it is easy to find.

The official launch event has been postponed until June due to delays in sorting out the server and hosting contracts, although a soft launch will go live with the re-launched website before that date. Initially conceived as being hosted by EDINA like the current site, the new server will instead be hosted by the University of Portsmouth. This change delayed setting up the new system and hence led to the extension of the website delivery date and the consequent delay in marketing and publicity materials being released.

## Outputs and Results

### Scanned Maps

Over 1000 historical maps relating to five Boundary Commission Reports (1832, 1868, 1885, 1917 and 1954) and administrative area maps have been scanned and had meta-data added to the images. By locating them geographically (geo-referencing) it has been possible to mosaic them together, thereby allowing them to be incorporated into a continuous viewing gallery on the Vision of Britain website known as the map library. Inclusion of additional new software (IIP Image viewer) allows the user to also see the map sheet in its entirety including its marginalia. Those that do not provide a continuous coverage of the whole of Great Britain, for example the borough constituencies in the 1832 Boundary Commission Report have been geo-referenced, but are only available as full map sheets.

### Digital Boundaries

Vector boundaries have been created as complete coverages for Parliamentary constituencies at the dates of the Boundary Commission Reports and for pre-1832. All new boundaries created will be visible on the Vision of Britain website through their association with an administrative unit and will be deposited as individual coverages at EDINA's UKBORDERS service and at the UK Data Archive for dissemination by them to the Higher Education sector.

All the digital boundaries and the scanned maps have been geo-referenced to Lambert Conformal Conic (LCC) projection with longitude and latitude co-ordinates. This co-ordinate system has been used instead of the Ordnance Survey national grid because it allows for the extension of the historic mapping to Europe at a later date and means data on Ireland could easily be included in the system. Technical software limitations mean all boundaries must exist in the same co-ordinate system to be usable together and therefore national mapping systems are unsuitable for this purpose. The decision to use LCC allows the combination of disparate mapping data and the gazetteer already has a structure in place to cover the hierarchy of administrative units in Europe if further international data were to be added.

### Statistics

Parliamentary election results from 1832 at least to 1992 have been added to the Vision of Britain web site in a new statistical theme on "Political Life" (we hope to add results right up to the present. By utilising this information in conjunction with the new digital constituency boundaries, the system is able to map election results for constituencies by colour according to party; blue for conservative, red for labour and so on.

### Textual material

The contents of Cheffins' authoritative book on Parliamentary constituencies and their registers since 1832 has been transformed into digital content and added to the existing database. Relationships have been created between the constituencies and the nations of England, Wales and Scotland and successor relationships between consecutive ones. A gazetteer of places has also been created based on the listing in the 1953 Ordnance Survey gazetteer. This provides a link for the user of Vision of Britain between the formal and legally recognised administrative units and the more colloquial understanding of a 'place'. Further examples of the text from the introductions to the Census General Reports have also been added to extend the coverage on Vision of Britain.

This project has created various core project documentation including; a project plan, bi-annual progress reports, this final report, a completion report and financial statements. It also has technical documentation detailing the system architecture and web logs monitoring usage statistics.

### **Teaching and Learning Materials**

Tutorials on types of background information held within Vision of Britain have been created on six themes; Franchise Reform, Travel writing, Agricultural change, Census taking, Boundary mapping and Political geography. These tutorials give users insight into how the site has been built and how they can research the given topics further based on where the information came from. In addition four video tutorials on how to use the site have also been created. These are screen shots of the site, with direction on screen and through voice-overs. They give direction on how to investigate the map library, places, census reports and statistics.

A study guide has also been created giving direction on how to use the site. It demonstrates how the information found on the site is useful in a number of disciplines and where else users can go to investigate further. This pack is available as a PDF on the website and will be divided into three sections totalling c. 55,000 words.

### **Additions to the Vision of Britain website**

There is now a distinct home page for the Vision of Britain website which has links to all the main areas of the site, including a direct places search and news updates. A greatly enhanced places gazetteer in the site provides better linking between administrative units and the "places" users recognise in their general consciousness. The statistical mapping feature of the Vision of Britain website has also been significantly improved by completely replacing the software used and the graphing functionality has also been revised. The mapping of parish units which previously was rather intermittent has been significantly augmented to produce a much more complete coverage of changing parish boundaries.

The functionality of the website has been enhanced by additional mapping and new ways to access the map images. A true digital map library has been created for the first time, which is innovative in its functionality; the ability to view both a continuous map layer and the full individual sheets and its relevance ranking search facility. There is also an ability to view and search by the meta-data of the map, including the date and map type.

### **Knowledge**

Vision of Britain is almost indefinitely extensible without changing the database structure. Current work is laying foundations for adding similar content for the rest of Europe and a possible future work going further back in time. It allows for complementary interweaving of disparate data sources into a concise, standardised framework. This creates an even more complete dataset for the national historical statistics of Great Britain using consistent and contemporary geographies. It also provides an authoritative resource for sector professionals, such as the Houses of Commons Library, local archivists and Office of National Statistics employees.

## **Outcomes**

We have created a library of scanned images of British administrative area maps which is as comprehensive as Ordnance Survey restrictions on copyright allow. This will be an immediately useful reference resource, and also provides us with a basis for further relatively modest boundary vectorisation projects; for example, we are hoping to hear shortly that a project working on nineteenth century Sanitary Districts has been funded, which will make extensive use of the scanned maps and other resources created by this project.

We have also assembled a large body of information on historical constituencies, their boundaries and past election results into a single tightly integrated corpus, in ways possible only in the digital realm. The project has therefore created a comprehensive geographical framework for the study of British political history. Further, because it is integrated with a very large existing database of census and other socio-economic data, and because we previously developed techniques for re-districting statistical data between the various reporting geographies (such as turning census data for

Registration Districts into statistics for constituencies), the project has enabled quite new analyses of the socio-economic determinants of voting behaviour.

Thirdly, we have designed a true digital map library, linked to but clearly distinct from our existing GIS built from images of historical maps. One aspect of these being distinct resources is that most of the maps exist in the system as two quite distinct images although of course linked by shared metadata: one image is cropped to remove all marginal information, geo-referenced to link it to real world coordinates, and re-projected so that all maps in the collection share the same coordinate system; the other image has none of this done to it and is a direct digital surrogate for the original paper sheet. The map library interface is designed to allow users to access maps partly via conventional cataloguing information, but also making use of the fact that all maps in the collection are geo-referenced in the basic sense of knowing what part of the earth's surface they cover.

Fourthly, JISC funding has enabled us to revisit several aspects of the work funded by the National Lottery in 2001-4. Two particular aspects will address major concerns expressed by our users. Firstly, although we had very extensively linked census data to the gazetteer/ontology of administrative units we constructed from the reference books identified by a National Council on Archives report, we did not have time then to sort out the many contradictions between the two sets of sources, especially for the c. 15,000 parishes. This has now been done. Secondly, we added a gazetteer of "places" in the final months of the lottery funding as a response to problems found in user testing, but this was derived entirely from our data on administrative units and had many problems. This has now been replaced by a new place ontology partly based on computerising, with JISC funding, an out-of-copyright Ordnance Survey gazetteer.

Finally, and perhaps most importantly, the project has addressed major problems with sustaining the overall *Vision of Britain* resource. One aspect is that previous funding had not enabled us to resolve many copyright issues, some of them probably unique to a project based on GIS technology but bringing together the work of many different organisations and individual scholars (the one saving grace was that we had always been careful not to include anything created commercially, or still within Ordnance Survey copyright). We are extremely grateful to JISC and JISC Collections for working with us to set clear policies in place and resolve the main issues affecting key components of our basic framework. Secondly, we have worked to establish new sources of income to cover the operating costs of the *Vision of Britain* web site, which are particularly high because of the high usage; EDINA have for example noted that it has roughly four times as many unique users as their Digimap service. Running costs up to 2007/8 were covered by the British Library, and this poorly documented arrangement was incapable of extension. We are now generating significant income from the site itself, by displaying advertising and co-marketing historic maps, and further income is coming from licensing data. The licensing income comes mainly from selling digital parish boundaries to companies advising on freeholders' liability for church chancel repairs, a market which will cease to exist when chancel liability is abolished in 2013, but we aim to develop a subscription income based on offering additional functionality.

This project has enhanced the overall *Vision of Britain* resource and, by funding a new server, is helping sustain it. *Vision of Britain* has a very large potential contribution to university teaching and learning because it holds consistent information on a very large number of localities: it is trivially easy to set assignments requiring each student to work with a different set of data, making plagiarism almost impossible and, just as important, meaning students can be actively encouraged to work together and compare areas. *Vision of Britain* is primarily a resource for projects, but this includes very small projects which would be impossible if students had to track down equivalent data from different dates in printed census reports (or on-line images of the same), compile a time series, deal with comparability issues and draw a graph. With our system, construction of the time series and the graph is almost instant, so such "projects" can be completed within a class, and most of the time spent on reflection and writing. We have authored ancillary resources to help teachers and students achieve this.

## Conclusions

The provision in the project plan of long lead times on both the scanning contracts and the boundary construction proved unnecessary and in some ways beneficial as it allowed for improvements in the methodology and adequate allowance to resolve issues where needed. The scope of the project was well conceived and was achievable in its envisaged outcomes.

Earlier movement on contracting for the licence agreements and server hosting would have resulted in less frenzied activity towards the end of the project and might have eliminated the need for a time extension for the technical set-up of the new server and system. Overall internal time and activity management was good, although the dependency on external factors in some areas lead to delays and re-scheduling of tasks. The continuous and homogenous nature of the team led to constituency and reliability in the progress of the project, although the dependence of certain key members for specific core tasks did, at times, result in overloading of work and consequently delays.

## Implications

Firstly, the addition of large quantities of text and scanned images of historical maps, coupled with the development of the user-friendly *Vision of Britain* interface, has very effectively obscured the fact that the real core of the GB Historical GIS is a large collection of historical statistics organised in a unique way, the system directly and consistently holding metadata for each individual data item. All other data libraries and archives that we are aware of instead hold consistent metadata just for "datasets", with very variable information about the internal structure of these datasets. Our structure was always designed to support automated analysis in a grid environment, but attempts to secure funding to develop this have repeatedly failed and part of the reason for this seems to be the "success" of *Vision of Britain* as a popular interface for local historians. This is of course not a criticism of JISC. Adding electoral data to the same framework is a major extension to this analytic potential.

Secondly, this project has substantially extended the system's functionality, mainly by upgrading the mapping software used, but there are still very large potentials for adding functionality which it may be hard to achieve with funding from digitisation programmes. One particular area where we would like to add abilities is enabling users to add their own information for particular localities. We are hoping to make a start on this by allowing them to add links from particular "places" in our site to local history sites about the same places; this would extend an existing facility which provides links from *Vision of Britain* to place-specific pages in large sites like *British History On-line*, but these were created by our systematically harvesting information from those sites. One general point about user-contributed content is that we are very concerned to keep the information, including statistics and legal changes, about administrative units authoritative, but we think that information about less formally defined "places" can be less tightly controlled without damaging the site's overall reputation.

Thirdly, and as noted elsewhere, this project followed and overlapped with a European Union-funded project. As well as sharing staff, we decided to base our work for JISC on the enhanced basic architecture developed for the European project. One consequence is that the system now runs entirely on open source software, but a larger one is that the system is finally capable of being extended beyond Great Britain, and perhaps especially to cover Ireland. There is therefore a potential to finally create a system providing balanced coverage of the whole UK, and colleagues at the Centre for Data Digitisation and Analysis in Belfast have already computerised much of the necessary data, but a substantial project would still be needed to integrate it. There is also a potential, of course, to build a historical GIS covering the whole of Europe.

Fourthly, our original application to JISC included mapping constituencies but not presenting election data, and the limited resources we had for working on election data meant we had to concentrate on assembling and enhancing existing transcriptions made by social scientists. This means that many historians are disappointed that our data include the names of parties but not the names of individual candidates. We very much hope that some further project can be undertaken, but suggest that simply adding the names is not enough, there is also a need to assemble a proper database of politicians so that they can be traced through the full sequence of elections they stood in. Such a project is probably better left to the History of Parliament Trust.

Finally, another potential this project has created is to extend the system back into earlier periods. It was always intended that this project would enhance that potential, by creating a map of ancient hundred, etc, as well as the pre-1832 constituencies. As mentioned above, copyright problems with the "Exeter" mapping of ancient parishes have forced us to change our plans a little, but a new commercial partnership means we will still have a viable base map usable with sources for much earlier periods. The GB Historical GIS has always seen a major part of its mission as being the assembly and integration of digital data created by academic research projects. Such projects often created far higher quality resources than can be aspired to by bulk digitisation projects led by archives and libraries, and almost by definition the most historically important sources were computerised by academic researchers before the bulk digitisation projects came along. However, these often elderly data files need extensive documentation and large scale reformatting, even when already held by data archives. We started studying what would be involved in integrating a specific set of medieval and early modern data sources into the GBH GIS more than ten years ago. Our original conclusion was that we needed an integrating framework very different from the historical GIS we had then built; but that new framework has been developed and now exists, and the academics responsible for the data sets are now mostly either recently retired or nearing retirement, so a project to extend our resource back in time is now very timely.

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## Glossary

Administrative Unit ~ geographical area legally identified as a reporting unit for official government administrative purposes.

Gazetteer ~ a listing of places by definition

GDAL~ (Geospatial Data Abstraction Library) open source translator library for raster geo-spatial data formats

Geographical Information System (GIS) ~ a computer system designed to map geographies using co-ordinates using lines and images on screen

Meta-data ~ the data that explains the context and relativity of the data

Ontology ~ structure which organises data in a strict hierarchy

Poly-hierarchy ~ having multiple hierarchies, not solely a one-to-one relationship between units

Raster images ~ scanned images with attached co-ordinates viewable on a computer

Vector Boundaries ~ boundary lines with attached co-ordinates drawn by a computer