Digital field survey technology

The future of BGS mapping?

by Nick Golledge

> “ the BGS is a pioneer amongst a growing number of geological surveys adopting digital field survey methods to meet a demand for data in a digital format ”

Users of BGS Bedrock and Superficial deposits maps increasingly require geological data in digital format. The BGS is now a pioneer amongst a growing number of geological surveys who are adopting digital field survey methods to meet this demand. A variety of hardware and software combinations are currently being tested by the BGS SIGMA project, both in UK onshore surveys and abroad. Trials are aimed primarily at assessing the overall practicalities of an integrated digital, rather than manual, methodology, and whether efficiency gains can be made. Fundamental to this approach is the adoption of a new paradigm — one of ‘database population’ rather than ‘map production’, the latter being an emergent product or value-added derivative of the former. So how close are we to swapping map cases for memory cards? Making a geological map can be a surprisingly complicated process. It involves the initial collection of a large amount of highly diverse data (which may have any number of attributes), and the subsequent representation of this data in two dimensions either on paper, or on a computer screen. Part of the process is highly subjective, part of it entirely objective. For example, while a geological boundary can rarely be placed with complete certainty (particularly in the Scottish Highlands), point observations (such as dip and strike measurements) can be located exactly. Field data collection can therefore be divided into two principal components: the interpreted data, and the absolute data. The former evolve into the final ‘map’ and three-dimensional geological model through an iterative process of sketching and redrawing, while the latter will remain unchanged throughout map compilation.

The author using a handheld PC and GPS in the Cairngorms, with (left) examples of handheld GIS, as used in the field.

Geoscientists are also, of course, individuals with preferences and idiosyncrasies, and these are often difficult to accommodate in a digital system. Depending on the terrain, field geologists capture entirely different data, and consequently require different tools. As a result, it will always be necessary to find and use the most effective technology for the job in hand; a ‘horses for courses’ rather than ‘one size fits all’ approach.

An example of this methodological diversity is the way in which field notecards are used throughout the BGS. Bedrock geologists working in the

Scottish Highlands may record the majority of their field data on cards, as the numerical nature of their structural observations lends itself to such an approach. By contrast, geologists mapping superficial deposits in the Highlands may fill out a notecard only at key sections, where detailed sketches and annotation are the primary data. Elsewhere, notecards may not be used at all, with all data being recorded directly on to the map face. A digital system that is suitable for one approach may, therefore, be less suitable for another. In developing a digital system that allows this kind of flexibility, it must be recognised that sometimes a semi-structured (rather than fully constrained) approach is the most efficient way to capture data.

While accommodating such diversity in approach, the data captured must be corporately consistent and attributed to a common standard to ensure that a coherent end-product is generated. So how can we implement the required level of flexibility, diversity and immediacy in an environment where we also need to ensure common standards? Is it possible to do this and produce efficiency gains?

In attempting to create a digital geological map, fundamental questions need to be asked about currently accepted methodologies. We should not try to replicate digitally what we do manually, or expect identical output from both systems. In order to achieve the efficiency gains central to the SIGMA project, geological mapping needs to be approached in a holistic manner, considering the process from an endpoint backwards. The geologist therefore needs to know how the products required by end-users are derived from central databases, so that the field data can be collected in the most appropriate format for efficient entry into these databases. The collection of field data is then guided, but not dictated, by the corporate data model.

The digital system that will be most widely adopted will be the one that is most adaptable to the widest variety of needs. Establishing a 'baseline' standard on to which individual requirements can be built will be fundamental to the success of digital field systems. This is a significantly different approach to the one that has been followed until now, and will necessitate the evolution of existing field mapping techniques to accommodate the differences between digital and analogue data handling. Only by recognising these differences can we implement systems that enable standardisation, allow flexibility when necessary, and produce efficiency gains where we most need them.

T Bradwell, BGS © NERC

Digital field survey equipment being used to record a frost-shattered quartz vein at 970 metres above sea level on Beinn a' Chreachain, south-west Scottish Highlands.

The map case, therefore, is not redundant just yet. Where staff adopt digital methods, the capability must be there to enable this. For others, the most efficient way to capture data will continue to be the paper map and a sharp pencil. But one thing that has come to light through exploring new avenues is that we need to look very hard at how we do what we do, and why.

By trying to find digital routes we have uncovered problems in the integration of the many types of data that we collect, both analogue and digital. To ensure that data capture is optimally efficient, the SIGMA project is focusing on developing the underlying corporate data handling infrastructure and documentary survey best practice. The BGS will then be in a powerful position to maximise the value of our data by establishing a fully integrated workflow, something which should save time and money, and deliver better outputs to our end-users

Information on the digital capture of geological data in the field is available from the BGS website by visiting: **www.bgs.ac.uk/dfdc/** ▮

Capturing geological data digitally in the field is not a new idea, but it is only recently that the technology has evolved to become affordable and to meet the BGS's requirements. One of the most versatile systems tested to date is the Pocket PC, which, when used with an expansion pack, provides sufficient memory and battery life for most field uses. To protect the equipment from adverse weather and general wear and tear, the Pocket PC is securely housed in a rugged, shock- and waterproof plastic case. By connecting the unit to a handheld global positioning system (GPS) receiver, spatial geological data can be captured quickly and accurately into geographical information system (GIS) software.

For further information, contact:

Nick Golledge
Tel: +44(0)131 650 0409
e-mail: nrgo@bgs.ac.uk

or

Dr Andy Howard
SIGMA project manager
Tel: +44(0)115 936 3234
e-mail: ash@bgs.ac.uk