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**STATISTICAL MAP PRODUCTION
IN THE OFFICE FOR NATIONAL STATISTICS**

by

Submitted by the Office for National Statistics, United Kingdom¹

¹ Prepared by Alistair Calder.

I. BACKGROUND - THE ROLE OF GIS AND MAPPING UNIT

Creation of the ONS and IDD

1. The Office for National Statistics was formed in April 1996 from the merger of The Office of Population Censuses and Surveys and the Central Statistical Office. The creation of ONS was seen as an opportunity to address a widely perceived need for greater coherence and compatibility in government statistics, for improved presentation and for easier public access.
2. At the same time a new division of ONS - the Integrated Database Division (IDD) - was established to take advantage of some of these opportunities. This new division was charged with developing an integrated database of key statistics drawn from across the organisation and from the rest of the UK Government Statistical Service.

The role of geography within IDD & and the GIS and Mapping unit

3. Recognition of the central role geography plays in providing a base for statistics, and of the potential of GIS in assisting in the integration of datasets lead to the transfer of responsibility for geographic policy within ONS to this new division. The new division also gained responsibility for GIS policy and the provision of a GIS and mapping service.
4. The role of the IDD GIS and mapping unit is to promote the use of GIS within ONS and improve the analysis and dissemination of ONS statistics. This paper focuses upon the work of this unit and particularly upon the Postscript based map production system which has been adopted. It provides a technical outline of the system and discusses some of the benefits to the organisation which have been obtained from the centralised provision of this service.

II. TECHNICAL OUTLINE OF THE MAP PRODUCTION PROCESS

Description of system in use

5. For some years now GIS systems have offered a simple method of generating thematic mapping quickly and easily from statistical data. Most users of GIS, particularly within statistical offices would recognise this as one of the main advantages of GIS in their organisations. However, when producing maps for inclusion in publications, most GIS users are limited to the output available direct from their systems. Maps are either printed out in large quantities on a colour printer or colour separated by photographic means from a single printed copy.
6. This approach is fine but is limited in two respects. Firstly, the results available from most colour printers are limited and the act of reproducing from a single copy further degrades the quality. The process of producing a colour copy and photographing it often results in fuzzy reproduction as well as relatively high production costs. Even for black and white mapping this route is less than ideal. Secondly, most GIS systems are very limited in the tools they provide to allow the production of high quality mapping. Although some GIS systems go some way to supplying the design tools required few are really targeted at the cartographic market. Producing high quality maps for presentation using GIS can often be time consuming and frustrating. The approach we have adopted to avoid these problems is to take mapping direct from our GIS systems, via a Postscript drawing package and into desktop publishing.
7. The combination of MapInfo GIS to maintain map bases and visualise statistical data and Adobe Illustrator to refine the symbolisation of map detail provides the ease of production, the accuracy and the cartographic quality we require. Critically the use of a

Postscript drawing package also provides us with a direct route into desktop publishing. Figure 1 provides an over view of the system which is described in more detail overleaf.

Maintenance of data in MapInfo

8. MapInfo's flexibility in importing data means that statistics can be easily imported from a wide range of database, spreadsheet or text formats. The only requirement is a consistent geographic name or code to enable us to link data to the map file. As with most other GIS systems this provides us with tremendous flexibility and ease in visualising complex statistical data. MapInfo allows us to edit statistical ranges and colours easily and to produce thematically shaded and other map styles extremely quickly.

9. However, although MapInfo is ideal for managing boundary sets and associated data it does not offer the flexibility of symbolisation we require for producing publication quality maps. For such work files are transferred into Adobe Illustrator running on Apple Macintoshes.

Transfer to Adobe Illustrator

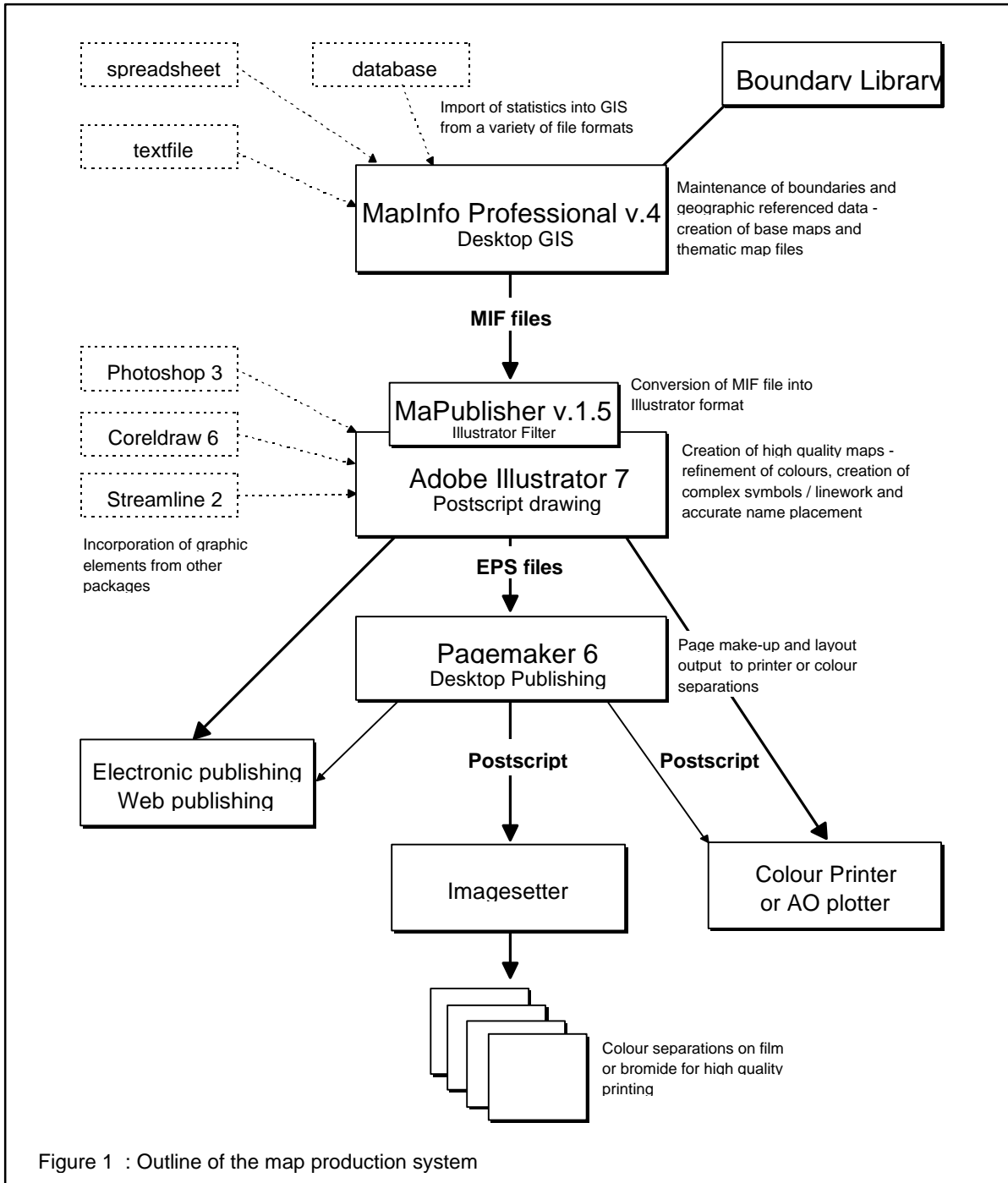
10. When our system was first instituted the transfer of maps between MapInfo and Illustrator depended upon filters developed in-house but these provided only a partial solution to the problem. Fortunately however, a commercial package, MaPublisher, was soon found which offered a more complete solution. MaPublisher allows the import of MapInfo MIF files directly into Illustrator and allows the user to easily alter the symbolisation and scale of the resulting map.

11. Adobe Illustrator is a Postscript drawing package used by many graphic design companies and most professional cartographic publishers in the UK. It provides much greater flexibility in the way in which data is symbolised than would be possible in a GIS system. Colours and patterns can be easily edited, complex line styles applied and map labels and can be easily edited and curved. Filters allow the addition of 3 dimensional features and sophisticated symbols such as shadows and vignettes.

12. The use of an industry standard platform for graphic production also means that other graphical elements such as scans or graphs can be easily incorporated from a wide range of compatible packages such as Photoshop or CorelDraw.

Transfer to Pagemaker

13. In most cases files are supplied by the unit direct to the design areas responsible for the production of publications as 'encapsulated Postscript' (EPS) files. These files can be placed directly into Pagemaker, the desktop publishing package used in ONS, and contain all of the information required to produce high quality colour separations for printing. Pagemaker is also used within the unit to put together complex page layouts which include more than one map.



III. ADVANTAGES OF THE PRODUCTION PROCESS

14. The major advantage of this process is obviously the added flexibility of symbolisation allowed by a drawing package like Illustrator. Because thematic data is transferred automatically from MapInfo the process of creating thematic maps is much less open to error - the use of files directly from the GIS system ensures the accuracy of data values and labels. Because boundary files can be transferred easily accurate base maps can be created automatically - there is no need to scan or digitise new sets specifically for map production.

15. Maps remain in a digital form throughout the process. It is only when final page films are produced that the image is produced - on a high-resolution film imagesetter rather than a conventional printer. The resulting screen and line accuracy and the lack of photographic processes leads to a much higher quality of output. The digital files produced in Illustrator and Pagemaker are ideal for electronic and Internet publication.

IV. ADVANTAGES OF ESTABLISHING A CENTRAL MAP PRODUCTION UNIT

Development of specialised skills and standards

16. Desktop GIS systems and other packages now offer the ability to produce maps easily from statistics. They do not however provide sufficient help in producing good maps. By providing a central service we are able to develop specialised cartographic skills and ensure the high quality required for cartographic work, particularly for publication mapping. The development of a central high quality mapping service has made the process of producing maps more efficient and has assisted in the promotion of ONS as a provider of quality products.

17. However, as well as defining standards and a house style for internal use, advice on the correct use of maps are being developed for new users of GIS. This role in supporting the efficient use of mapping by inexperienced users is seen as being a key role of the unit as GIS use develops in the organisation.

Map base library

18. Our publication map work involves the regular reuse of the same bases and often the same subjects in slightly different formats. By centralising map production much duplication of effort has been removed. Bases are produced once in a flexible format and can be re-symbolised quickly and cheaply. We have already built a significant library of map bases which we can make use of. This role, as the custodian of boundary sets, is becoming progressively more important as GIS becomes more widely used within ONS

V. CONCLUSIONS: PROGRESS TO DATE AND PLANNED DEVELOPMENT

19. The system described here is fully operational. Using this approach we have already produced mapping for around 50 publications and have radically improved the quality of ONS map products.

20. It is our intention to monitor changes both in desktop GIS and graphic production software to ensure that we continue to use the right tools at each stage of the process. A change of GIS software seems likely in the next few years and there are a number of areas, including the 3 dimensional visualisation of data which we intend to investigate further. However no fundamental change in our approach is anticipated. The flexibility of the graphic tools already available to us means that improvements in our products are more likely to be related to the development of staff skills than to technical improvements.

21. Our principle area of development over the next few years is certain to be in the publication of statistical mapping on the Internet. The graphic environment we are using is ideal for the production of digital images and the production of electronic mapping is certain to become a key part of our role.

22. Equally it seems highly likely that, as our use of the Internet for data dissemination grows, GIS and mapping tools will have a central role to play in providing access to ONS statistics.

APPENDIX A : TECHNICAL SPECIFICATION OF EXISTING SYSTEM AND A NOTE ON ALTERNATIVE OPTIONS.

The notes below record the hardware and software we are using. Where alternative approaches are possible these have been outlined.

Hardware

PCs

Pentium Pro 200Mhz 32Mb RAM
 Pentium 60 32 Mb RAM
 and other slower PCs

Macs

PowerMac Clone 166 Mhz 128 Mb RAM
 PowerMac 100 Mhz 32Mb RAM

Networking

All PCs and Macs are linked by a single Ethernet network. Files from both systems are stored on a central server.

Plotting - Hewlett Packard DesignJet CM 755

When outputs are for presentation rather than publication the final output is often to our large format colour inkjet plotter. This allows us to output high quality plots up to A0 (1188mm x 840mm) on a variety of media including high quality paper, and clear film. For smaller outputs we use an A3 inkjet printer - an IBM Lexmark 4079PS

Software

MapInfo Professional version 4

Further details : www.mapinfo.com

MapInfo acts as our primary GIS system in the mapping unit. Although now overpriced it offers some advantages over other systems and seems likely to remain important, at least in the short term.

Nonetheless, MaPublisher converts either MapInfo MIF files or ArcInfo ungenerate files - it could be used with any GIS system which is able to export in either of these formats. If such an export option is not available from a given GIS the process of developing a filter should not prove too difficult as the file formats involved are relatively simple.

MaPublisher version 1.5

Further details : www.avenza.com

MaPublisher Acts as a plug in filter for Illustrator (or Freehand) and accepts input from MapInfo or ArcInfo and creates editable graphic files. Critically MaPublisher allows the user to edit the data, styles and scale of the map produced. Although not a GIS in its own right MaPublisher allows the user to alter data values and ranges within Illustrator.

Illustrator version 7 for the Power Mac

Further details : www.mv.us.adobe.com

If necessary Freehand, an alternative Postscript editing package, could be adopted for editing the map (MaPublisher will import into this package too) but Adobe Illustrator is slightly better suited to cartographic work. The use of other Postscript drawing packages such as CorelDraw is possible but would require the development of custom built filters. This is not technically difficult but seems unnecessary in light of the availability of commercial filters for Illustrator and Freehand.

Our decision to adopt Apple Macintoshes for carrying out map design work was to some extent the result of software availability. Until recently (a reasonably good version of) Illustrator was only available for the Macintosh platform. Late in 1996 a comparable version of Illustrator was released for Windows 95/NT. It would be quite possible to implement a system very similar to ours using only Windows (or indeed UNIX). Nonetheless, given the choice, we intend to continue to use Macintosh machines - this remains by far the best platform for professional graphic work of this type.

Desktop publishing - Pagemaker Version 6 For the Power Mac

Further details : www.mv.us.adobe.com

The desktop publishing system adopted by ONS is Pagemaker on the Macintosh but again this is not a requirement of the approach we have adopted. Virtually all desktop publishing packages, whether for the Macintosh or the PC, allow the import and colour separation of EPS files. The obvious alternative for professional publishing would be QuarkXpress which would provide a similar (or better) solution.

Some GIS systems can directly produce a rather limited form of EPS file for inclusion direct in desktop publishing. Any claims in this area should be approached with some scepticism - most such outputs are fine for the production of individually printed copies but fail to provide support for the colour separations required for professional printing. As with so many file transfer formats EPS files remain a very unstandard standard.