ArcGIS and Cartographic Production in a National Mapping Agency

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Cartographic Production Development Manager
Overview

• What is Ordnance Survey? and what is “Cartographic Production”? 

• Five production examples of efficiencies introduced through the use of ArcGIS.

This will show ArcGIS, including v10, has helped
Ordnance Survey - Overview

• Great Britain’s National Mapping Agency
• Founded 1791, we are an Executive Agency within a Government Department
• Annual operating turnover (to 1/4/2012) of $202 million, with a profit of $37.6 million
• 1180 staff (1450 in 2007)
• Based in Southampton – with a team of surveyors spread around the country
Cartographic Production

- All graphic products = and <1:10 000 scale
- All derived vector data products
- 43 graphic and data products
- 67 staff
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Five examples of how we use ArcGIS to help us become more efficient.
Problem 1:

We had an old and unsupported production system
Software Support – finished April 2006

Hardware Support – E-Bay etc

(but it might not work)
Data for each database was held in up to 55 tiles

And

It was Spaghetti data
Translation of data

1. Analysed existing feature classification

251 relevant feature codes comprising:
  45 contours
  86 line codes
  78 point codes
  11 polygon codes
  31 text features
2. Identify the database structure

Using the Digest and EuroRegionalMap specifications:
• created 7 themes (databases) and 52 feature classes
• allocated lines, points and polygons to these feature classes
• drew up a diagram of how they all fitted together
Using the databases:

Built the Map

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Using ArcGIS we created a transfer process that automatically transferred the data into these feature classes.

This allowed us to continue updating the original data whilst we were building the system.
3. Issues with spaghetti data on translation.

Lines can transfer as lines or polygons

*because lines can go round in a loop*

Polygons can transfer as lines

*Because the sides might not be closed*

Features do not meet at tile edges

*A 962,000 meter contour had a 14 meter gap at the end*
Also:

Symbols were out of position

• *Stations not always on railway lines*
• *Roundabouts not always on road junctions*

Text was as it appeared on the map

*Sometimes as individual letters*
Benefits

1. Topologically structured database
   • Improved geometrical integrity
   • Holes in polygons, not two types of feature
2. Improved attribution
   • Lack of support for the old system meant no changes had been allowed
3. Allows increased process automation
   • Reducing manual effort required
4. Better database utilisation
Which leads to Problem 2.
Problem 2: We were having to make the same update to data in different datasets.
1:250k Core Data → Road Map Series

1:250k Core Data → Data for Customers
Identify the database structure

Using the Database structure from Problem 1:

• Map the structure for the output data – for each product component
Then define the route for the data
And a process that moves it
(FME)
Small Scale Core Data

Product Specific Data
NATS Aeronautical data - Tour Map data
Historical data - Boundary data

Overlay and Marginal Information

Merged Data

Change Data

Data Output
Twelve (+) products

Graphic Output

EuroRegional Map

EuroGlobal Map
Benefits

1. Topologically structured databases
   • Improved geographical and data consistency
2. Reduced resource requirement
   • Changes only applied once
3. Increased process automation
   • Further reducing manual effort required
4. Better database utilisation
Problem 3:

Our business is downsizing.
From
4,500 Staff
We printed or own maps.
We sent the data (feature codes) to Printing, and they did the rest.
We will have no room for print facilities.
Identify the database structure

Using the Database structure from Problem 1:

• Map the structure for the output data – for each product component

The process uses the data created as a result of answering the first two problems
Using the databases:

Build the Map

We had already built the map
A style needed for each of these:

251 relevant feature codes comprising:
- 45 contours
- 86 line codes
- 78 point codes
- 11 polygon codes
- 31 text features
Then identify the relationships between the features:
Interaction of lines and symbols

Road Junctions
Overs and Unders
Symbol Holdout
Roundabouts
And many more!!
Interaction of lines and symbols

Road Junctions
Overs and Unders
Symbol Holdout
Roundabouts
And many more!!
Interaction of lines and symbols

Road Junctions
Overs and Unders
Symbol Holdout
Roundabouts
And many more!!
And set them up
34 types of road feature
Including masks
4 masks holding out data from 20 layers
Turns this
Into this
Benefits

1. Cartographers control the map
   • Instead of hoping that the printers know what we want

2. Electronic delivery method
   • Can be sent anywhere for printing

3. Reduced costs and environmental impact
Problem 4:

We need to produce a complicated data product in house
Meridian™2

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The data was revised annually by a third party contractor

Incorporating new road detail and revision data supplied by Ordnance Survey
In December 2007 management decided to bring production in house

To be delivered by the end of October 2008
Formats

• NTF – as 2856 10km x 10km tiles
• DXF – as 2856 10km x 10km tiles
• MID/MIF – as 20 layers
• Shape – as 20 layers
  plus a Coverage file
  plus an E00 file
Supply Sets

- Great Britain or,
- Scotland or,
- England or,
- Wales
  
as
  - Everything or,
  - Communication or,
  - Topology
Different ways to supply the data
New product – new data model
all imported from the NTF original data

141002550DO16CN80C7VXTWFC3002LL00026PNST DOGMAELS ROAD\RNB4546\0%
23100256100256011002560%
21100256200020798707058 0795107031 0%
141002560DO16CMJ7C7EWTWFC3004LL00045PNMELIN Y DRE\0%
23100257100257011002570%
21100257200050722304624 0754504762 0785504962 0798705251 0804805314 0%
141002570DO16CMLOC8CETWFC3001LL01125RNA487(\)\TRY0%
23100258100258011002580%
2110025820003089505994 0855606075 0827106075 0%
141002580DO16CM91V7U2&WFC3001LL00634RNA484\0%
23100259100259011002590%
21100259200040904805354 0817605522 0821005920 0827106075 0%
141002590DO16CM8PC8CKAWFC3001LL00810RNA487(\)\TRY0%
23100260100260011002600%
21100260200070555602917 0554802525 0554402407 0549802100 05474019741%
00 0542801825 0527601590 0%
141002600DO16CMQTV9R5TWFC3001LL01385RNA487(\)\TRY0%
23100261100261011002610%
21100261200070722304624 0676604497 0657304479 0642504393 06110043771%
00 0634104175 0627804102 0%
141002610DO16CNABC8MB&WFC3001LL01171RNA487(\)\TRY0%
23100262100262011002620%
2110026220004088506804 0866906744 0865306736 0861806719 0%
141002620DO16CM7DC7GTMWFC3002LL00247PNABERYSTWYTH ROAD\RNB4548\0%
23100263100263011002630%
2110026320007090806777 0889106788 0885006704 0%
141002630DO16CM3TC7FWTWFC3002LL00064PNABERYSTWYTH ROAD\RNB4548\0%
23100264100264011002640%
21100264200030771002081 0770702153 0776602877 0%

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Building the Editing System
One Database

or

2856 ?
NTF data consists of lines, points and nodes

No polygons!
Features at or crossing tile edges have a feature on each tile
Features at or crossing tile edges have a feature on each tile

Points at ends of a line feature have a Node record

Line, Point and Node identifiers are tile based
i.e. each tile will have feature number 1
Which means 2856 databases!
We need
Automatic validation of attribution
Especially in relation to nodes
A consistent editing environment
The same for each tile
We need

Automatic validation of attribution

The Product Library

Reviewer Batch Job Manager

Auto Date Field Population

FCT Metadata
Validation

Decide what values **must** be put in

And populate them automatically where possible

Decide what values **mustn’t** be entered

And create rules that trap them
So we created a Condition Table in PLTS at 9.3.1

Currently 385 rules

This was then imported into the Reviewer Batch Job Manager
And the system tells us when we get it wrong!
Auto Date Field Population

As we edit data, dates **must** be populated in the creation and modification fields.

FCT Metadata allows us to do just that.
<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATION_DATE</td>
<td>#date#</td>
</tr>
<tr>
<td>MODIFICATION_DATE</td>
<td>#date#</td>
</tr>
</tbody>
</table>

**Metadata Favorites**

- Meridian2 - Meridian2
And then we built a delivery model
Different ways to supply the data

Job Done
Different ways to supply the data

Job Done in 7 months!
Benefits

1. Data now in house
   - Improved currency and quality
   - Back in control of content
2. Cheaper – Only have to pay for update carried out rather than a set charge
3. “Customer Friendly” revisions to data being removed
4. Potential for single database on removal of NTF format a stage further forward
Problem 5: Customer complaints about data across tile edges
• Create a series of models in ModelBuilder to automate the identification of edge errors.
• 10,567 tiles of data in .gz format
• 32,287,492 polygons
• 215,204 edge match errors involving 183,651 polygons

• Only 0.57 %......
  but an error is an error
Benefits

1. Better data allowing successful generation of new products
2. Happy customers – One of the UK’s largest insurance companies was unable to use our data within its GIS system
3. Good publicity – In showing that we understand our customers concerns and make efforts to deal with them
And that is not all!

These are just five of the processes we have delivered.

There are more…….
Thank you
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