

# How to hold 10.5m statistics in one column of one table:

**Strengths and weaknesses of the DDI Aggregate Data Extension in directly driving an on-line data visualisation system**

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# A Vision of Britain through Time

- Three year project funded by UK National Lottery
  - Not JISC, not ESRC ...
  - Main product a web site launched 26<sup>th</sup> October 2004
  - Built on many earlier data and boundary digitisation projects
- A visualisation project, not a data library
  - Created by a historical geographer, not a data librarian
- Designed to present 200 years of British census and vital registration data to a general audience: *Life Long Learners*
  - Much of the demand is from *local* and family historians
  - data items often need to be disassociated from their original context
    - Original tables cover whole country for single date
    - Users want time series for single location
- A **seriously** popular (and populist) web site
  - C. 30m page requests served since launch
  - C. 40,000 distinct users per month
  - AOL UK web site of the day in January

# Potential schools demand has yet to hit us

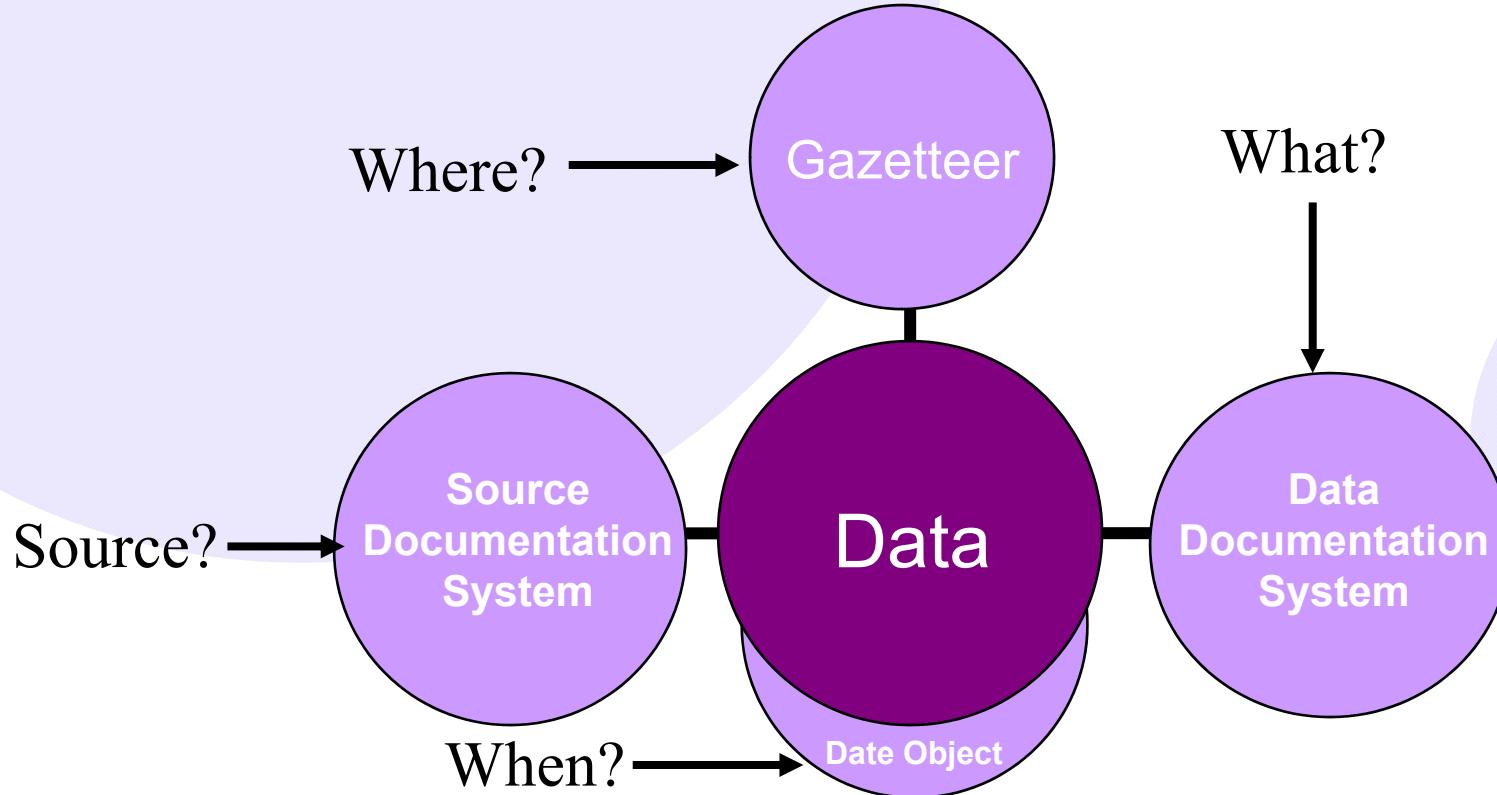
- Key Stage 2 of the History National Curriculum for England requires that all students prepare:
  - ‘A study investigating how an aspect in the local area has changed over a long period of time, or how the locality was affected by a significant national or local event or development or by the work of a significant individual’, using information on ‘education; population movement; houses and housing; religious practices; treatment of the poor and care of the sick ...’
- It is a legal requirement that all English children in state schools do such a project
- Key Stage 2 means ages 8-11 – typically, at age 9
  - No, we don’t know how to serve this audience either
- The Office of National Statistics tries to reply to all letters from schools requesting historical data for their local area

## “Vision of Britain” is not just statistics

- Other content includes:
  - Gazetteer/Geographical name authority (Over 50,000 administrative units)
  - Descriptive Gazetteers (90,000+ entries; c. 5m words)
  - Images of three sets of One Inch maps of Britain (20 Gb of scans)
  - Administrative Boundaries (50,000 polygons)
  - Text of the *Preliminary and General Reports* of every GB census 1801-1961 (3m. Words?)
  - Text of *Guide to Census Reports: Great Britain 1801-1966* (279 pages).
  - 11 Travellers’ Tales (Defoe, Boswell, etc; c. 1.5m words)
- **But this presentation focuses on data, and on the DDI implementation**
  - Statistical content fairly ordinary: big chunk of GB census reports since 1801, vital registration reports, etc

## Data-centric Overview of GBH GIS:

- All statistics – c. 10.5m values -- are held in one column of one table
- Easy to access, but how do we know what each number means?
- We record **four** main characteristics for each number:



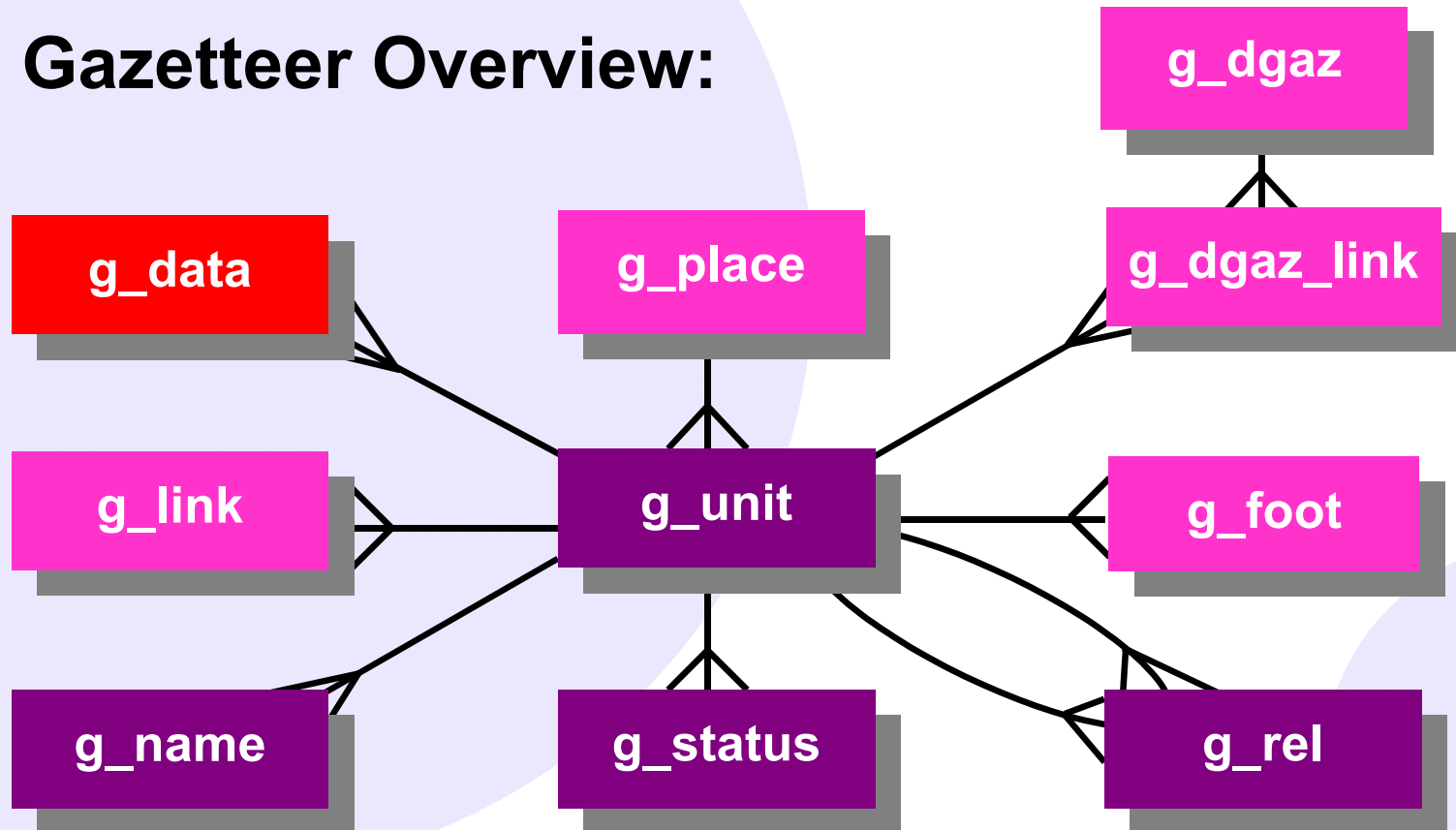
## When: Date Objects

- This is the *fairly* easy one
- Dates held directly within the data table
- ... but we store dates in a specially defined *date object* (using Oracle's object-relational capabilities), not in a conventional Oracle date value:
  - Census data stored using simple year value
    - Means graphs, etc, treat censuses as regularly spaced
    - Exact date of each census stored elsewhere in system
  - Unemployment counts, etc, stored using full calendar dates
  - Vital registration data stored usually with a duration, I.e. a pair of full calendar dates
  - Elsewhere, we store text strings within date objects, such as “around the reign of Edward II”, but with statistical data we require at least a specific year

## Where: Gazetteer

- Every data value in the data table is associated with one of our 50,000 administrative units as defined in our gazetteer
  - Quite independent of our DDI implementation
  - UK administrative geographies too fluid to treat geographies as DDI variables, units as DDI categories
- All units in the gazetteer have an **ID number**, a **type**, and at least one **name**.
- All units in the gazetteer are required to be **part of** at least one higher level unit, but we do not necessarily know geographical locations
- If one or more boundary polygon is held for a unit, system can do choropleth mapping
- Presentation given on our gazetteer at IASSIST 2003.

## Gazetteer Overview:



- This diagram excludes metadata tables and **g\_authority**
- Places table enables simpler searching and TT linkage
- A simple structure for some very complex information



## Key Source: Youngs' *Local Administrative Units of England*

The main basis  
for populating  
the  
administrative  
units gazetteer  
So is this  
geographical  
information?

Cheetwood EP.<sup>216</sup> Salf. RDn. Abol 1967 to help cr Lower Broughton St Clement with St Matthias EP.<sup>305</sup>

**LOWER BROUGHTON ST CLEMENT WITH ST MATTHIAS**  
EP Cr 1967 by union Lower Broughton St Clement EP, pt Salford St Matthias with St Simon EP.<sup>305</sup> Salf. RDn.

**BROUGHTON EAST**  
Tp and chap (built 1745<sup>322</sup>) in Cartmel AP, sep CP 1866,<sup>4</sup> sep EP 1748 as 'Field Broughton',<sup>12</sup> as such eccl refounded 1875.<sup>304</sup> qv. *LG* Lonsd. Hd, Ulv. PLU, pt Grange USD, pt Ulv. RSD, Ulv. RD (1894—1960), N Lonsd. RD (1960—74). Civ bdry: 1884,<sup>51</sup> 1884,<sup>52</sup> 1884,<sup>53</sup> 1884,<sup>55</sup> 1884,<sup>56</sup> 1894 (loses the pt in the UD to help cr Grange CP),<sup>58</sup> 1914.<sup>59</sup> Transf 1974 to Cumbria.<sup>40</sup> *Parl* Seq 10.

**BROUGHTON ST JOHN [THE EVANGELIST]**  
EP Cr 1878 from Broughton EP.<sup>303</sup> Salf. RDn.

**BROUGHTON IN FURNESS**  
Chap in Kirkby Ireleth AP, sep EP [St Mary Magdalene] 1870,<sup>306</sup> sep CP 1866 as 'Broughton West',<sup>4</sup> qv. Ulv. RDn. Eccl bdry: 1886.<sup>8</sup> Abol 1956 to help cr Broughton in Furness with Woodland EP.<sup>244</sup>

**BROUGHTON IN FURNESS WITH WOODLAND**  
EP Cr 1956 by union Broughton in Furness EP, Woodland EP.<sup>244</sup> Ulv. RDn (1956—70), Furness RDn (1970—\*).

**BROUGHTON WEST**  
Chap in Kirkby Ireleth AP, sep CP 1866,<sup>4</sup> sep EP 1870 [St Mary Magdalene] as 'Broughton in Furness',<sup>307</sup> qv. *LG* Seq 14. Bdry: 1935 (exchanges pts with Millom Rural CP, Cumb).<sup>307</sup> Transf 1974 to Cumbria.<sup>40</sup> *Parl* Seq 10.

**BRUNSHAW**  
CP Cr 1894 from the pt of Burnley CP not in Burnley

## LANCASHIRE

153

refounded 1854,<sup>199</sup> 'Burnage' a sep EP 1875 from Withington EP, Barlow Moor EP.<sup>150</sup> *LG* Salf. Hd, Chorlton PLU, Withington USD, UD (1894—1904), Manch CB (1904—10). Civ bdry: 1883.<sup>31</sup> Abol civ 1910 ent to Manch CB (assoc with Lancs) and to South Manchester CP.<sup>310</sup> *Parl* S'rn Dv (1832—67), S-E Dv (1867—85), Stretf. Dv (1885—1918). *Eccl* Ardwick RDn (1875—1912), Heaton RDn (1912—\*). Eccl bdry: 1900 (help cr Ladybarn EP),<sup>202</sup> 1905,<sup>199</sup> 1927,<sup>135</sup> 1929.<sup>204</sup>

**BURNAGE ST NICHOLAS**  
EP Cr 1929 from Barlow Moor EP.<sup>152</sup> Heaton RDn.

**BURNLEY**  
The following have 'Burnley' in their names. Insofar as any existed at a given time: *LG* Black. Hd, Burnley PLU, pt Burnley USD, pt Burnley MB (1861—89 [enlarged pt 1871—89]), Burnley CB (pt 1889—94, ent 1894—1974), pt Burnley RSD. *Parl* N'rn Dv (1832—67), Burnley Parl Bor/BC (1867—\*). *Eccl* Blackb RDn (until 1847), Whalley RDn (1847—72), Burnley RDn (1872—\*).

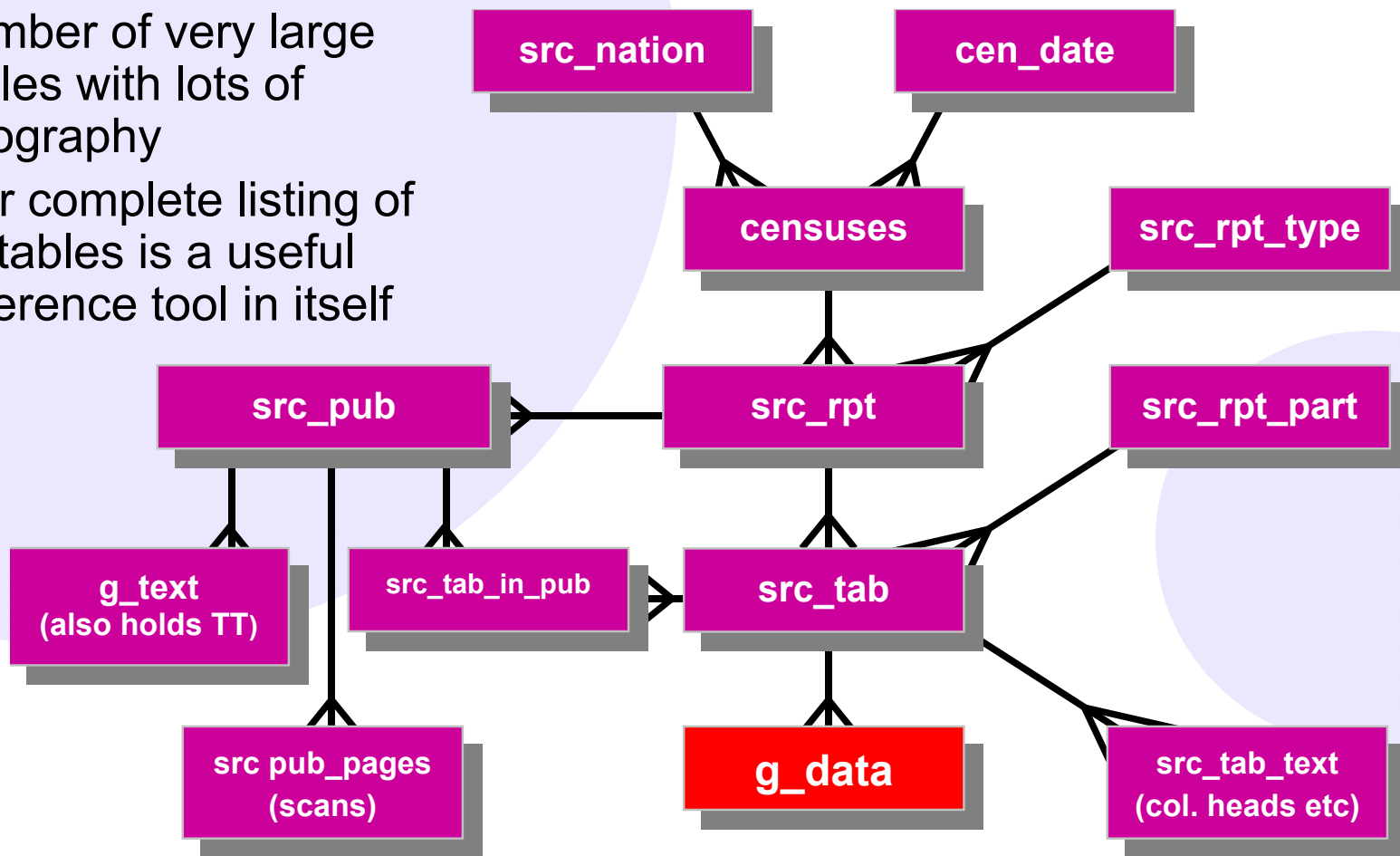
**CPI/EP1—BURNLEY [ST PETER]**—Chap in Whalley AP, sep CP 1866,<sup>4</sup> sep EP 1716 (incl tps Briercliffe with Extwistle, Cliviger, Habergham Eaves, Worsthorne with Hurstwood; also incl 2 civ tp/eccl ex-par areas of Ightenhill Park [eccl, 'Ighton Hill' until eccl abol 1845 to help cr Habergham All Saints EP<sup>124</sup>] and Reedley Hallows, Filly Close and New Laund Booth).<sup>12</sup> Civ bdry: 1894 (the pt not in the CB cr Brunshaw CP, and gains the pts in Burnley CB of Briercliffe with Extwistle CP, Habergham Eaves CP, Ightenhill Park CP; Reedley Hallows, Filly Close and New Laund Booth CP),<sup>295</sup> 1911,<sup>308</sup> 1926.<sup>311</sup> Eccl bdry: 1741 (pt orig area tp Cliviger cr 'Holme in Cliviger' EP,<sup>12</sup> refounded 1843 as 'Holme St John'<sup>293</sup>), 1837 (orig area tp Worsthorne with

# Sources: Source Documentation System

- This structure defines and provides IDs for:
  - All the censuses taken in Britain between 1801 and 1961
  - All the reports published by each census
    - ... and, eg for county reports, the separate publications comprising each report
  - All the tables within each reports
  - Column and row headings, notes to tables, etc
- The **data table** holds, for *source tables* we have computerised:
  - “Source table IDs”
  - Column within table
  - Row within table
- Key point: an infinite number of *source tables* can be defined within a fixed set of Oracle tables
- System is able to reconstruct census reports in their entirety, including both text and tables
  - System provides ‘drill-down’ mechanism, rather than exact reconstruction
  - Follows hierarchies of units recorded in the gazetteer
- Non-census sources identified by simpler Dublin Core compliant system

- So far, poorly populated because the project has focused on a small number of very large tables with lots of geography
- Our complete listing of all tables is a useful reference tool in itself

## SDS Schematic:



## What: Data Documentation System

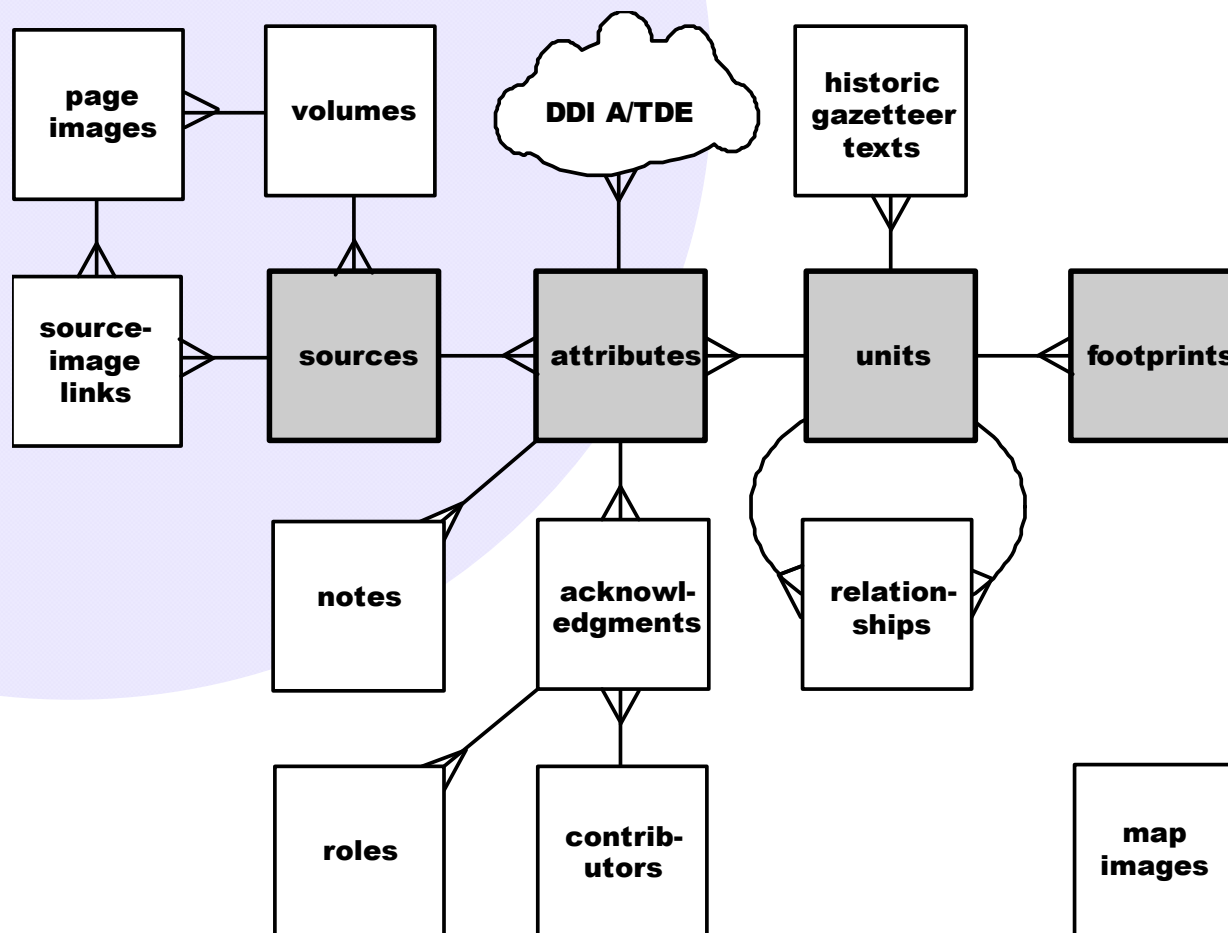
- Based closely on the DDI aggregate data extension
- No requirement from funding body or elsewhere for standards compliance
  - Funding body's only requirement was Dublin Core
  - System is a large stand-alone web site
    - We are very interested in web services, but no one will fund us to develop them
    - Web service activity mainly to do with OGC and ADL standards
  - Even our collaborators in the Arts and Humanities Data Service/UKDA not particularly interested
- Performance **is** a very large concern
  - Large numbers of users already noted
  - They want graphs and maps, not bulk data downloads
- So why implement the DDI?

## Why we support DDI standard

- Vision of Britain system needed to be:
  - Large
    - GB Historical DB holds c. 25 m data values
  - Extensible
    - New funding bids adding data on ecclesiastical units, elections, industrial structure (but no money for new software)
  - Provide direct access to individual data items
    - Users want local time series, not national maps
- Writing code to generate particular web pages from particular “data sets” impractical on this scale
- Once focus shifts from “data sets” and “census tables” to individual data values, holding all the data items in a “data items” table is obvious
- But how to make it work?

## January 2002 schematic:

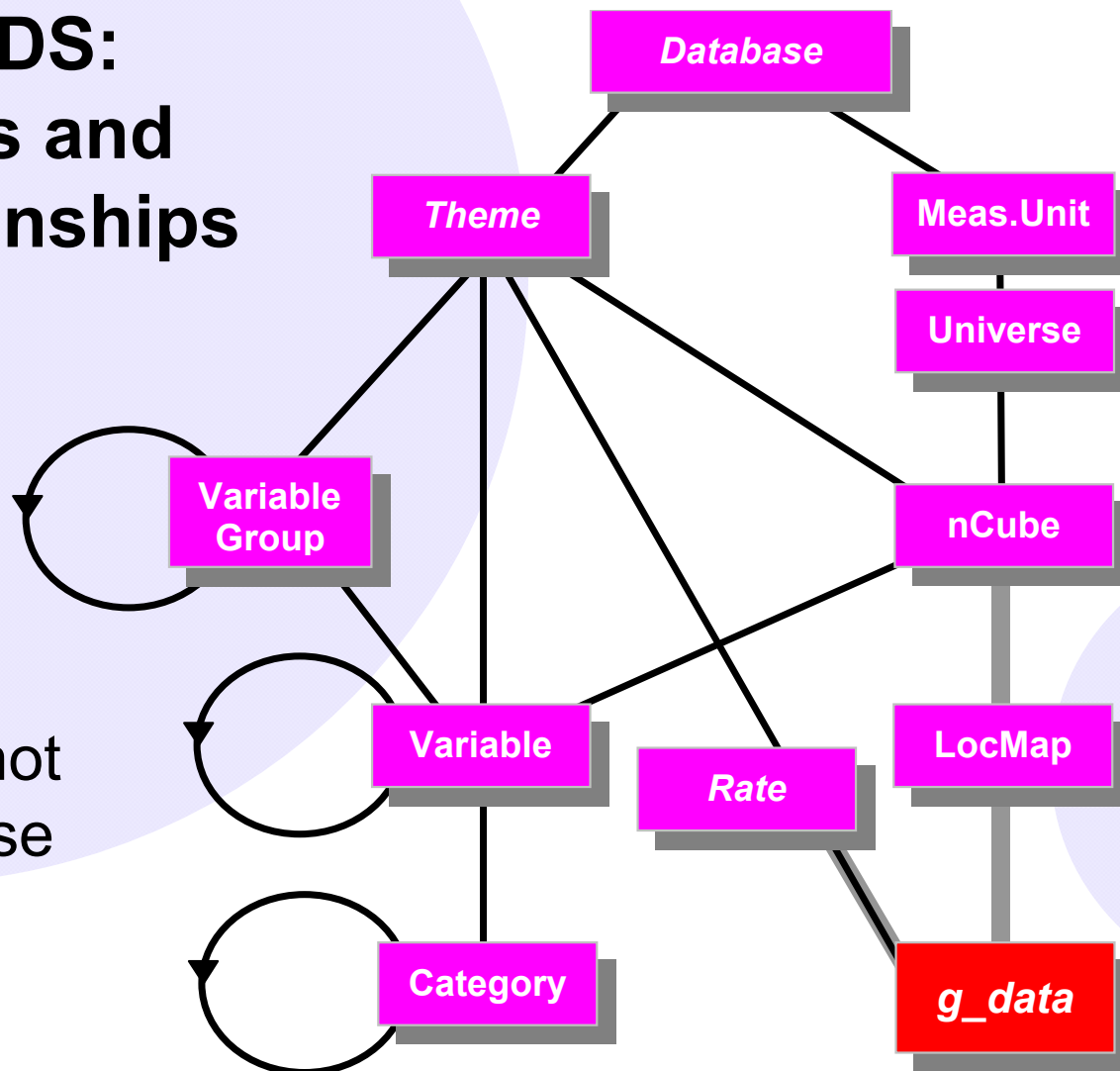
Architecture decided December 2001; DDI training May 2003



## DDI Aggregate Data Extension 101

- Defines meaning of each data value by location within an *nCube* whose dimensions consist of *variables*, each defined as a set of *categories*
  - For example, gender by age by cause of death
  - Each different categorisation of cause of death is a *different variable*
    - The six Registrar General's *Decennial Supplements* 1851-1901 use five different cause of death classifications, which we place in a *variable group*
  - *Category groups* enable mapping of one variable into another
- Each nCube covers a *universe*
  - Two nCubes might both combine gender and age, but one covers total population, the other total deaths
- The very highly abstract nature of this data model in itself creates practical problems

# GBH DDS: Entities and Relationships

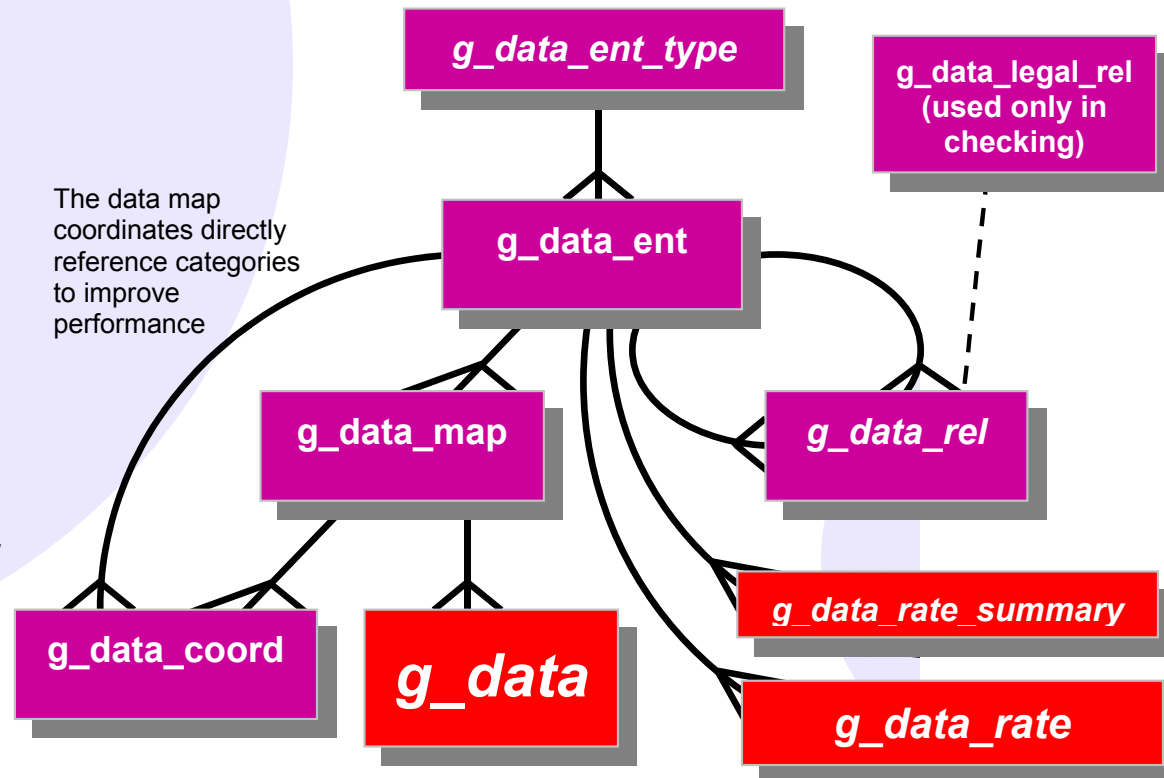


- but this is not the database structure ...



## GBH DDS Schematic:

- Data model further abstracts the DDI
- Holding all labels and text for all entities in one table simplifies searching
- System extensively denormalised for performance
  - e.g. universes and measurement units are held both as entities *and* as nCube attributes
  - data\_rate and its summary hold all data needed for most accessible maps and graphs
- Fixed set of tables holds any amount of data in any number of nCubes, with any number of dimensions



# GBH modifications to DDI

- New concept: Cell references
  - ID values (text strings) linking data table to data map
    - A/T DE designed to work with flat and hierarchic text files, not RDBMS
    - Discussed with Wendy Thomas!
  - Generally mnemonic (e.g. “Tot\_Pop”)
    - For system, could just as well be “Fred”
    - But helps non-DDI-literate humans use system
- Additional entity types:
  - Database
  - Theme
  - Rate
- Attributes redefined as entities:
  - Universes
  - Measurement Units
- Entities **not** used:
  - Category Groups

## Additional presentational elements

- Database and themes
  - Everything belongs to overall “database”
    - Relatively few changes needed to system to hold whole additional web sites, eg for other countries
  - Most other elements assigned to specific themes
    - Population – Life & Death – Industry – Work and Poverty – Social Structure – Housing – Learning & Language – Roots & Religion
    - Two more to be added
      - Agriculture and Land Use – Political Life
- Rates
  - Define most accessible level of statistical data
  - Defined by Numerator, Denominator and Multiplier
    - eg “Unemployment rate is number out of employment, divided by number economically active, multiplied by 100
    - **Not** number in employment, multiplied by 1000

## Generating derived data

- *Variables* mapped on to other *variables*
  - eg detailed occupational categories mapped onto 5 social classes
  - Defined by mapping each occupational *category* onto a particular social class *category*
- System then computes nCube to nCube mappings
  - Defined in terms of cellRefs
  - Checks that nCubes share universes
- We then pre-compute **all** derived data values implied by these mappings
  - Currently means adding c. 2.5m additional data values
  - This takes a long time!
  - As does subsequent pre-computation of all rate values
  - Could this be done by triggers within DBMS?
- NB all this means that the system includes a substantial knowledgebase on, for example, alternative occupational coding systems, and their relationships

# Graphing and mapping

- Supports very general approach to creating graphs and maps
- Web site decides how to graph data based entirely on metadata:
  - One dimension, one category, multiple dates: time series
  - One dimension, two+ categories, one date: pie chart
  - One dimension, two+ categories, 2+ dates: stacked chart
  - Two dimensions, one dimension has only 2 categories: population pyramid (multiple pyramids if 2+ dates)
  - Two dimensions, both have 3+ categories: getting tricky
  - Three+ dimensions: currently ignored
  - NB nCubes have to be “additive” for most of this to work
- Mapping nCubes permits very large number of logically valid maps
  - Web site currently only maps rates
  - One dimensional nCubes simple to maps
  - Higher dimension nCubes raise big user interface issues
- Visualisation of more complex nCubes is seriously limited by constraints of a high volume web site

## Issue: Duplication between DDS and SDS

- “Belt and braces”
  - Some data values covered only by SDS, not DDS
    - Appear only in table reconstructions, not in maps/graphs
  - Non-census data only in DDS
    - Appear only in maps/graphs
  - Some duplication of information appears, in census tables organised as natural nCubes
    - eg age/sex structure tables
  - Will be more problematic if we add tables with less geography
- But much information in DDS is interpretative
  - Contains historical judgements that data from different censuses are *broadly* equivalent
    - eg “usual residence” versus “persons present”
  - My assumptions about equivalence make it important that the SDS holds the original column/row headings
  - Many important tables hold quite diverse data
    - Particularly true of parish tables

# Columns in the 1831 Parish Table

Name and type of geographical unit

Area of unit in English statute acres.

Number of inhabited houses

By how many families occupied.

Number of houses under construction.

Number of uninhabited houses.

Number of Families chiefly employed in Agriculture.

Number of Families chiefly employed in Trade, Manufactures and Handicraft.

Number of All other Families not comprised in the two preceding classes.

Total number of male inhabitants.

Total number of female inhabitants.

Total number of all inhabitants.

Males of twenty years of age [or more]

Agriculture: number of Occupiers employing Labourers.

Agriculture: number of Occupiers not employing Labourers.

Labourers employed in Agriculture.

Number Employed in Manufacture, or in making Manufacturing Machinery.

Number Employed in Retail Trade, or in Handicraft as Masters or Workmen.

Number of "Capitalists, Bankers, Professionals and other Educated Men.

Number of "Labourers employed in Labour not Agricultural.

Number of Other Males 20 Years of Age (except Servants)

Number of "Male Servants 20 Years of Age.

Number of Male Servants under 20 Years of Age.

Number of Female Servants.

II.  
CLASSIFICATION OF SCHOOLS.

IN REGISTRATION DISTRICTS, OR POOR LAW UNIONS.

DIVISION I.—LONDON.\*

DESCRIPTION OF SCHOOLS.	MIDDLESEX							
	1. KENSINGTON.				2. CHELSEA.			
	No. of Schools.	Number of Scholars belonging to the Schools.			No. of Schools.	Number of Scholars belonging to the Schools.		
	Both Sexes.	M.	F.	Both Sexes.	M.	F.		
<b>DAY SCHOOLS</b> -	264	12626	6869	5957	104	6738	3950	2788
PUBLIC DAY SCHOOLS -	49	8207	4630	3577	28	5184	3096	2088
PRIVATE DAY SCHOOLS	215	4419	2039	2380	76	1554	854	700
<i>Classification of Public Schools.</i>								
CLASS I.—SUPPORTED BY GENERAL OR LOCAL TAXATION	2	160	84	76	4	526	443	83
CLASS II.—SUPPORTED BY ENDOWMENTS	3	684	448	236	..	..	..	..
CLASS III.—SUPPORTED BY RELIGIOUS BODIES	39	6828	3766	3062	22	4441	2526	1915
CLASS IV.—OTHER PUBLIC SCHOOLS	5	535	332	203	9	917	197	90
CLASS I.								
Workhouse Schools -	*2	160	84	76	..	..	..	..
Military Schools -	..	..	..	..	..	..	..	..
CLASS II.								
Collegiate and Grammar Schools -	..	..	..	..	..	..	..	..
Other Endowed Schools -	3	684	448	236	..	..	..	..
CLASS III.								
<i>Denominational.</i>								
Ch. of England—National	15	4220	2407	1814	7	2292	1296	996
Others -	9	922	465	459	11	1334	712	622
Church of Scotland	..	..	..	..	..	..	..	..
Presbyterians	..	..	..	..	..	..	..	..
Independents—British	2	..	..	..	..	..	..	..
Others -	2	..	..	..	..	..	..	..
Baptists—British	2	..	..	..	..	..	..	..
Others -	1	..	..	..	..	..	..	..
Wesleyan Methodists	1	210	137	73	2	235	155	70
Dissenters (not otherwise described)	1	64	7	57	..	..	..	..
Roman Catholics	5	608	335	273	1	460	250	180
<i>Undenominational.</i>								
British	1	88	48	40	..	..	..	..
CLASS IV.								
Ragged Schools (exclusive of those supported by Religious Bodies)	3	488	332	156	2	217	127	90
Juvenile Refuge	..	..	..	..	..	..	..	..
Orphan Schools	2	47	..	47	..	..	..	..
Other Subscription Schools, of no specific character	..	..	..	..	..	..	..	..
<b>SUNDAY SCHOOLS</b>	38	5380	2640	2740	19	3370	1669	1701

# 1851 Census of Education

SUPPORTED BY TAXATION  
SUPPORTED BY ENDOWMENTS  
SUPPORTED BY RELIGIOUS BODIES  
OTHER PUBLIC SCHOOLS

PUBLIC DAY SCHOOLS  
PRIVATE DAY SCHOOLS

DAY SCHOOLS  
SUNDAY SCHOOLS

Workhouse Schools  
Military Schools

Collegiate and Grammar Schools  
Other Endowed Schools

Church of England - National  
Church of England - Others  
Church of Scotland  
Presbyterians  
Independents - British  
Independents - Others  
Baptists - British  
Baptists - Others  
Wesleyan Methodists  
Dissenters (not otherwise described)  
Roman Catholics  
Undenominational - British

Ragged Schools  
Juvenile Refuge  
Orphan Schools  
Other Subscription Schools

Church of England  
Independents  
Baptists  
Unitarians  
Wesleyan Methodists  
Catholic and Apostolic Church



## Issue: Categories and Variables

- Basic DDI principle:  
New set of categories => new variable
- It is good that GBH system includes:
  - Variable group “Age”, with (currently) 12 categorisations
  - Variable group “Cause of Death”, with 5 categorisations
  - Variable group “Occupation”, etc
- But what to do where the same table from a particular census lists different sets of categories for different areas?
  - Done for sensible reasons
  - Not uncommon in occupation tables
  - Also a major issue if we add electoral data
    - Candidates differ between constituencies

# 1841 Occupation Tables

- First British census to gather occupation data via household enumeration
- **No** occupational coding system used
- 3,286 occupational titles appear (ignoring purely typographic differences)
- But different lists appear for each county
  - Lancashire: 682 (as illustrated)
  - Rutland: 155
- So do we define a separate variable for each county?
- This example obviously poses other problems

Accountant		
Acid-maker	Lath-render and Merchant	
Actor (Play)	Lathe-maker	Whalebone-merchant
Agent and Factor	Laundry-keeper	Wharfinger
Agricultural Mach	Law Officer	Wheelwright
Alkali-Manufactur	Lead Agent	Whip-maker
Alkali-merchant	Lead-manufact	Whitesmith
Alum-maker	Lead-merchant	Whiting-maker
Anchor-smith and	Leech bleeder	Wig-maker
Animal and Bird-d	Librarian	Wine-cooper
Animal and Bird p	Lime-burner	Wine Merchant
Architect	Linen-Manufac	Wire-drawer
Army	Linen-merchan	Wire-worker
Army Half pay	Lint-maker	Wood-bailiff
Artist	Lithographer	Wood Dealer
Attorney, Solicitor	Livery-stable K	Wood Cutter and Woodman
Auctioneer, Appra	Locksmith and	Wool Agent and Broker
Baby-linen-maker	Lodging and B	Wool-comb-maker
Back-maker	Looking-glass-	Wool (Fancy) dealer
Bacon-dealer and	Looking Glass	Wool-dealer and Stapler
Bailiff (branch not	Loom-maker	Woollen Clothier and Draper
Baker	Macintosh-mak	Woollen & Cloth Manufacture (all bran
Ball-maker	Maltster	Worsted-dealer
Bank Agent	Mangle-maker	Worsted-manufacture (all branches)
Banker	Manure-dealer	Yarn Agent
Bark-dealer	Marble Mercha	Yarn-dealer
Barometer-maker	Marine-store-d	Yeast-dealer
Barrister and Con	Marines	Zinc-worker
Basket-maker	Mason and Sto	Total Number of Persons whose Occu
Bat-maker	Mason, Marble	Other Persons employed in Trade (br
Bath-keeper and	Mat and Mattin	Number of Persons returned as of Ind
Bazaar-keeper	Match-maker a	Almspeople, Pensioners, Paupers, an
Bed and Mattress	Mathematical I	Other Persons
	Measure-make	Residue of Population
		Total Population

## Issue: Why hasn't this been done before?

- This approach is **very** wasteful of disk space
  - Largest users of space are, in fact, the seven indexes that we have built on the data table
- But does this matter?
  - Entire Oracle content, including polygons, text, etc, fits into 10 Gb
  - Scanned maps occupy 20 Gb even in down-sampled versions used in web site
  - Our server came with 6 x 73 Gb disks, *by default*
  - Oracle content is held permanently within the 32 Gb of RAM
- In general, social science data occupies what are now pretty trivial amounts of disk space
- Have conventional data library practices adapted to this?

## Issue: What use is this for academic researchers?

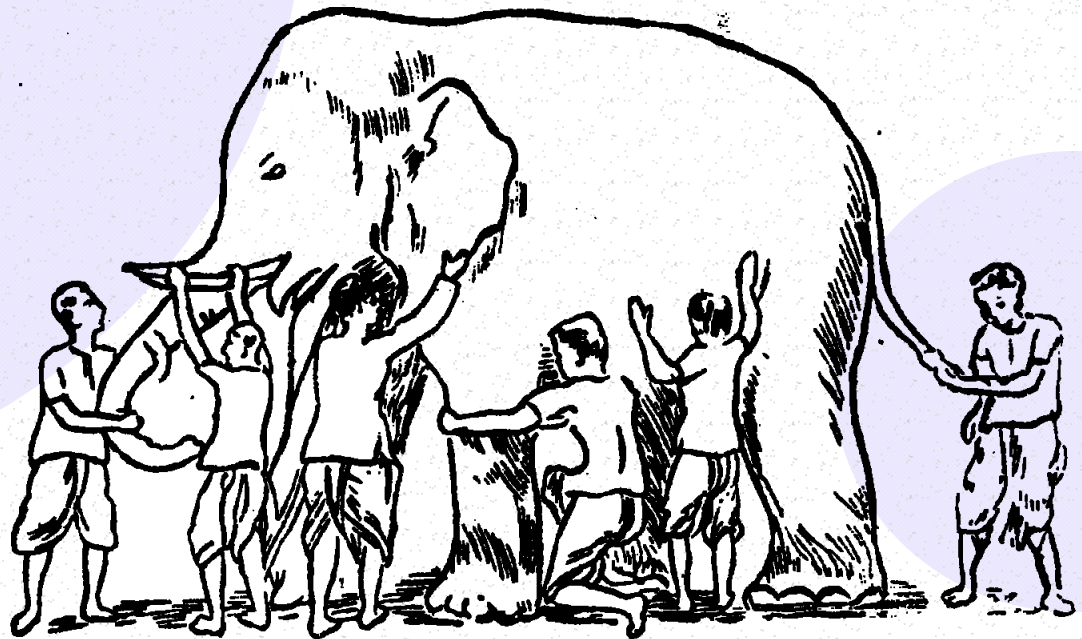
- One answer is that we need to find out
  - We were able to build this system only through lottery funding
  - System paid for by the general public, so they had to be our primary audience
  - In practice, the same interface is very useful to many academic historians doing local case studies
- System can provide full audit trail for otherwise *ad hoc* manipulations
  - Tidying up and matching of geographical names done when loading data
  - Geography conversion tables, for redistricting, held as unit-to-unit relationships
  - Recodings held as category-to-category mappings
- **Very** regular data architecture makes system accessible to automated pattern seekers, including web crawlers
  - Can use data to find metadata, as well as vice-versa
  - Partly done to enable Google to explore the system
  - But can also let the Geographical Analysis Machine in
  - Seeking funding under e-social science programme

## Our support for metadata standards ....

- Data Documentation System inspired by the DDI Aggregate Data Extension:  
<http://www.icpsr.umich.edu/DDI>
- Spatial data handling based closely on Open Geospatial Consortium (OGC) standards -- web services potentials:  
<http://www.opengeospatial.org>
- Data model for core gazetteer based on Swedish National Topographical Database, but details then heavily influenced by Alexandria Digital Library Gazetteer Content Standard:  
<http://alexandria.sdc.ucsb.edu/~lhill/adlgaz>
- Funding body required support for Dublin Core
  - **Most** table references g\_ **authority** table, with DC-based columns:  
<http://www.dublincore.org>
- Text mark-up reflects Text Encoding Initiative guidelines  
<http://www.tei.org>

## ... is rather like the **Blind Men and the Elephant**

- This system probably provides more support for open standards than any other GIS in the social sciences or humanities
- Standards support is not simply to let us tick boxes on a funding application, but has deeply influenced system architecture
- But the view of the system provided by any one of those standards is very partial
- System as a whole is a description of Britain designed by a historical geographer, and only incidentally a collection of data and metadata



## Web sites, etc

- Vision of Britain:

[www.VisionOfBritain.org.uk](http://www.VisionOfBritain.org.uk)

- Great Britain Historical GIS:

[www.gbhgis.org](http://www.gbhgis.org)

[www.port.ac.uk/research/gbhgis](http://www.port.ac.uk/research/gbhgis)

- Mailing list:

[www.jiscmail.ac.uk/lists/gbhgis](http://www.jiscmail.ac.uk/lists/gbhgis)