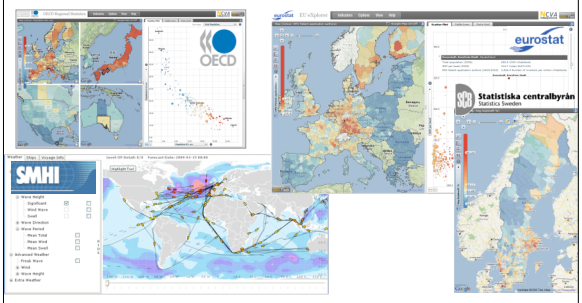
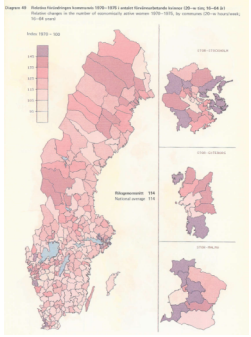
NCVA
National Center for Visual Analytics
Linköpings universitet
expanding reality

Introduction to GeoVisual Analytics II



PROFESSOR AND DIRECTOR MIKAEL JERN NCVA
http://ncva.itn.liu.se/

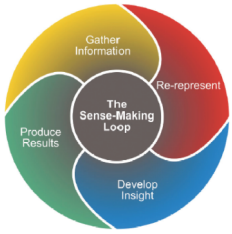
Universitetet i Lund samarbetar med SCB 1974-1980



Färgbildskrivaren användes för att skapa bilder till FOB 75

Visual Analytical Reasoning Process – Sense Making Loop

- Gather information and data
- Re-represent
  - Choose form that aids analysis
- Develop insight
  - Through exploration and visual manipulation
- Produce results (knowledge)
  - Hypotheses, Presentation, Tell-a-Story, Communication



eXplorer for regional exploration and analysis

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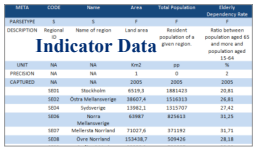
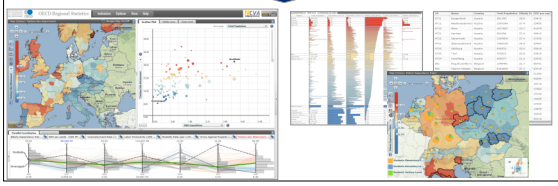




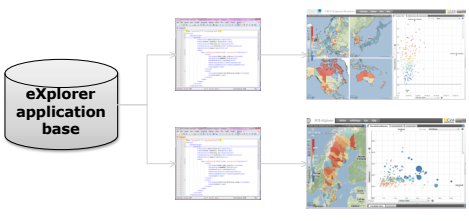
Introduce advanced GeoVisual Analytics technique

100% Web-enabled technology for Statistics Analysis and Communication

Spatial-Temporal and Multivariate Data

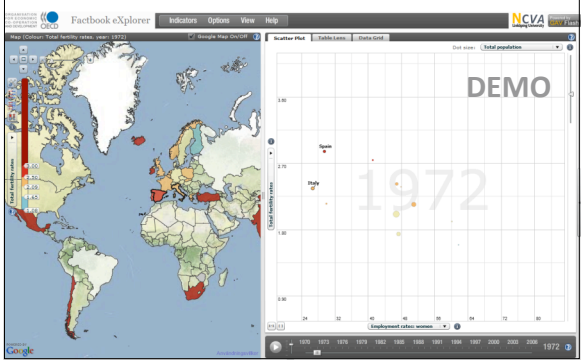
Open eXplorer - a common base

- all eXplorer applications use the same compiled code. The only difference is the configuration and data behind it.



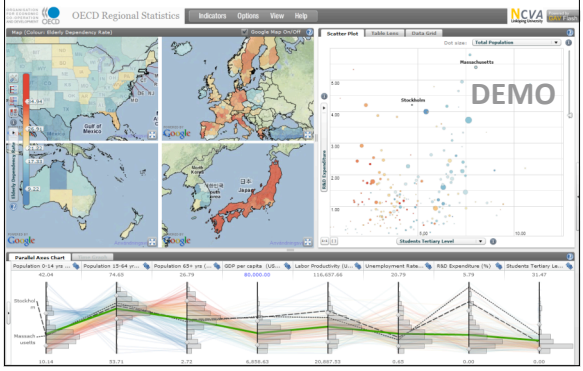
OECD Factbook Fertility Rate vs. Employment Women 1972-2006

Collaboration between NCVA and OECD



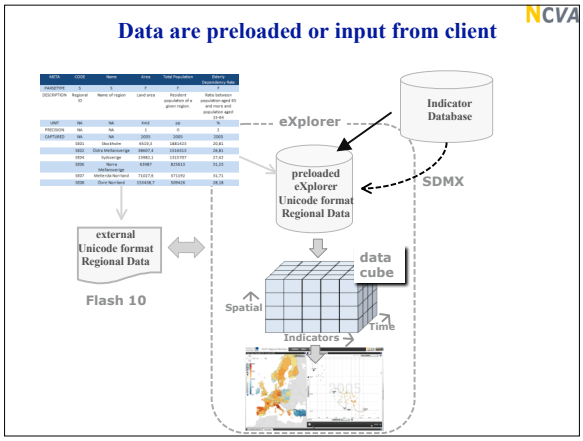
OECD eXplorer R&D Expenditure vs. High level Education

Collaboration between NCVA and OECD

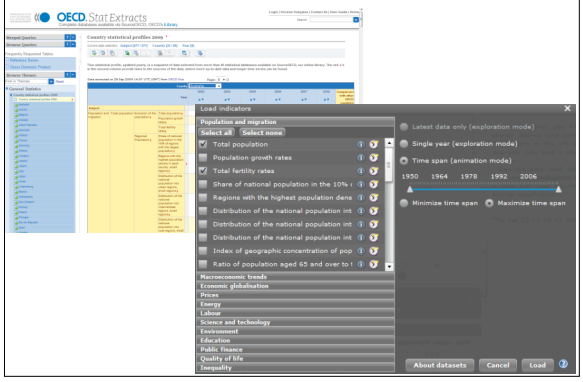


http://stats.oecd.org/OECDregionalstatistics

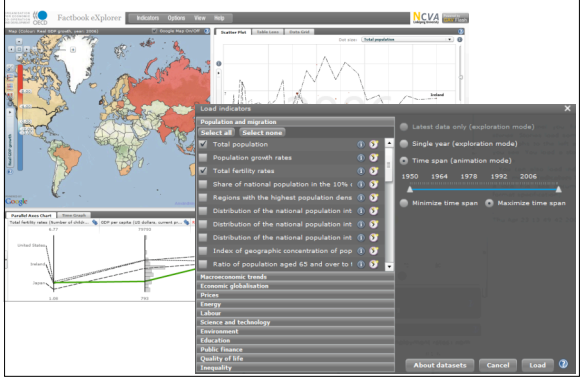
Data are preloaded or input from client



OECD Factbook 256 indicators 1950 - 2007

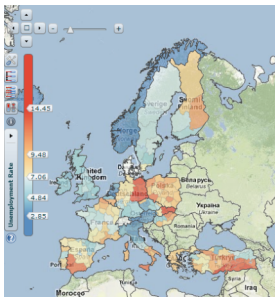


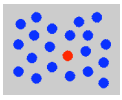
OECD Factbook 256 indicators 1950 - 2007



Choropleth Map Component

Dynamic Colour Legend, Perception and Pre-attentive Processing using Colour





Colour coding, the mechanisms of pre-attentive processing are triggered
Your brain "gets the picture" in milliseconds and regions "pop-up"

Choropleth Map supports Map Layers

Each Layer can be turned off/on

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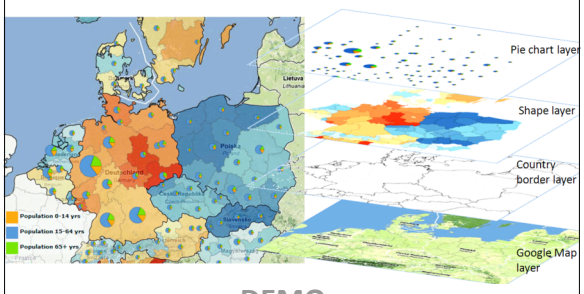
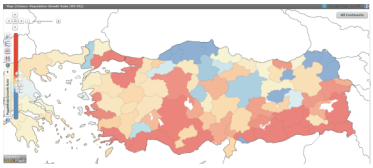
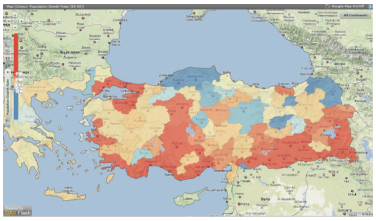
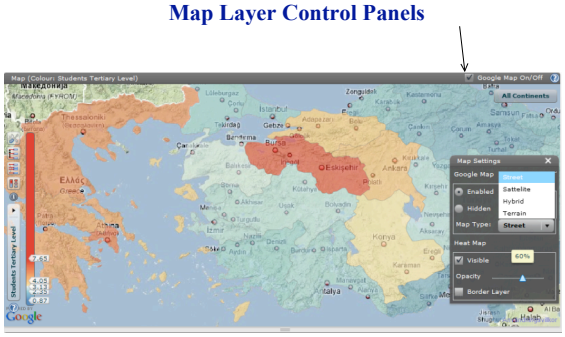


DEMO

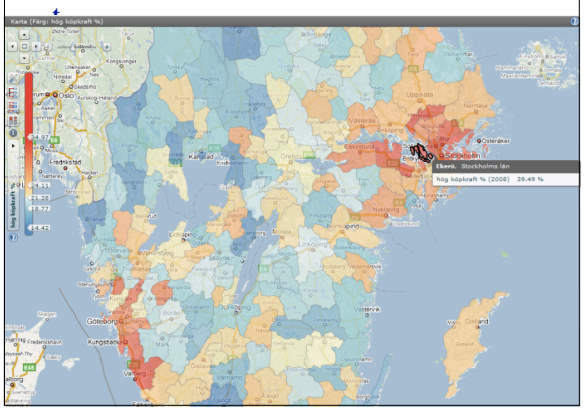




Map Layer Control Panels

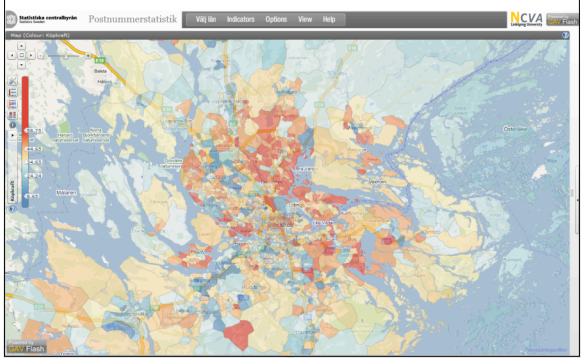


Data Map (Heat Map) layer 60% opacity
Google Map layer turned On
Google Map layers: Street, Satellite, Hybrid, terrain
Border layer turned Off



Purchase Power for Stockholm 2400 zip code regions

dynamic visualization of large geographical data



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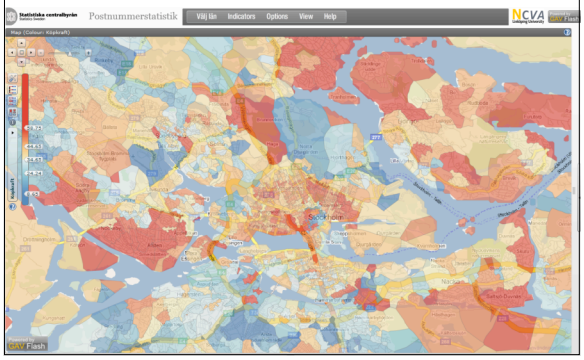

Purchase Power for Stockholm 2400 zip code regions

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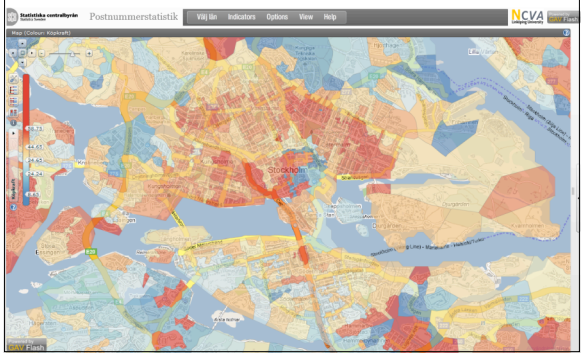

Choropleth Map with Pie Charts

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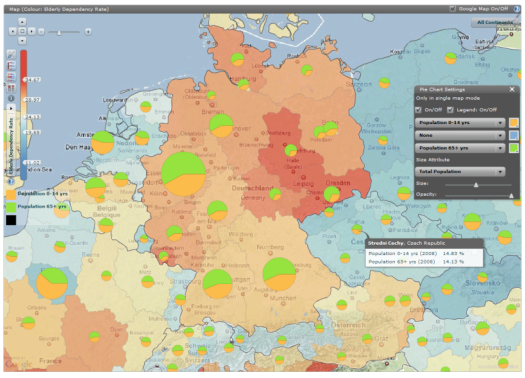
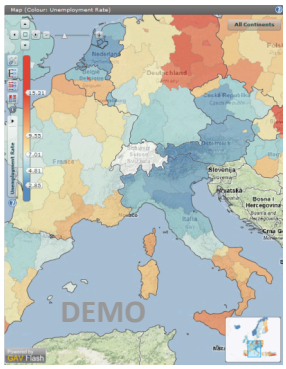
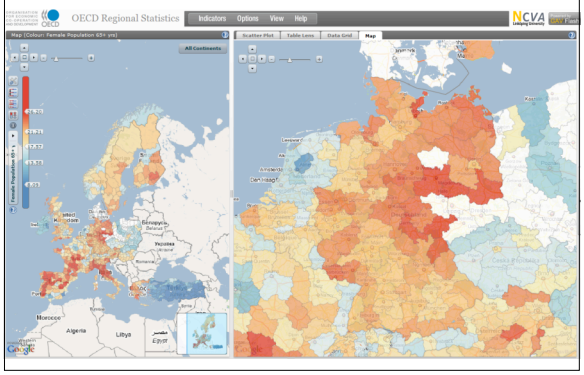


Choropleth Map with Focus & Context tool



Focus & Context in the Choropleth Map



Advanced tools for Colour Mapping

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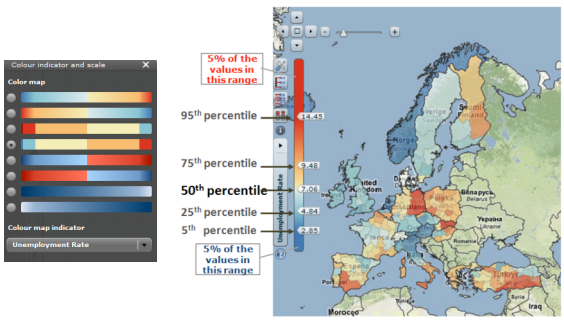
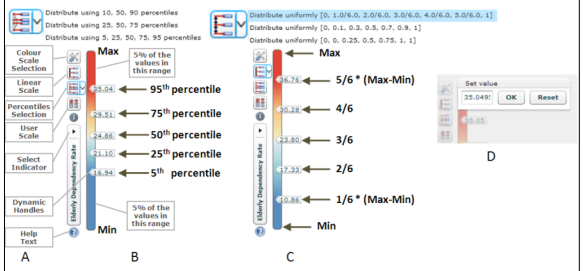
Diverging colour scales and dynamic colour scale sliders

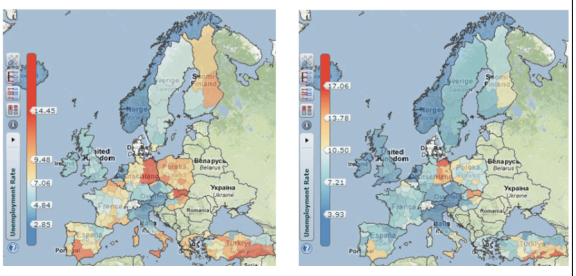
Class values based on statistical methods



Percentile or linear class values calculation



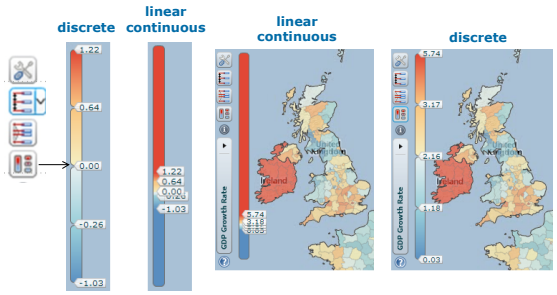
Advanced tools for Colour Mapping



Colour classes based on percentiles

Colour classes based on linear calculation

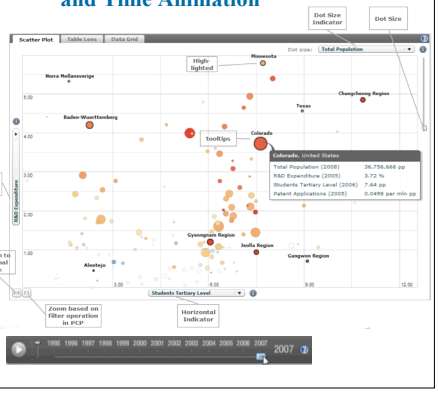
Linear vs. Discrete Colour Scale

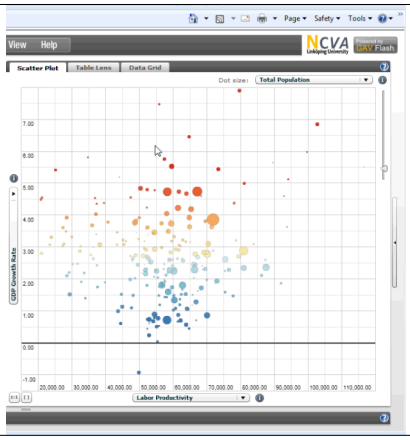


and divergent at 0.0 ..

Advanced Scatter Plot – allocate 4 indicators and Time Animation

1:X-axis
2:Y-axis
3:Colour
4:Dot Size
5:Time





Advanced Scatter Plot – Zoom

Advanced Scatter Plot – Time Animation

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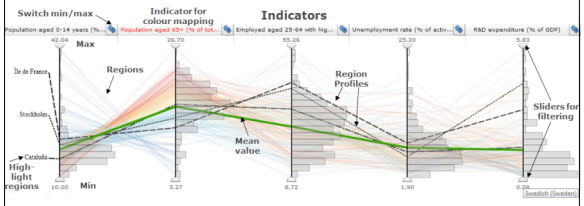
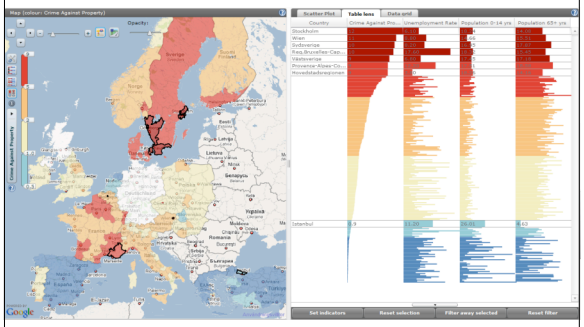
Parallel Axes (coordinates)



- Visual inquires – Threshold and Conditioned filter operations using range sliders, Axis Histogram and Percentiles;
- Pick interesting data items for profile and comparison;
- Re-organize (add, delete, move) attribute axes;

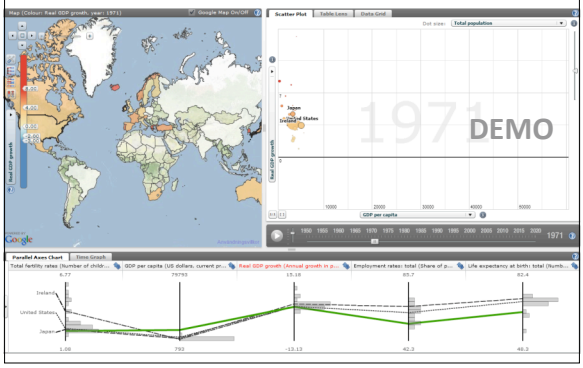
Table Lens



GDP growth vs. GDP per Capita

fertility, employment and life expectancy

Dynamically time-linked Map, Scatter Plot and Parallel Axes



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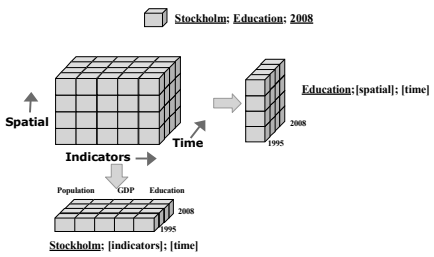
Visualize and Interpret **Spatial**-**Temporal** and **Multivariate** data using the **Data Cube** with more than 3.000.000 data cells



Large data sets require an architecture facilitating dynamic performance

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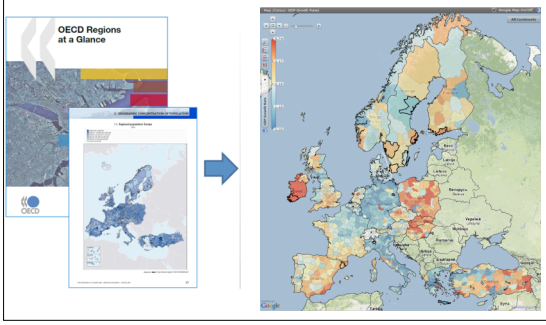
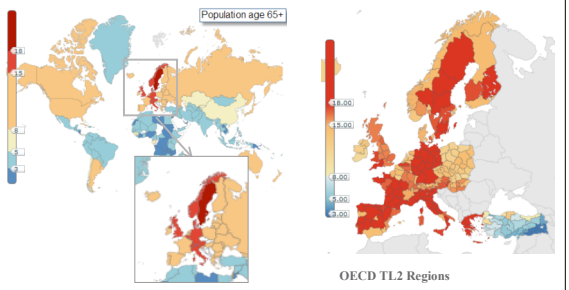
A growing interest in **regional** development

From **static** reports to **dynamic** visualization Web reports



Aggregated data for the World, NUTS2, NUTS3, ..

"where is the ageing population in the world"



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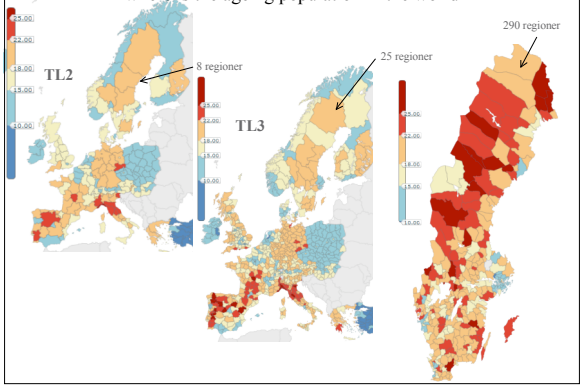
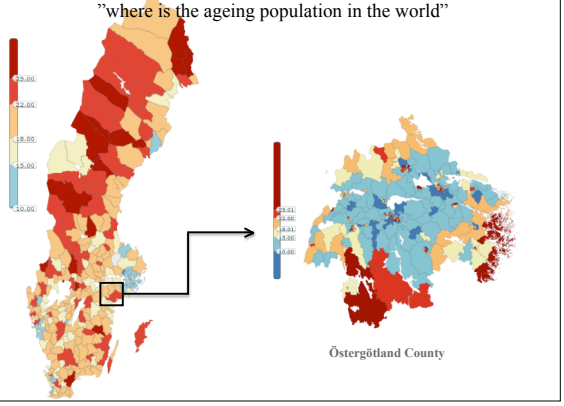


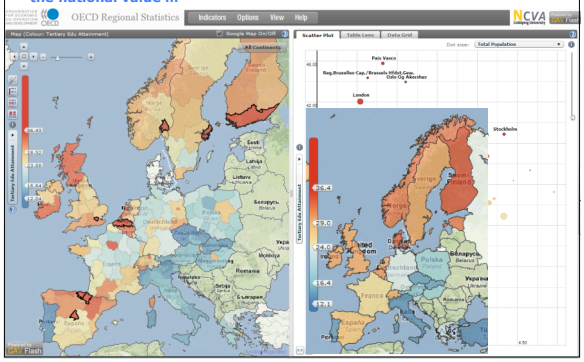
Aggregated data for municipalities and zip codes, ..

"where is the ageing population in the world"



... Through improvement of human capital in the knowledge based economy and increased access to education

- the regional difference in tertiary education varied from 150% to 70% of the national value ...



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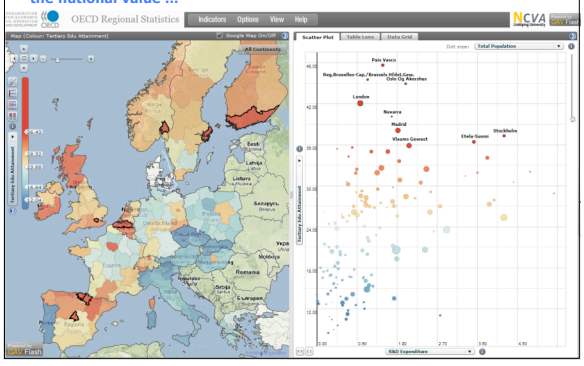
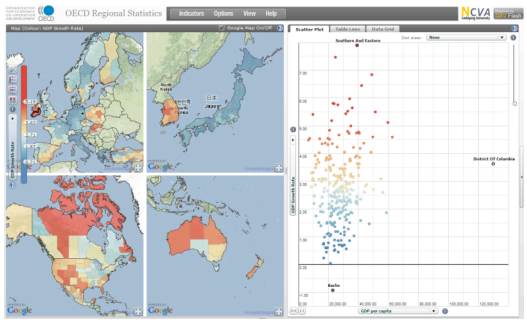


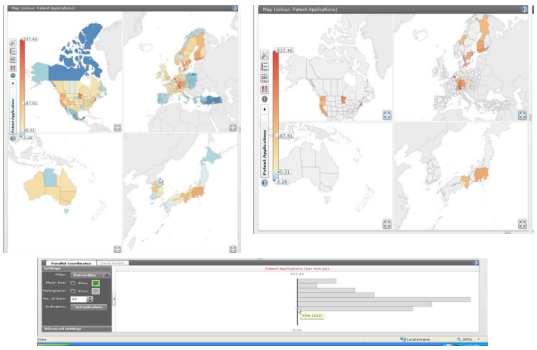
Local factors matter in attaining growth: more than 40% of GDP and employment growth in recent years are due to 10% of regions



Resources for competitiveness are many (population, age structure, education, activity rates, environmental assets etc.)…

Factors for innovation are geographically concentrated;

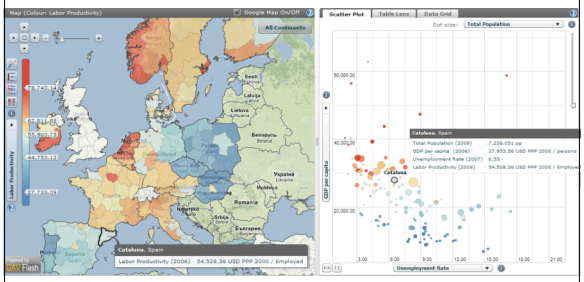
interaction between business and non business innovation activities as well as cooperation among regions are crucial for national innovation objectives:



How does your region do?

Cataluña Spain

Labor Productivity (map), GDP per capita vs. Unemployment Rate

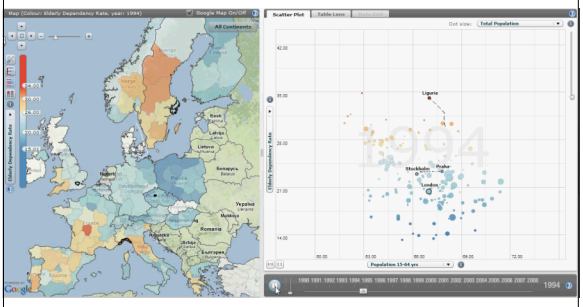


How does your region do over time?

Liguria (Italy), Stockholm, London and Prague 1990-2008

Elderly Dependency Rate vs. Population age 15-65

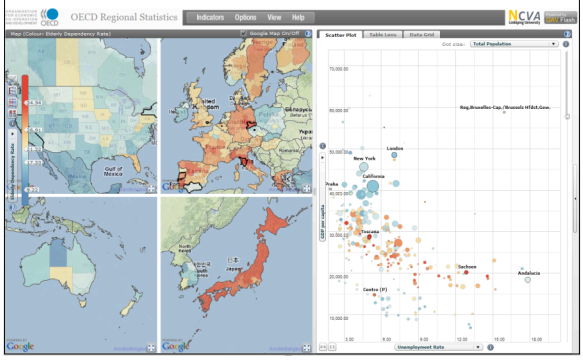
DEMO



Regional Development

850 regions (TL2) in OECD countries

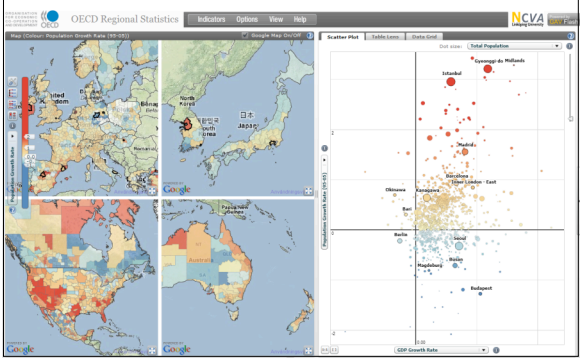
elderly dependency (colour), GDP per capita (Y), Unemployment rate (X)



Regional Development

2000 regions (TL3) in OECD countries

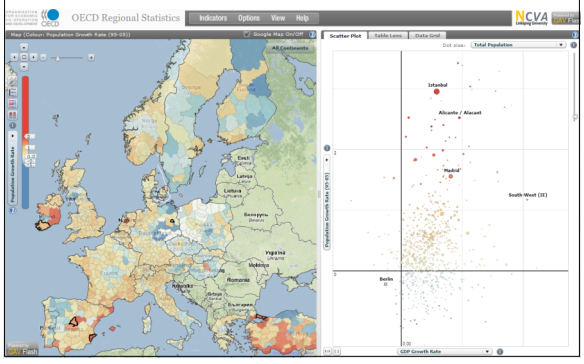
Population growth rate (colour) and (Y), GDP Growth rate (X)



Regional Development

2000 regions (TL3) in OECD countries

Population growth rate (colour) and (Y), GDP Growth rate (X)



Advanced analytics tool – Parallel Axes Chart

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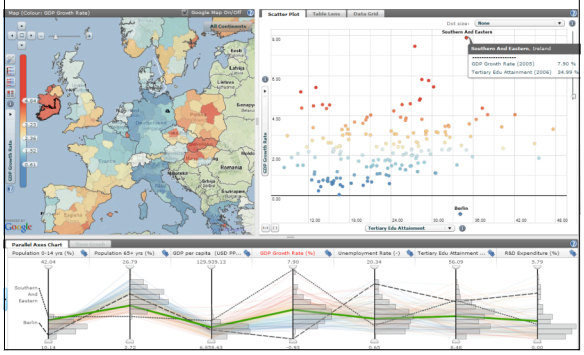
New advanced tool for statistics analysis – Filter Operation

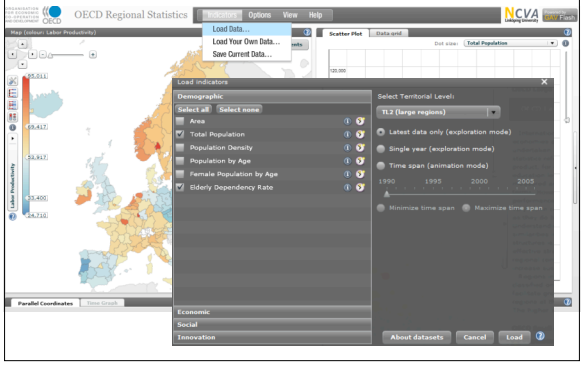
DEMO



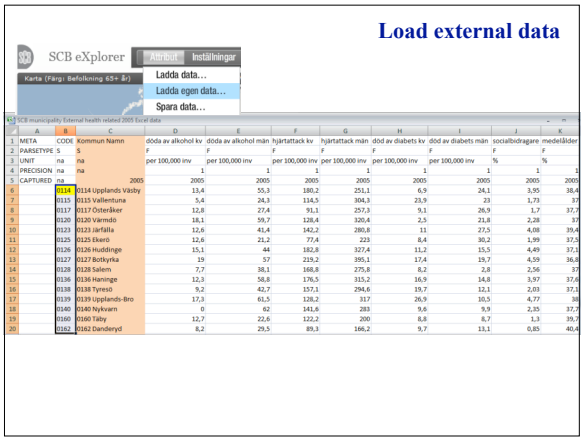
Data are pre-loaded

NCVA

DEMO



Load external data



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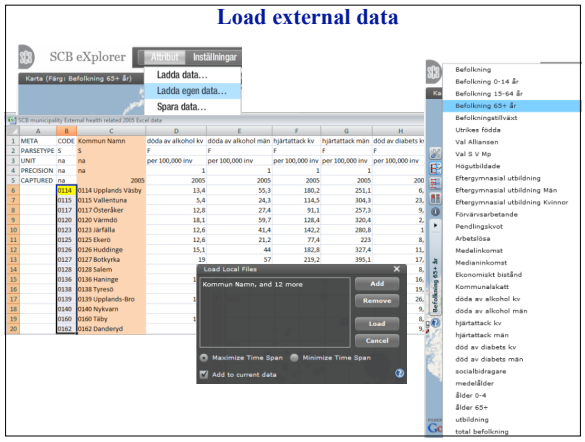

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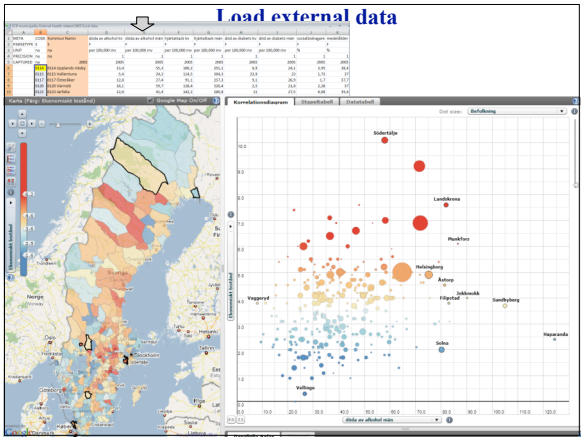
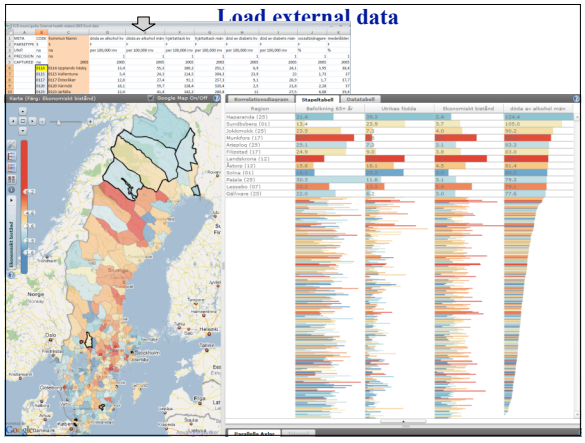


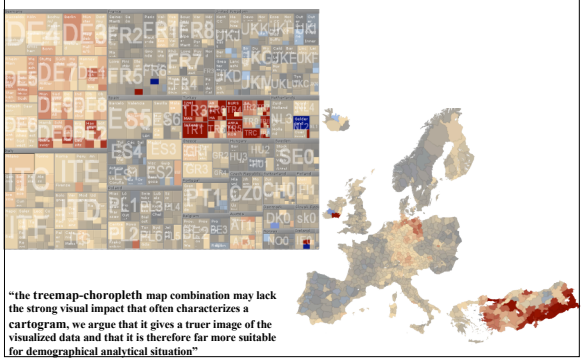
Load external data



Treemap and Choropleth Map – 65+

Size of a cell represents the average population 2002-2007

Colour represents population change for four age groups in percent 2002-2007

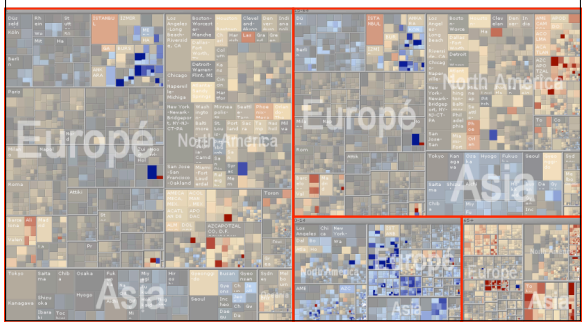


"the treemap-choropleth map combination may lack the strong visual impact that often characterizes a cartogram, we argue that it gives a truer image of the visualized data and that it is therefore far more suitable for demographical analytical situation"

Treemap for full OECD dataset - Hierarchy age groups (t, 0-14, 15-64, 65+) and regions for Continents, Countries, TL1, TL2, TL3

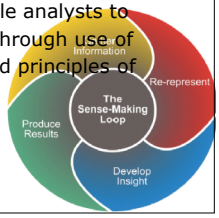
Size of a cell represents the average population 2002-2007

Colour represents population change for four age groups in percent 2002-2007



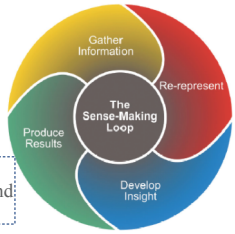
Challenge and Motivation – for Storytelling

- Interactive Visualization is nice to play with but…
- Difficult to collect and report the results knowledge gained in an Explorative Data Analysis (EDA) session ;
- Develop technologies that enable analysts to communicate what they know through use of appropriate visual metaphor and principles of reasoning and graphics representation;



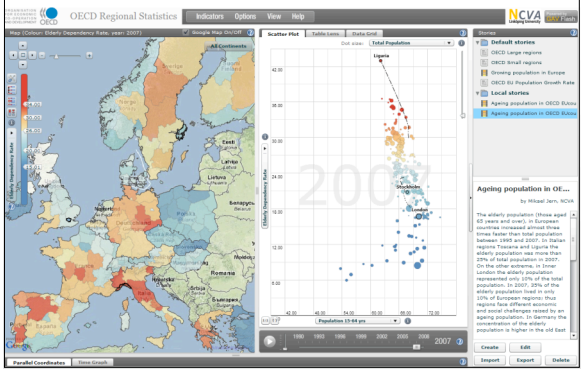
Visual Analytics Reasoning Process

- Gather information – Tasks?
- Visual representation
  Choose visual forms that aid analysis
- Develop insight
  Through exploration and dynamic visual inquiries
- Produce results (knowledge)
  Presentation, Communication and Story Telling

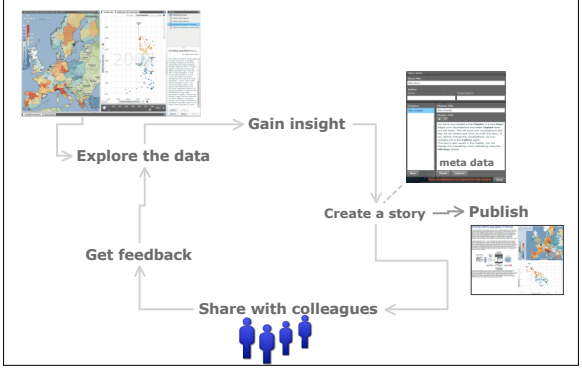


Capture, Share and Communicate discovery and knowledge

The Story and its Chapters are saved to XML

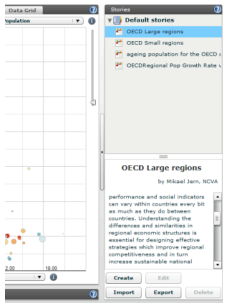


Collaboration & Sharing through Story Telling



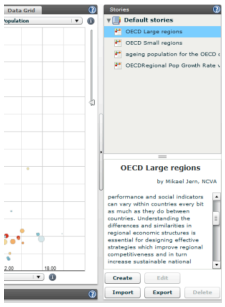
Generic eXplorer - Stories

- Architecture for Story -Telling
- Capture the current application state
- Dataset, map positions, scatter plot axes – everything is saved.
- Collaborate with others.
- Video: Story Telling



Generic eXplorer - Stories

- Stories are generated as XML files
- They can easily be shared with colleagues
- Video: Story Telling II

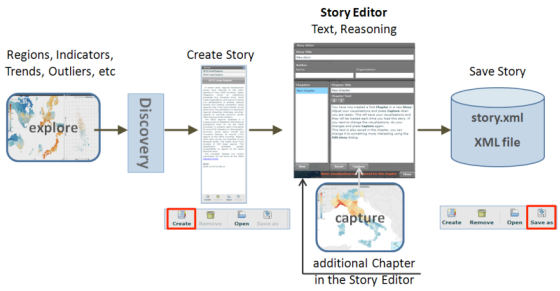


Collaboration & Sharing

- The goal: To gain insight from statistics and spread the knowledge.
- In line with the Web 2.0 development
  - Blogs, Wikis, social networks, OpenSource collaborations
- Solid data (OECD, Eurostat)
- Domain experts
- Analysing tools -> eXplorer
- Publishing tools -> booklets

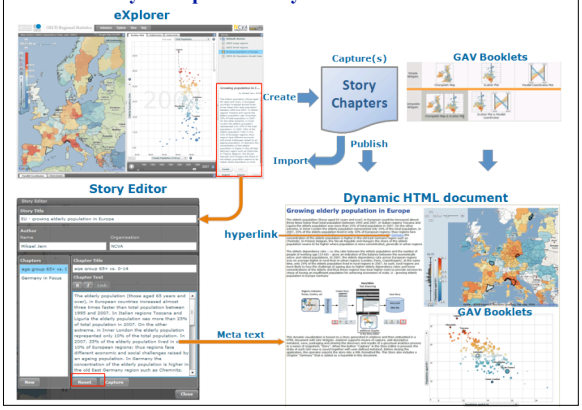
Capture, Share and Communicate discovery and knowledge

NCVA



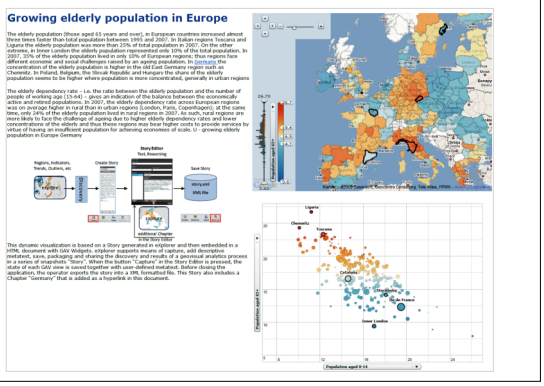
From Story in eXplorer to Dynamic HTML Document

NCVA



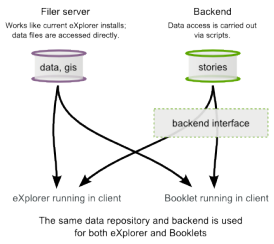
From Story in eXplorer to dynamic HTML document

NCVA

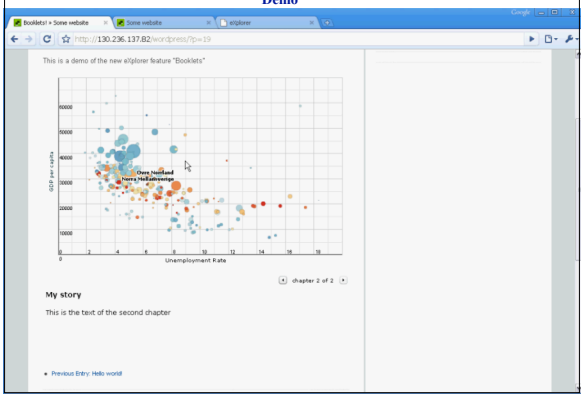


From Story in eXplorer to Wiki article
Backend

- A server side service for distributing stories through booklets.
- Stories created in eXplorer can be stored on the same server through the backend, and then used in other web-based publisher.

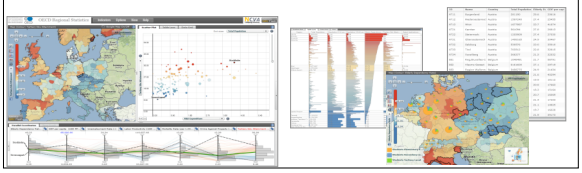


From Story in eXplorer to Wiki article
Demo

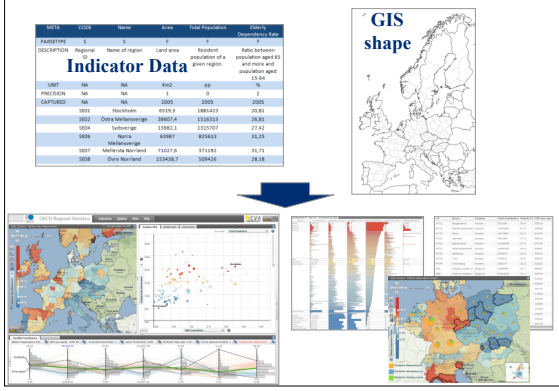


eXplorer for regional exploration and analysis

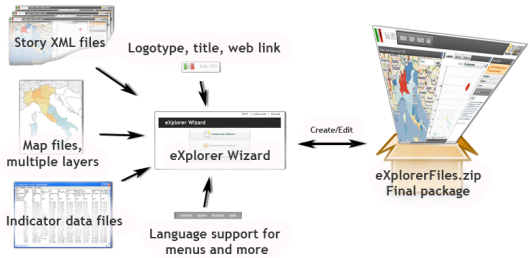
- **100% Web** compliant with Adobe Flash and Flex;
- Facilitate **explorative** and **communicative** visualization with **analytics reasoning** aspects;
- Regions are **simultaneously** explored in **dynamically linked** views;
- Interactive **Time Animation**;
- Integrated **Story Telling** and Web Publishing;



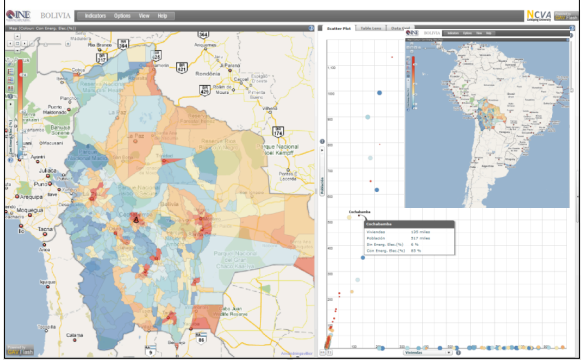
eXplorer for regional exploration and analysis

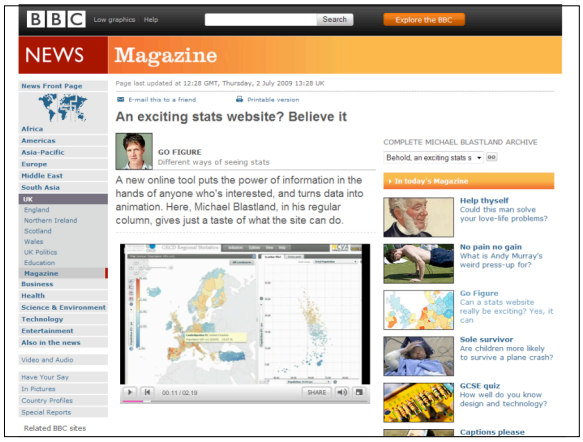


Open eXplorer and the Wizard
Customize your own eXplorer Application

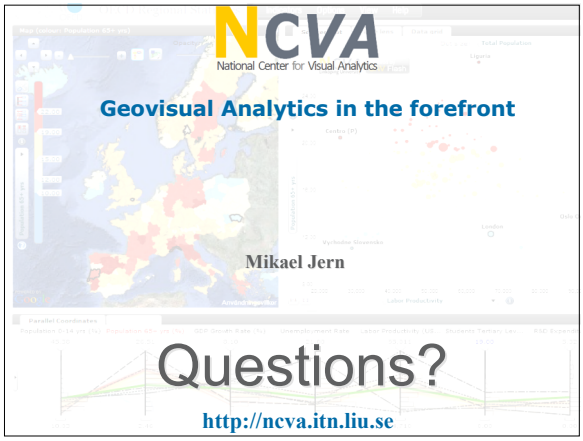


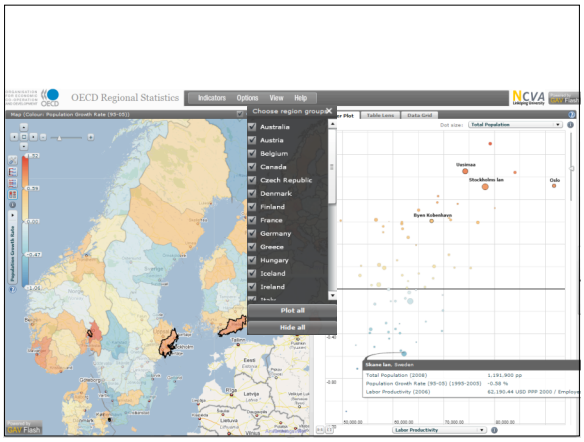
Open eXplorer used in Bolivia




BBC
NEWS
Magazine
An exciting stats website? Believe it
A new online tool puts the power of information in the hands of anyone who's interested, and turns data into animation. Here, Michael Blastland, in his regular column, gives just a taste of what the site can do.
GO FIGURE
Different ways of seeing stats
Help thyself
Could this man solve your love-life problems?
No pain no gain
What is Andy Murray's weird press-up for?
Go Figure
Can a stats website really be exciting? Yes, it can
Sole survivor
Are children more likely to survive a plane crash?
GCSE quiz
How well do you know design and technology?
Captions please


Linköping University
eXplorer
NCVA


NCVA
National Center for Visual Analytics
Geovisual Analytics in the forefront
Mikael Jern
Questions?
http://ncva.itn.liu.se


OECD Regional Statistics
Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Plot all
Hide all