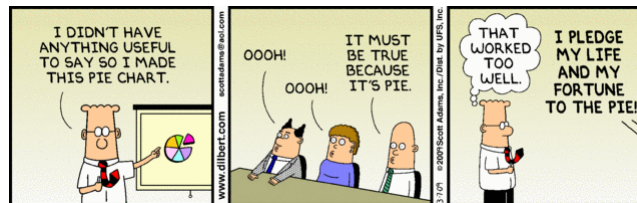


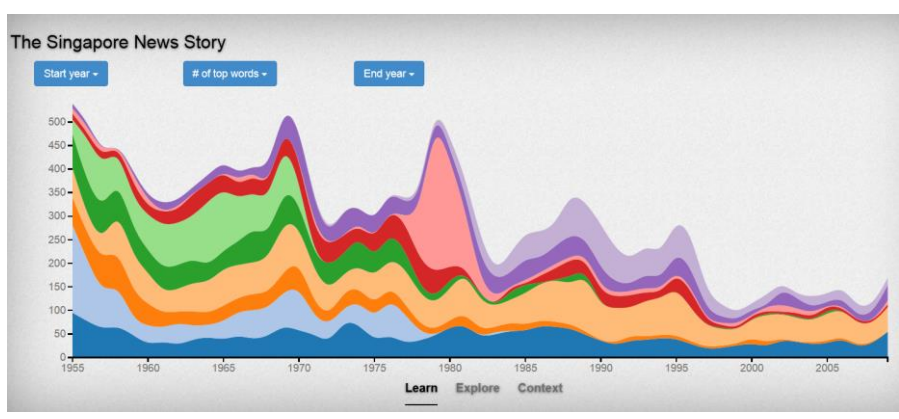
IS428 Visual Analytics for Business Intelligence Lesson 11: Thinking about Visual Analytics Design



Content

- Visual Analytics design issues
- The information visualisation reference model
- The user-centered design approaches

A Tale of Two Data Visualisation



Source: <http://singaporenews.github.io/>

A Tale of Two Data Visualisation



Source: <http://www.thiakx.com/educity/?loaded>

Why Visual Analytics (VA) Design?

- Good design process is the key to Visual Analytics applications success
- Good design process will make your VA systems cost-effective.
- Knowing what you want to get out of VA applications is fundamental to the design process

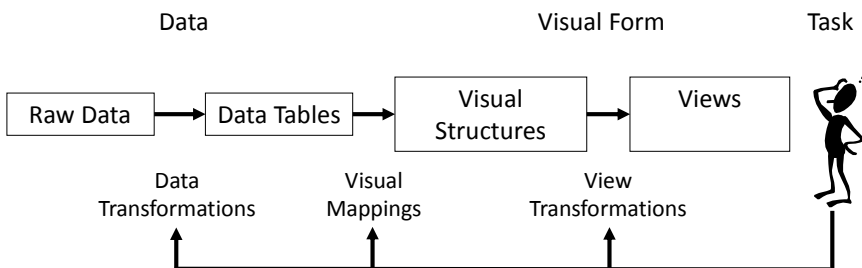


The Information Visualisation Reference Model

Data Management
 Select data source
 Clean data
 Categorise data
 Moderate data

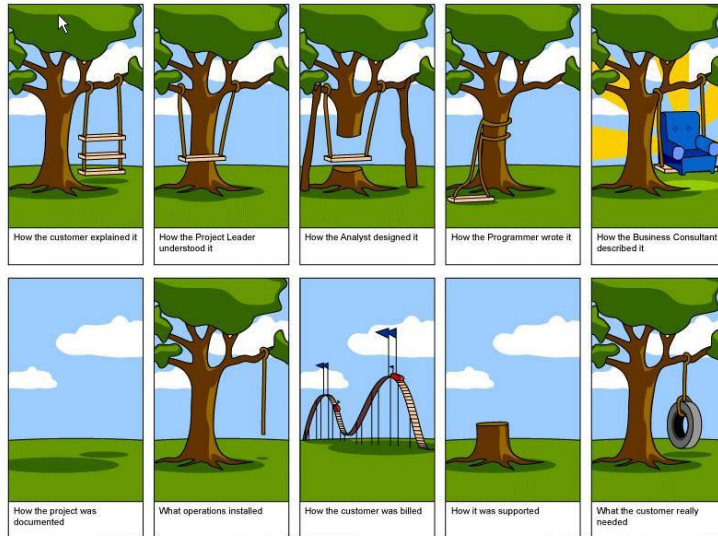
Visualisation
 Information design
 Visual encoding
 Interface design

Visual Analytics
 Observations
 Hypothesis
 Evidence (+/-)
 Summarise
 Communicate



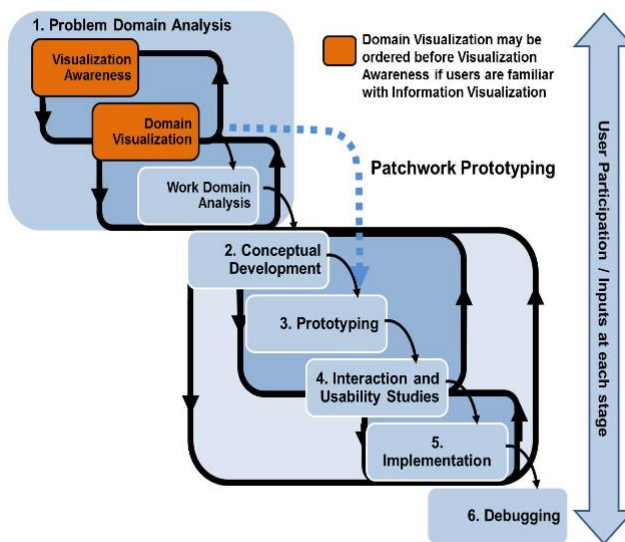
Source: Heer, J. Agrawala, M (2008) Design consideration for collaborative visual analytics. *Information Visualization* (7) :49-62

What the user needed.....



Source: <http://www.datadrivenconsulting.com/2009/12/what-the-customer-needed/>

User-centered Design Process – A Practice Approach



Source: Koh, L.C. et. al. (2011) "Developing and Applying a User-Centered Model for the Design and Implementation of Information Visualization Tools", InfoVis 2011, London.

Exploratory Analytics Audiences

- Provides every analytical display, interaction, and function that might be needed by those who use it for their analytical tasks.
- Grounds the entire analytical experience in a single, central workspace, with all displays, interactions, and functions within easy reach from there.
- Supports efficient, seamless transitions from one step to the next of the analytical process, even though the sequence and nature of those steps cannot be anticipated.
- Doesn't require a lot of fiddling with things to whip them into shape to support your analytical needs.

Customisable Analytics Audiences

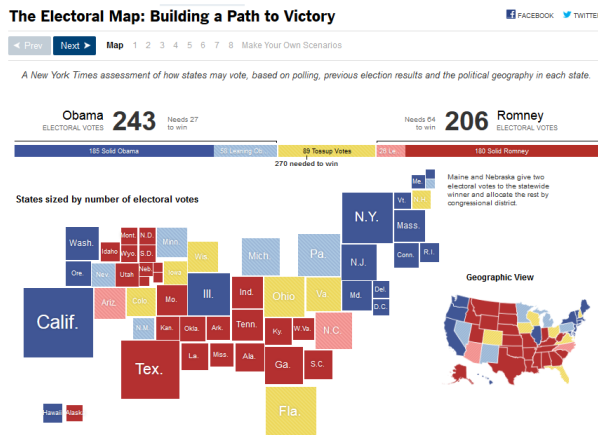
- Provides the means to develop an application that supports precisely what's needed in the most effective way possible. This requires a high degree of programmability, both in terms of power and flexibility.
- Provides ready-made libraries of useful functions that can be easily plugged into the application with much less effort than it would take to build them from scratch.
- Easy and efficient to use by those who develop the applications.
- Provides the means to remove everything from view in the finished application that isn't needed.

Establishing intent

- When the function is to explain
- When the function is to explore
- When the function is to exhibit data

When the function is to explain

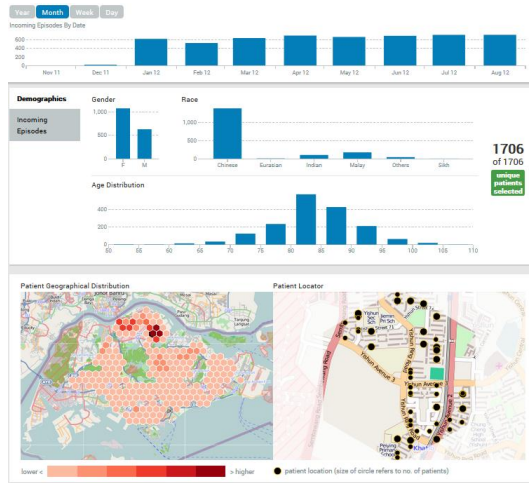
- Explanatory data visualisation is about conveying information to a reader in a way that is based around a specific and focused narrative.



Source: <http://elections.nytimes.com/2012/ratings/electoral-map>

When the function is to explore

- Exploratory data visualisation seeks to facilitate the familiarisation and reasoning of data through a range of user-driven experiences.



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When the function is to exhibit data

- Data art is more about creating an artifact, an aesthetic representation or perhaps a technical/technique demonstration.

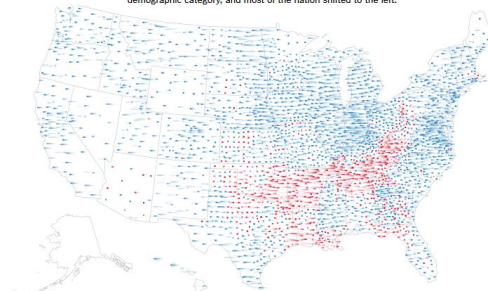
How Obama Won Re-election

Whites Were Outvoted | Women | Hispanics | Youth

Romney's Shift Wasn't Enough

2008 | 2012

In 2008, Barack Obama drew increased support from nearly every demographic category, and most of the nation shifted to the left.



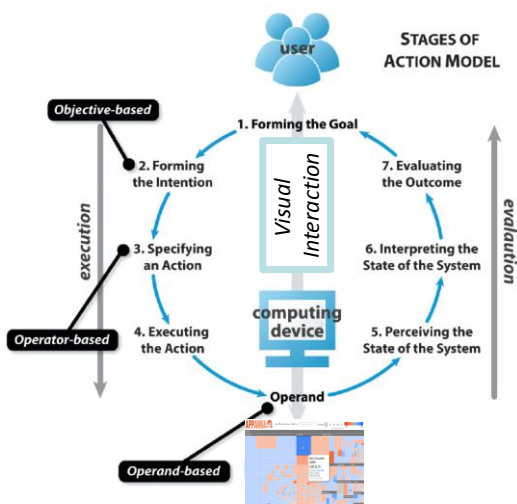
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Source: <http://www.nytimes.com/interactive/2012/11/07/us/politics/obamas-diverse-base-of-support.html>



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Interactive VA Design Model



Source: Roth, R.E. (2012) "Cartographic Interaction Primitive: Framework and Synthesis". *The Cartographic Journal*, Vol. 49, No. 4 pp. 376-395.

Visual Analytics Objective Primitives

objectives

visual insight

- | | | |
|--------------|---|--|
| 1. identify | → | e.g., ID, locate |
| 2. compare | → | e.g., difference, change |
| 3. rank | → | e.g., anomaly, outlier |
| 4. associate | → | e.g., correlation, trend, cause-effect |
| 5. delineate | → | e.g., cluster, hotspot, spike |

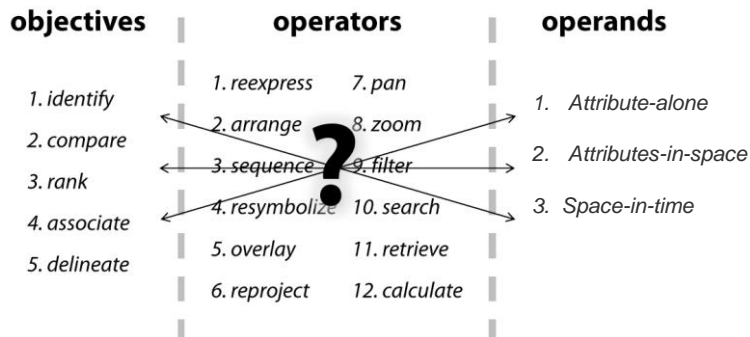
Interactive Analytics Operator Primitives

operators

- | | |
|-----------------------|----------------------|
| 1. reexpress | 7. pan |
| 2. arrange | 8. zoom |
| 3. sequence | 9. filter |
| 4. resymbolize | 10. search |
| 5. overlay | 11. retrieve |
| 6. reproject | 12. calculate |

Visual Analytics Design

- The syntactic of interaction primitives



What can we learn from this example

The Capitol's Age Pyramid: A Graying Congress

The 111th Congress, which convened in 2009, is among the oldest in U.S. history. The average age of members of Congress has risen steadily since 1981, with just a slight hiccup in the early 1990s; the rise is likely the result of a high incumbency rate, the aging of the U.S. population, and the first-time elections of older candidates. Roll over the charts below to learn more.

Average age of members of Congress, by party

Year	Dem Avg Age	Rep Avg Age
1981	57.7	56.5
1983	57.8	56.6
1985	57.9	56.7
1987	58.0	56.8
1989	58.1	56.9
1991	58.2	57.0
1993	58.3	57.1
1995	58.4	57.2
1997	58.5	57.3
1999	58.6	57.4
2001	58.7	57.5
2003	58.8	57.6
2005	58.9	57.7
2007	59.0	57.8
2009	59.1	57.9

House of Representatives

Party	Avg. Age
Democrats	59
Republicans	56.5

Senate

Party	Avg. Age
Democrats	63.4
Republicans	63

2009

The average age of members of the 111th Congress is among the oldest of any Congress in U.S. history, at 59.1 years for Democrats, 57.7 years for Republicans.

Note: Not including independent Sen. Joseph Lieberman of Connecticut, who was 87 at the start of the 111th Congress, and independent Sen. Bernie Sanders of Vermont, who was 65.

Note: Charts show percent of members at a particular age at the start of each session.

Source: Daniel Fehrenbach analysis of data from the Biographical Directory of the U.S. Congress, HSI Research.

Alex Lova, Kurt Hillenring, Alex Fikes/The Wall Street Journal

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What can we learn from this example

Is It Better to Buy or Rent?

Whether renting is better than buying depends on many factors, particularly how fast prices and rents rise and how long you stay in your home. Compare the costs of buying and renting a home in the calculator below. Click the **ADVANCED SETTINGS** button to change inputs such as your rate of return on investments, condo/common fees and your tax bracket.

Buying is better than renting after 5 years.

YOUR INFORMATION

Monthly rent	1,100
Home price	172,000
Down payment (%)	34,400 (20.0)
Mortgage rate (%)	5.781
Annual property taxes (%)	1.35

Annual home price change: **+2%**

Annual rent increase or decrease: **+3%**

Legend: ■ Buying is better, ■ Renting is better

Y-axis: \$20,000 to -\$20,000

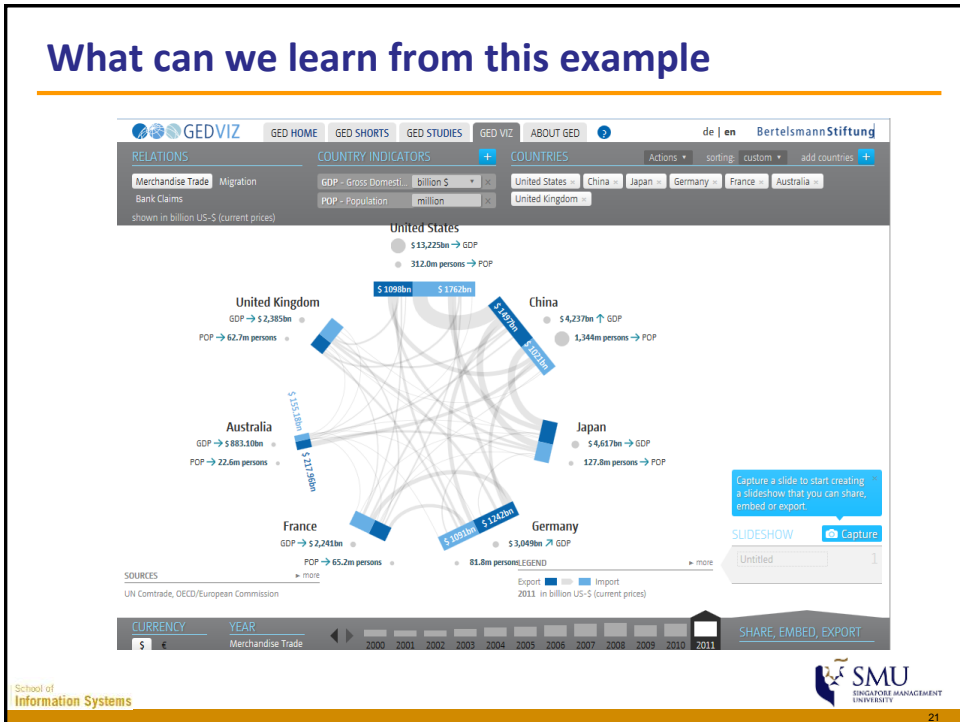
X-axis: YEARS FROM NOW (1 to 30)

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What can we learn from this example

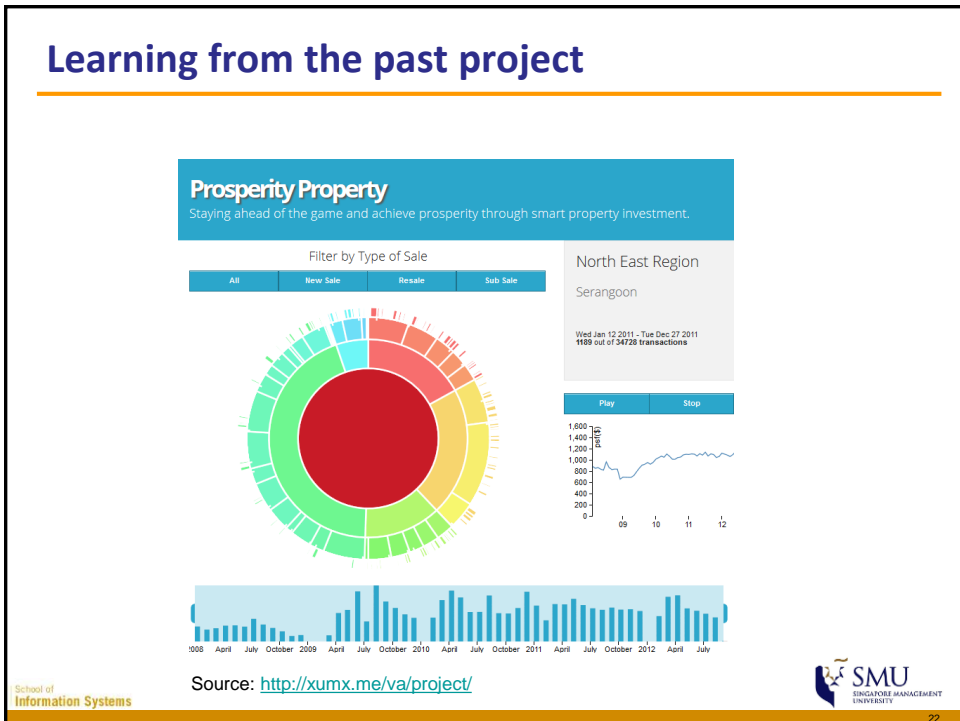


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Learning from the past project



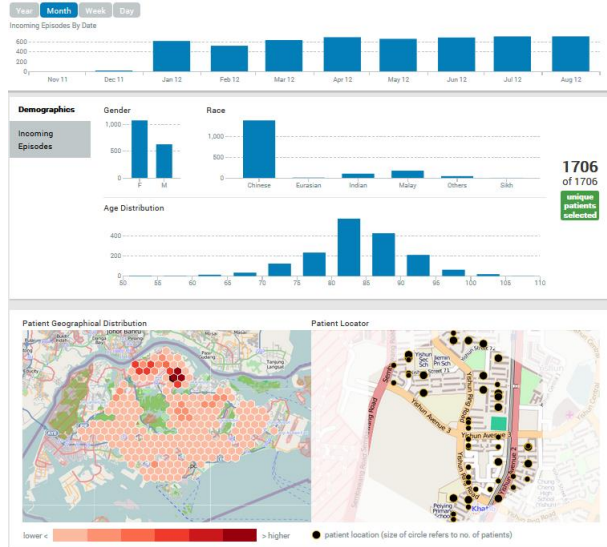
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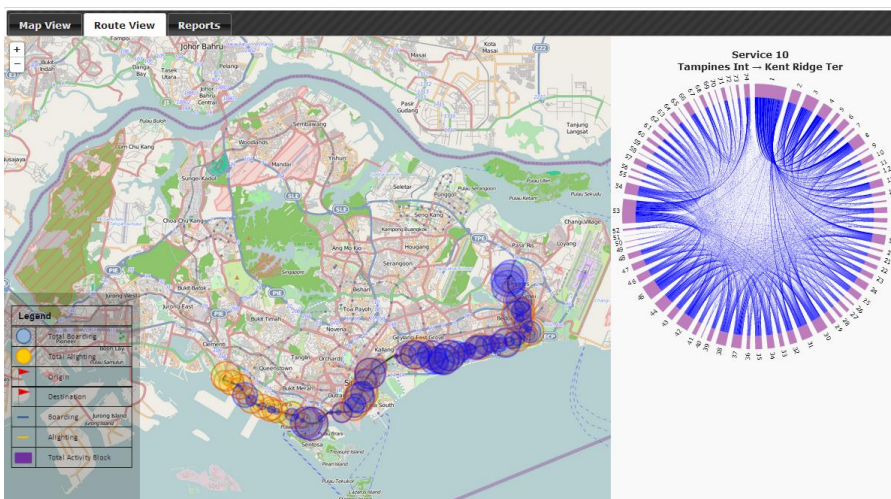
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Learning from the past project

- Visually-driven Patient Record Dashboard



Learning from the past project



Source: <http://10.0.106.64:8080/TPAS/>