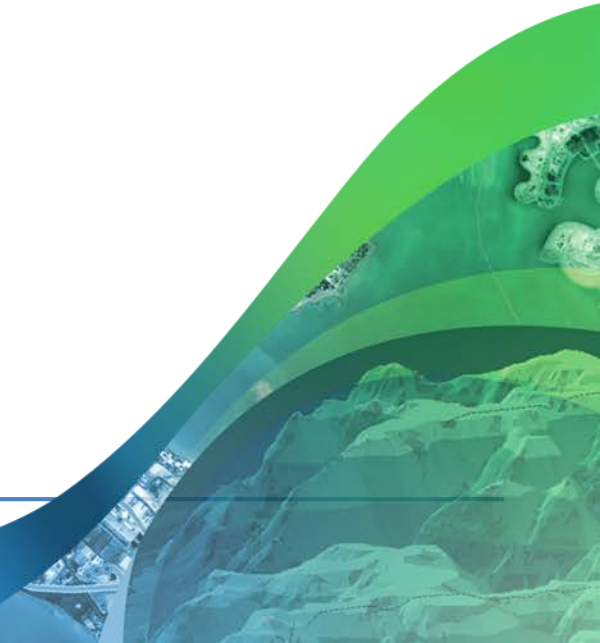
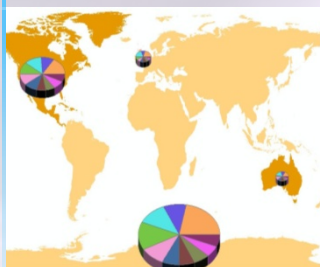
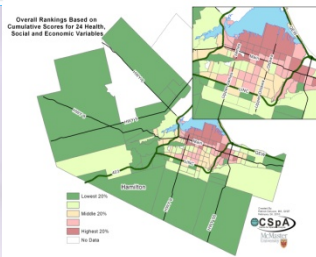
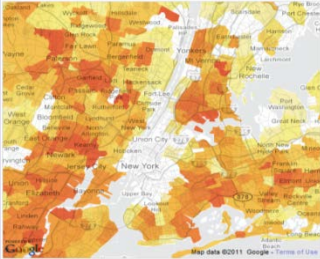

EARTH SC/ENVIR SC/GEOG 2GI3

What is GIS?

Dr. Darren M. Scott

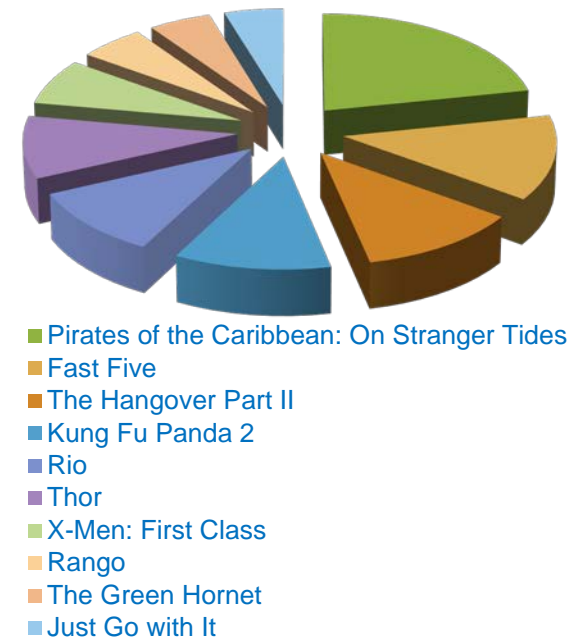


What is Geographic Information?



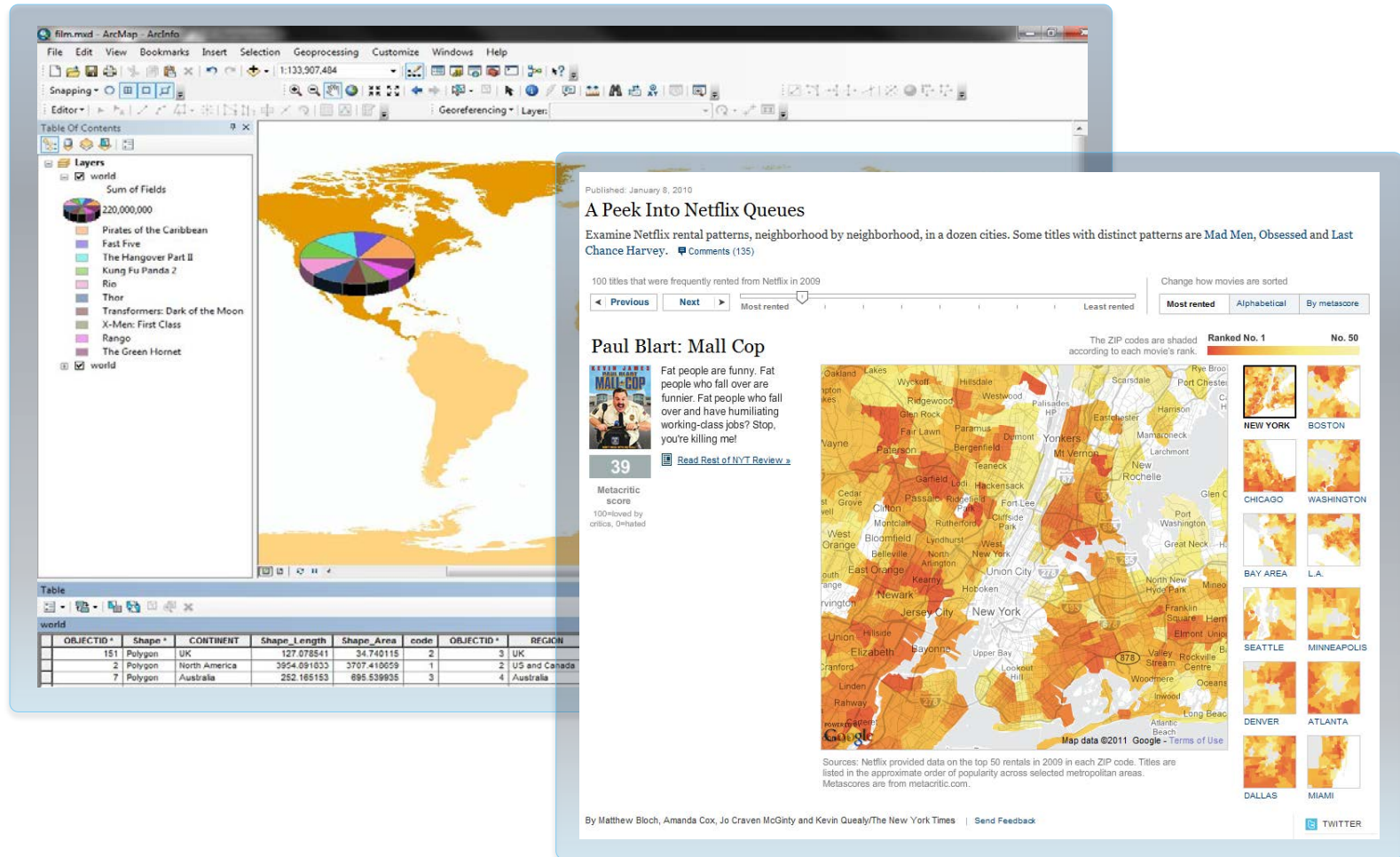
What is Geographic Information? (1)

Summer 2011 Films	Gross
Pirates of the Caribbean: On Stranger Tides	\$987,111,968
Fast Five	\$596,925,140
The Hangover Part II	\$528,577,688
Kung Fu Panda 2	\$505,908,427
Rio	\$469,495,385
Thor	\$437,003,116
X-Men: First Class	\$321,812,269
Rango	\$242,421,099
The Green Hornet	\$227,817,248
Just Go with It	\$214,945,591



Bowman and Trevillion, 2011

What is Geographic Information? (2)



<http://www.nytimes.com/interactive/2010/01/10/nyregion/20100110-netflix-map.html>

What is Geographic Information? (3)

■ Spatial:

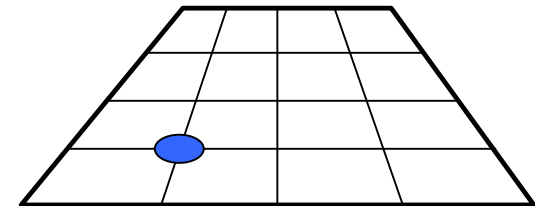
- ❑ Can be georeferenced (i.e., assigned coordinates pertaining to a location on the Earth's surface)

■ Scale/resolution:

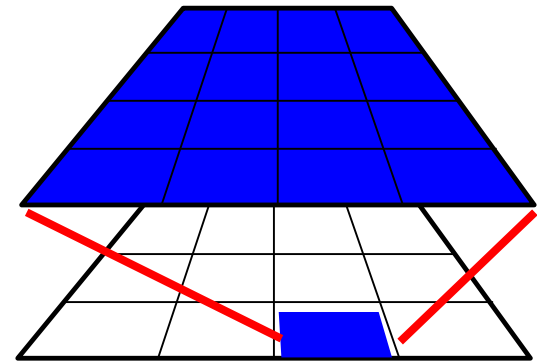
- ❑ Can be very coarse (e.g., continents) or very detailed (e.g., postal codes)

■ Dynamic:

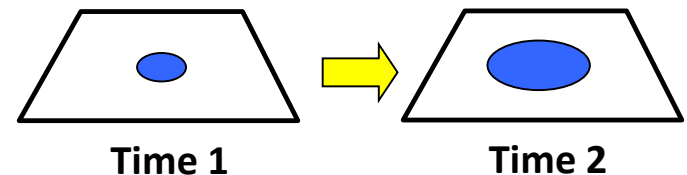
- ❑ Spatial dynamics (i.e., variations across space)
- ❑ Temporal dynamics (i.e., variations through time)



Coordinate system



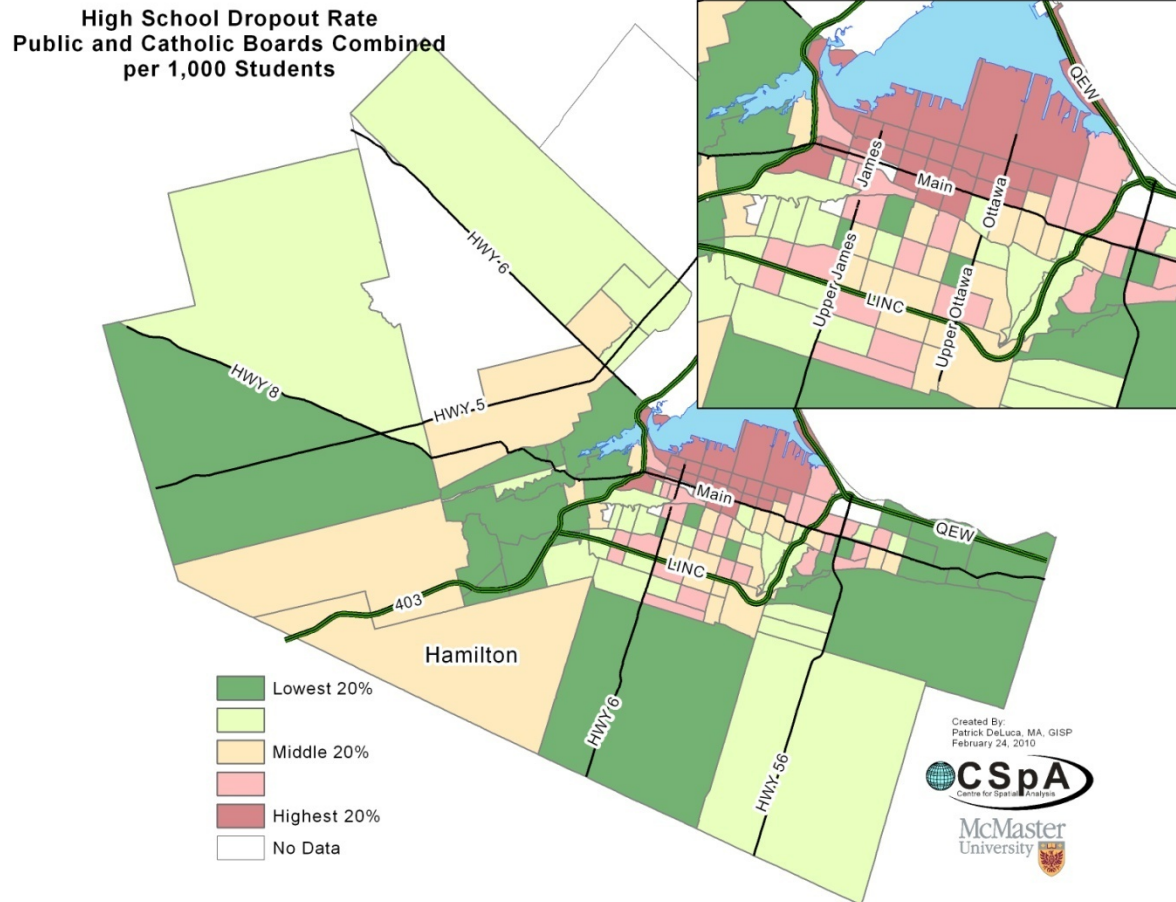
Scale / Resolution



What is Geographic Information? (4)

	A	B	C	D	E	F	G
1	CMA-CT	Dwelling valueRank	% female lone-parentRank	Income-med-15+Rank	Income-med-famRank	DropoutRTRank	%LICO-U18Rank
2	5370001.01	100	54	76	84	77	38
3	5370001.02	72	57	77	80	72	57
4	5370001.04	98	56	88	108	91	43
5	5370001.05	87	34	55	42	46	64
6	5370001.06	85	80	89	104	66	81
7	5370001.07	38	43	53	56	54	50
8	5370001.08	84	49	78	91	37	55
9	5370001.09	83	60	109	89	31	55
10	5370002.01	82	83	73	87	98	86
11	5370002.02	93	103	93	101	85	111
12	5370002.03	66	37	71	72	51	53
13	5370002.04	91	59	85	106	89	67
14	5370003.01	81	88	102	79	53	61
15	5370003.02	63	42	68	96	82	93
16	5370003.03	58	29	41	35	31	23
17	5370003.04	56	23	44	30	45	19
18	5370004.01	43	47	43	25	57	24
19	5370004.02	59	16	48	40	59	25
20	5370005.01	62	63	50	70	69	39
21	5370005.02	53	33	38	52	39	34
22	5370005.03	76	78	51	78	50	46
23	5370006	48	61	79	59	70	84
24	5370007	46	58	57	46	107	80
25	5370008	55	87	30	53	64	88
26	5370009	39	28	21	43	52	42

What is Geographic Information? (5)



What is Geographic Information? (6)

- Almost all digital data are georeferenced (i.e., have spatial coordinates so that they can be placed on a map)
- Tools to deal with such data are therefore very useful
- Such tools reveal information that was previously “hidden”



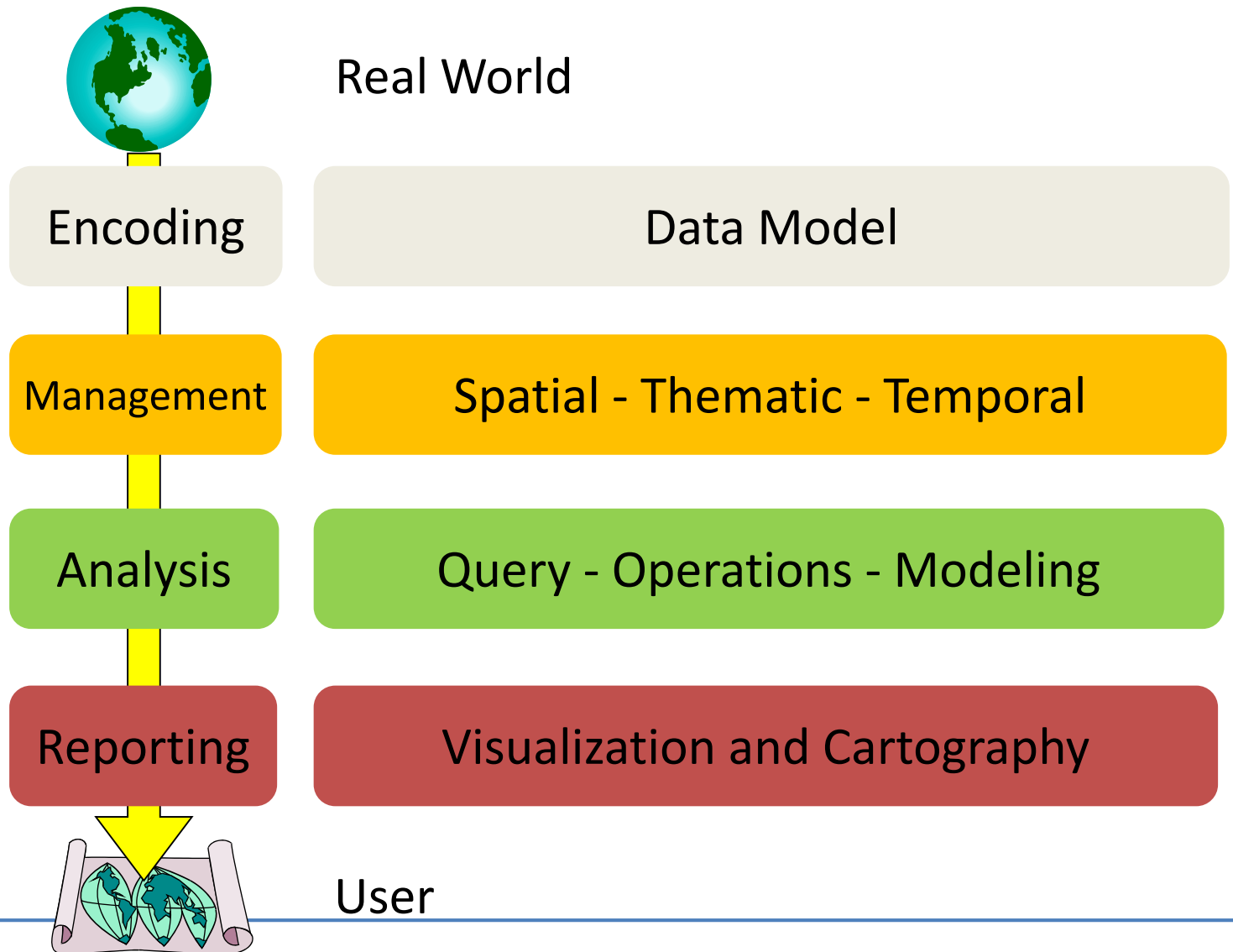
What is a GIS?



What is a GIS? (1)

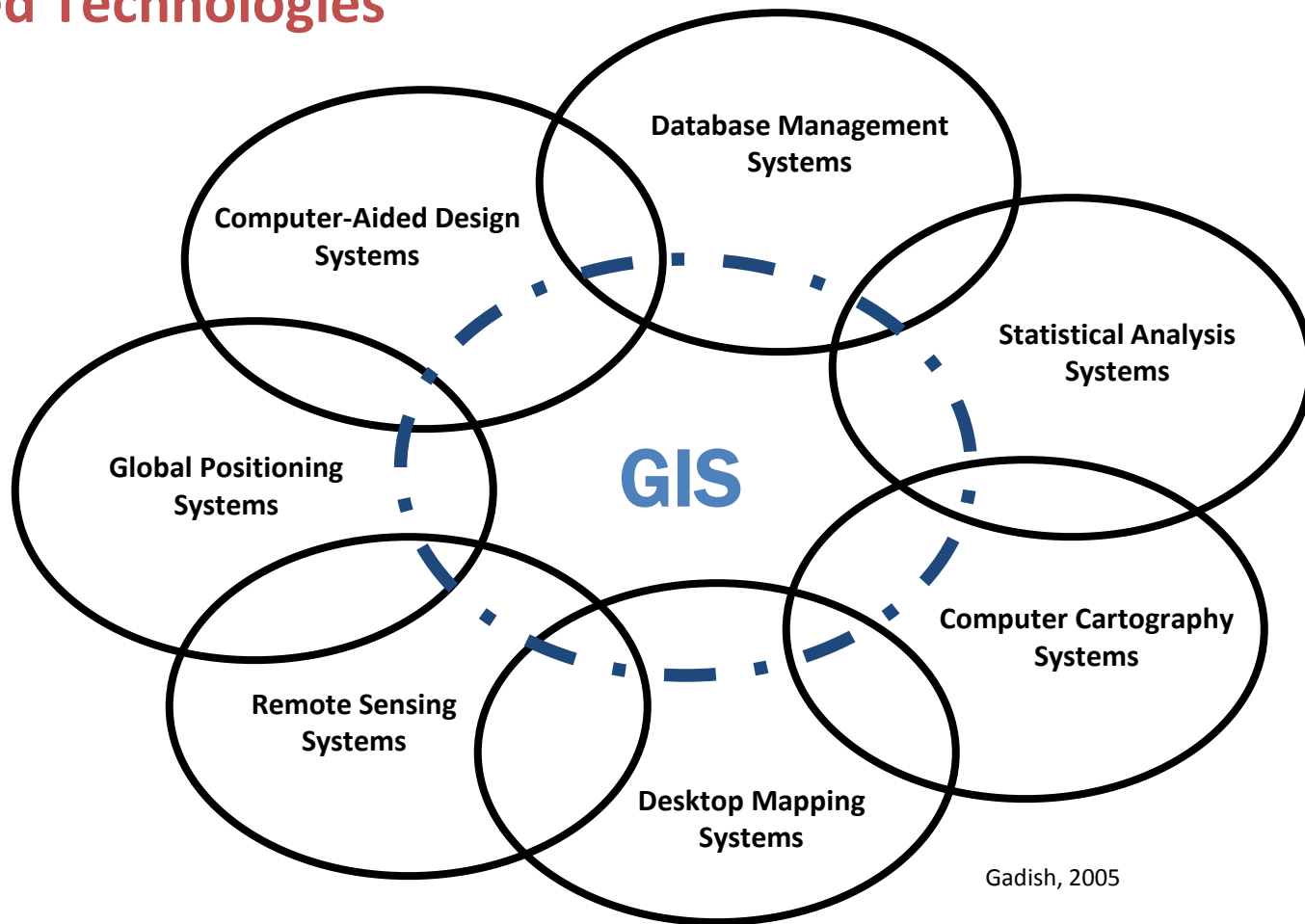
- A GIS is a collection of computer hardware, software, geographic data, and personnel designed to effectively capture, store, manipulate, analyze, and display all forms of geographically referenced information

What is a GIS? (2)



What is a GIS? (3)

Related Technologies



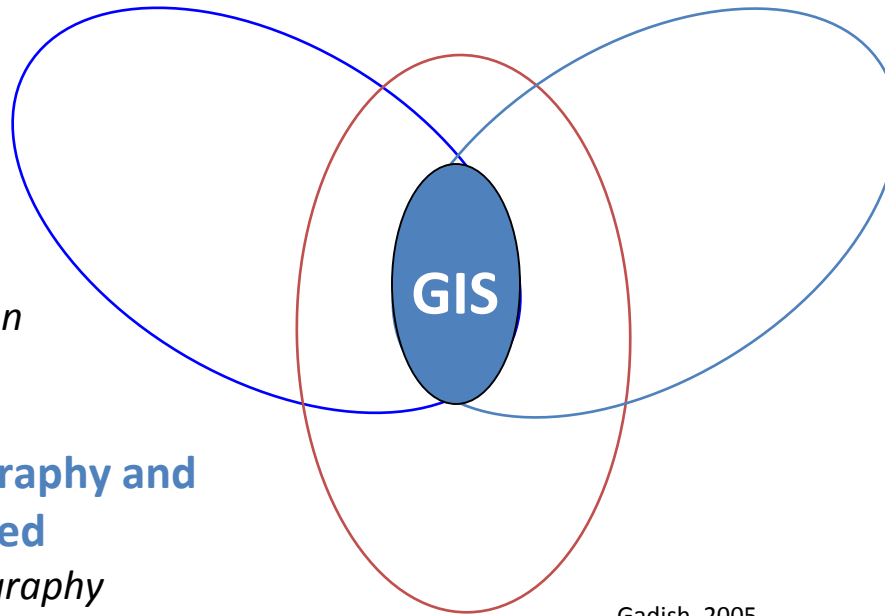
What is a GIS? (4)

Computer Science

*graphics
visualization
database
system administration
security*

Geography and Related

*cartography
geodesy
photogrammetry
GPS
spatial statistics*



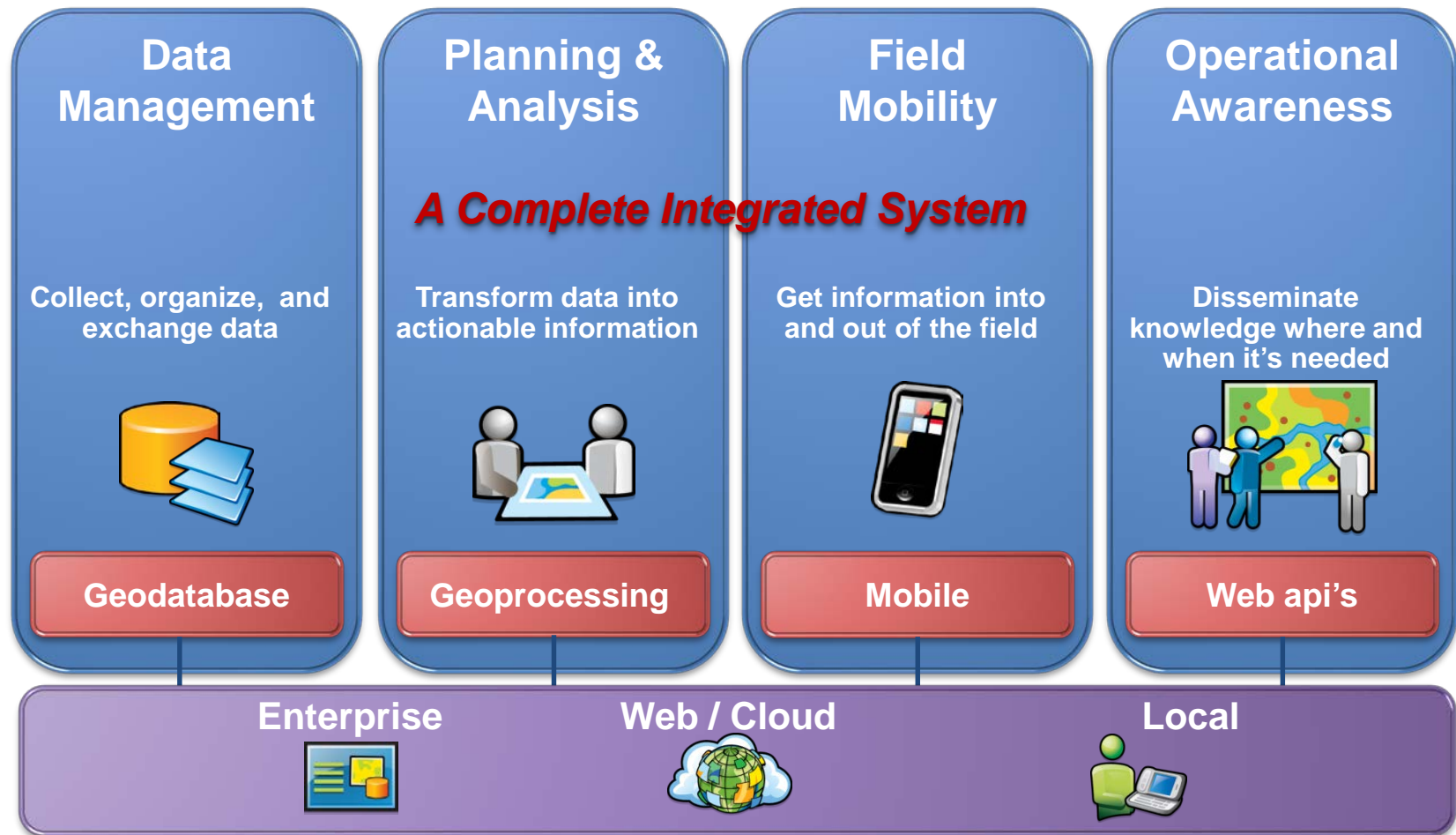
Gadish, 2005

Application Area

*public admin.
planning
geology
mineral exploration
forestry
site selection
marketing
civil engineering
criminal justice
surveying*

The convergence of technological fields and traditional disciplines

What is a GIS? (5)



Byers and Prosser, 2011

What is a GIS? (6)

- Some advantages of a GIS are:
 - ❑ Integrates information from multiple sources
 - ❑ Provides a powerful repertoire of analytical tools to explore data
 - ❑ Ability to separate information into layers, and then combine layers to produce new information
 - ❑ Good employment opportunities

What is a GIS? (7)

- Some disadvantages of a GIS are:
 - ❑ Long process of encoding and verifying the integrity of information
 - ❑ Compatibility between different GIS software packages
 - ❑ Technology changes rapidly

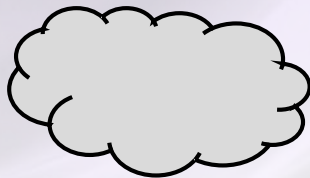
What is a GIS? (8)



Geographic information systems are specialist software packages allowing us to display data as maps

The “science” bit comes when we use advanced analysis techniques to turn information on a map into meaningful intelligence that people can use to make decisions

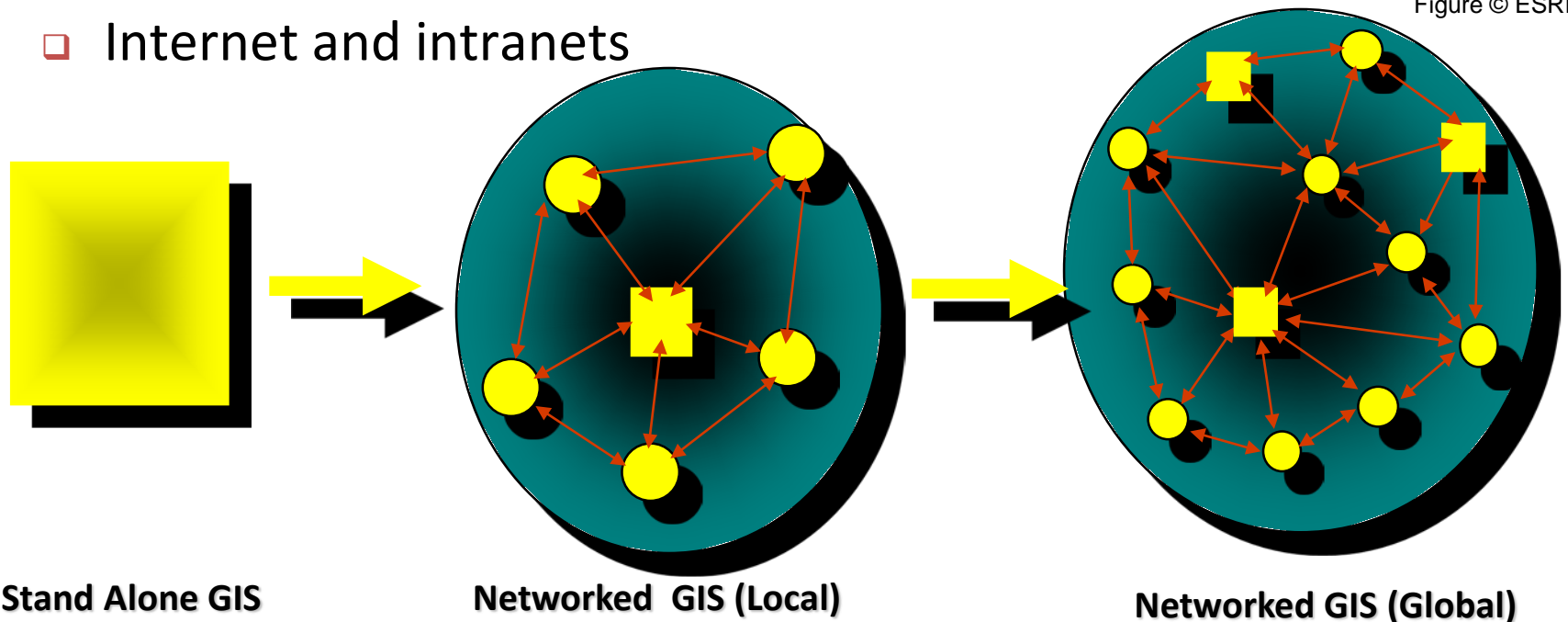
Parts of a GIS



Parts of a GIS (1)

■ Networks

- ❑ Without a network, rapid communication or sharing of digital information could not occur
- ❑ Internet and intranets



Parts of a GIS (2)

■ Hardware

- ❑ Basics: keyboard, mouse, monitor, CPU, cables, Internet/intranet connection
- ❑ Output devices: printers and plotters
- ❑ Input devices: scanners and digitizing tablets, mobile mappers, GPS units

■ Software (often the term “GIS” refers to this)

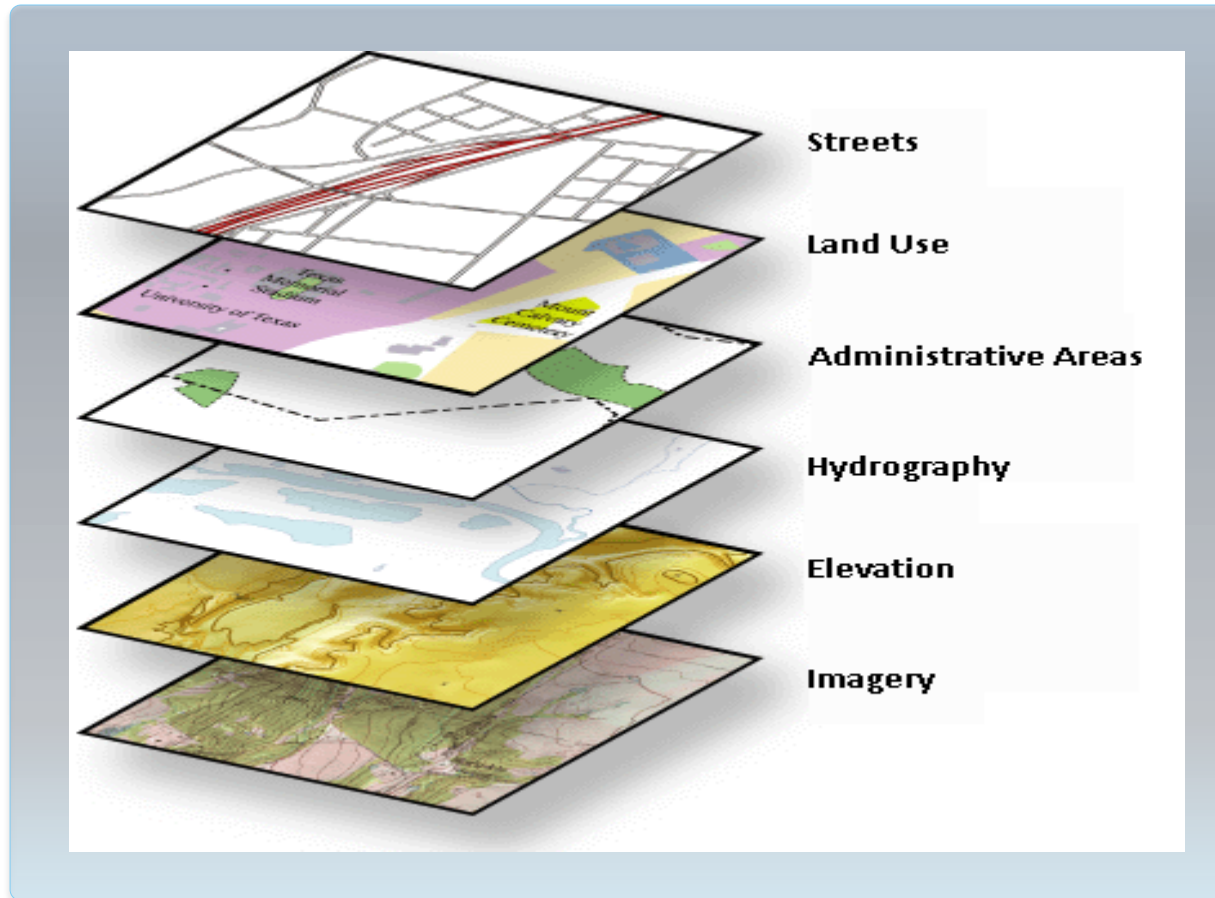
- ❑ ArcGIS, MapInfo, Idrisi, TransCAD, etc.

Parts of a GIS (3)

■ Database

- ❑ Geographic information is arranged in “thematic” layers
- ❑ May be built to serve a specific project (e.g., optimal route for a highway) or may be constantly maintained (e.g., utility company)
- ❑ May be very small (a few megabytes) or very large (a terabyte)
- ❑ Often is the most expensive component of a GIS

Parts of a GIS (4)



Bowman and Trevillion, 2011

Parts of a GIS (5)

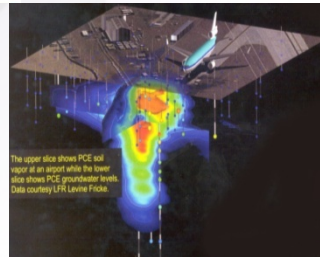
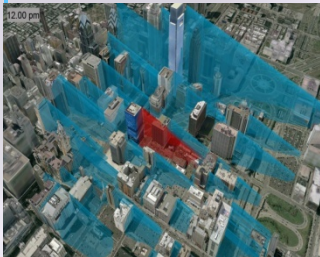
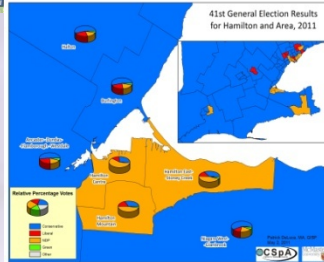
- Management

- Organization must establish procedures for ensuring that its GIS activities stay within budgets, maintain high quality and meet the needs of the organization

- People

- A GIS is useless without people to design, program and maintain it; supply it with data; and interpret its results

GIS Applications



GIS Applications (1)

- Applications generally set out to fulfill the five “M’s” of GIS:
 - ❑ Mapping
 - ❑ Measurement
 - ❑ Monitoring
 - ❑ Modeling
 - ❑ Management

GIS Applications (2)

- Business uses of GIS



GIS Applications (3)

- Government uses of GIS (national)



GIS Applications (4)

- Government uses of GIS (provincial)



GIS Applications (5)

- Government uses of GIS (municipal)



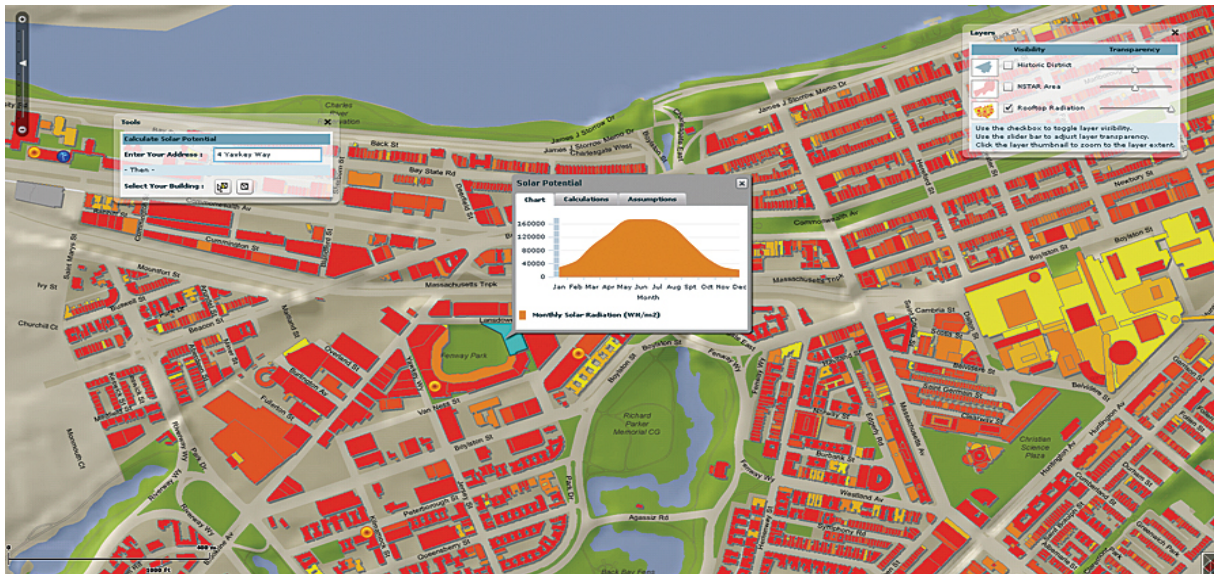
GIS Applications (6)

- Government uses of GIS (police services)

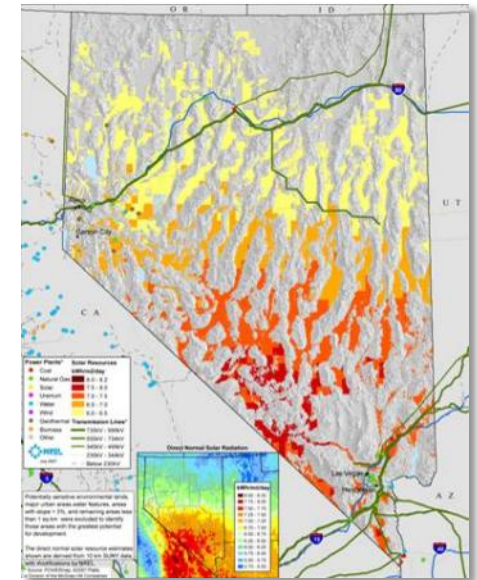


GIS Applications (7)

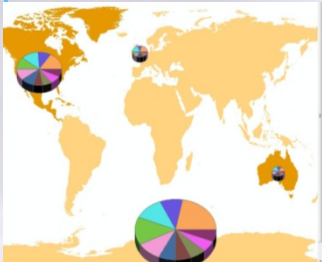
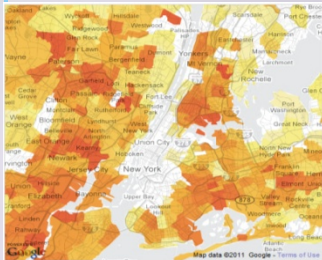
■ Natural resources (solar energy)



<http://gis.cityofboston.gov/solarboston/>



History & Evolution of GIS



Brief History of GIS (1)



Brief History of GIS (2)

ERA OF INNOVATION

DATE	TYPE	EVENT
1963	Technology	CGIS initiated
1969	Commercial	ESRI Inc. formed
1969	Academic	“Design with Nature” published
1970	General	First geocoded census released
1972	Technology	First LANDSAT satellite launched

Brief History of GIS (3)

ERA OF COMMERCIALIZATION

DATE	TYPE	EVENT
1981	Commercial	ArcInfo launched
1985	Technology	GPS operational
1987	General	GISWorld begins, IJGIS published
1988	Academic	NCGIA established
1996	Technology	Internet GIS products introduced
1996	Commercial	MapQuest comes on line

Brief History of GIS (4)

ERA OF ENABLING & EXPLOITATION

DATE	TYPE	EVENT
2000	Commercial	GIS passes \$7 billion
2000	General	GIS has 1 million users
2000	Technology	Internet data warehousing, field collection, wireless technologies
2005	Technology	Google Maps goes live
2008	Technology	LBS continue to develop
2010	Technology	Mobile devices, 3D technology

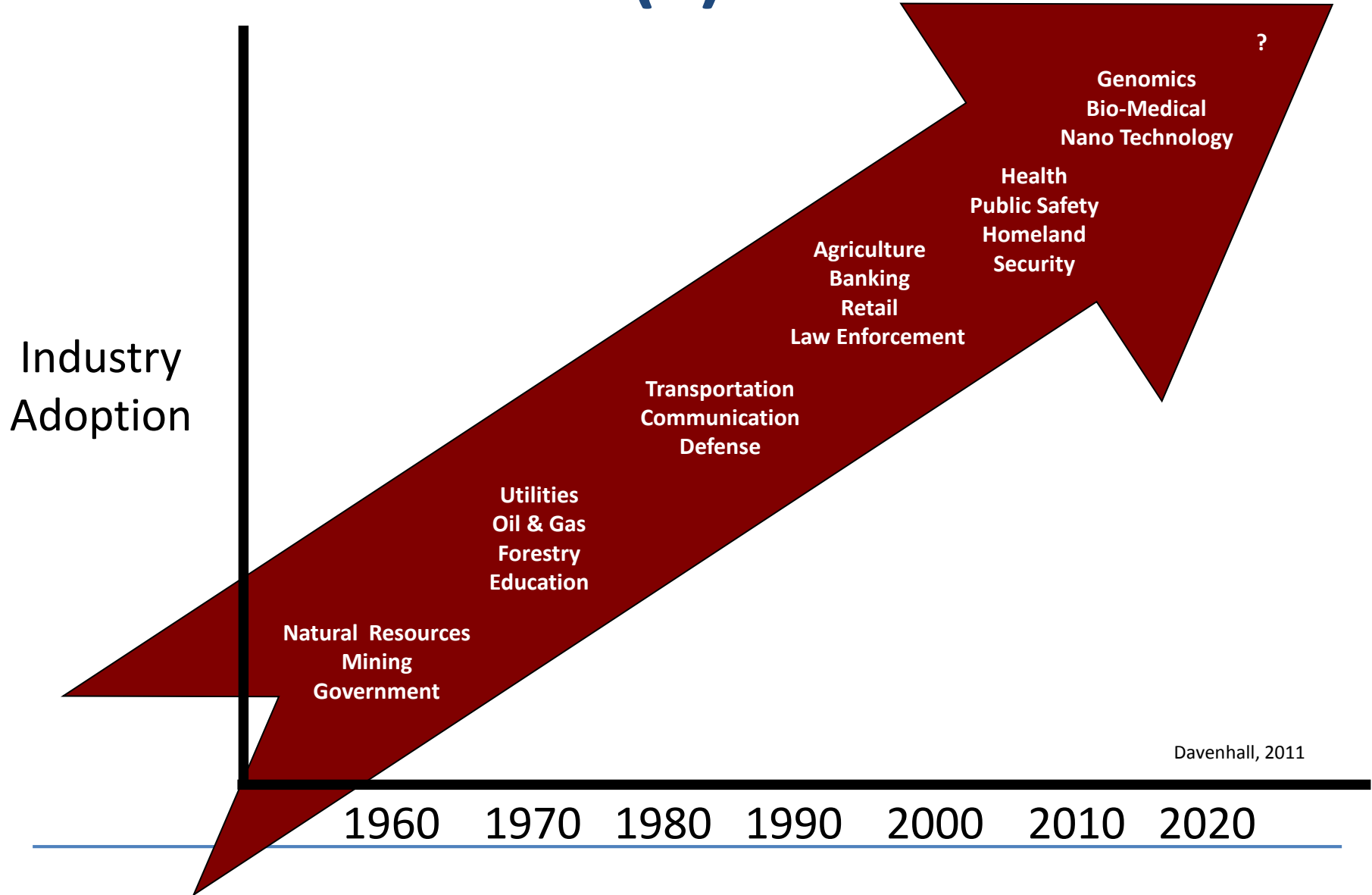
Reasons for Increased Use (1)

- Greater awareness of the potential of GIS
 - US Department of Labor has labeled geotechnology as one of the three “mega-technologies” of the 21st century
- Reductions in the price of GIS hardware/software
- Better technology to support applications; specifically, visualization, data management and analysis, and linkage to other technologies

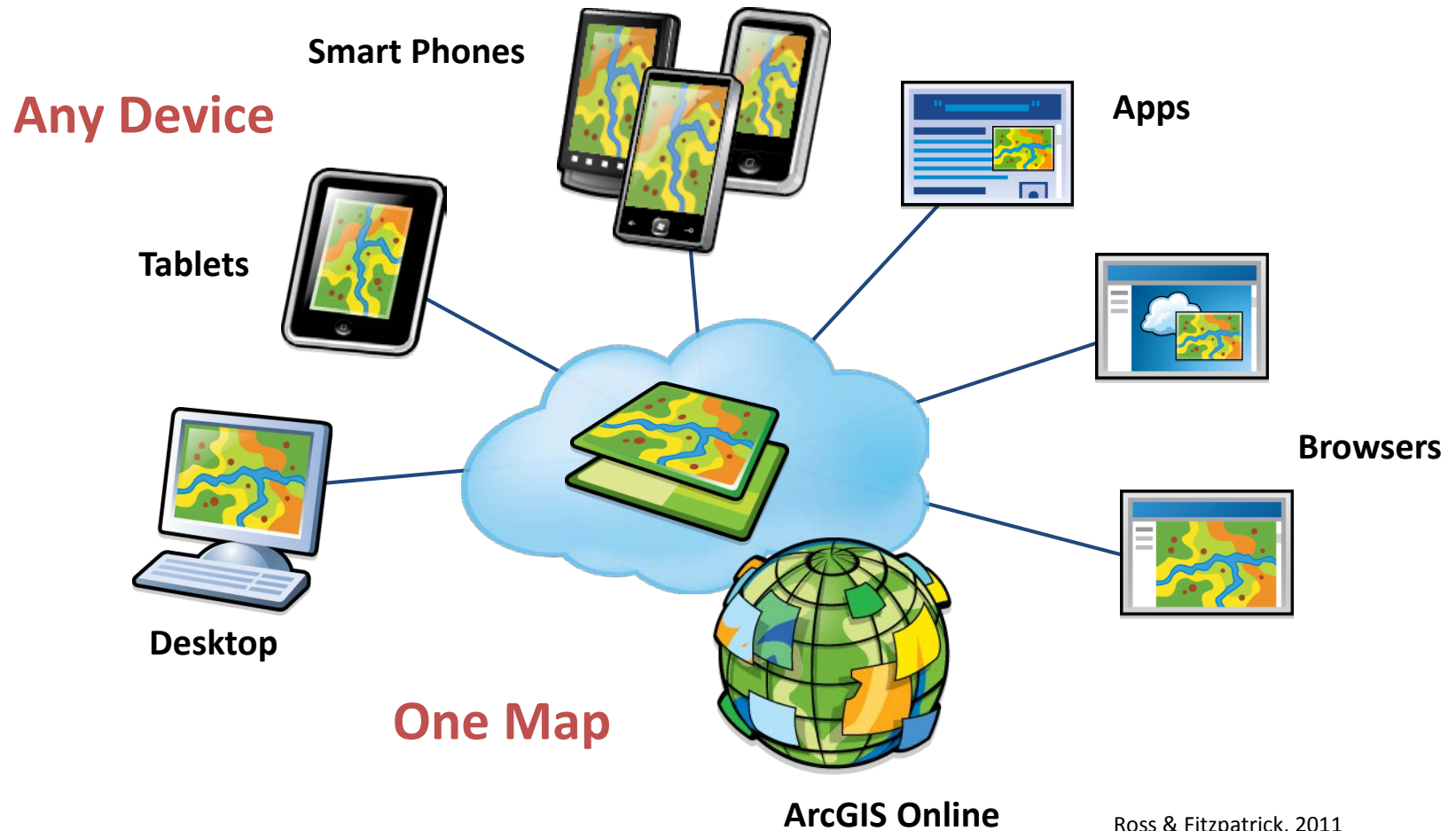
Reasons for Increased Use (2)

- Proliferation of georeferenced digital data
- Accumulated experience of applications that work
- Availability of web-mapping tools
- Ubiquity of GPS and LBS

Evolution of GIS (1)



Evolution of GIS (2)



Ross & Fitzpatrick, 2011

Evolution of GIS (3)

- Demo of mobile GIS

