18 Operating Safely with GIS

OVERVIEW

- Describes how best to use GI science and technology to make safe decisions
- Involves seizing opportunities without losing public trust or incurring excessive costs
- Describes the role nation-states play in setting the ground rules and the extent to which they are active participants and regulators in GI markets

LEARNING OBJECTIVES

- **The nature of trade-offs in GIS-based decision making.**
- **The common and different drivers for organizations and employees using GIS.**
- **The characteristics of information in general and GI in particular.**
- **Some important elements of the operating environment for safe GIS-based decision making—the law, trading in GI and the role of governments, protecting or undermining privacy, the ethics of behavior, and public trust.**
- **How the operating environment can vary through time and in different jurisdictions.**
- **Where to go for more detailed information and advice.**

KEYWORDS

Copyright, intellectual property and liability; government; open data; trust and ethics

OUTLINE

18.1 Introduction

- Managers exist to make decisions and implement them successfully
- every organization -businesses, governments, voluntary organizations, and everything else (even universities) -has managers, and everyone at some stage is going to be a manager in some function
- GIS and GI are central to many management functions and much decision making.

18.2 GIS and Decision Making

- Any policy or management action taken has consequences, some of which are unforeseen
- Everything is interconnected: normally, some gain and some lose in decision making.
    - As example is given in Applications Box 18.2 which details the trade-off between geographic detail and privacy

18.3 Organizational Context

- The GIS world is driven by organizational and personal objectives, scientific understanding, and raw materials (GIS, skills, and GI).

18.4 Geographic Information

18.4.1 The Characteristics of Information

- From a management perspective information does not wear out through use, though it may diminish in value as time passes
- Information can be considered a public good where:
    - The marginal cost of providing an additional unit is close to zero
    - Use by one individual does not reduce availability to others (“nonrivalry”)
    - Individuals cannot be excluded from using the good or service (“nonexcludability”)

- In practice, information is an optional or partial public good- it is possible to opt to take it or not and individuals can be excluded from using it in some situations
- Information in digital form can generally be copied and distributed via the Internet at near-zero marginal cost and creates: producer externalities; network externalities and consumer externalities

18.4.2 Additional Characteristics of GI

- Comparing one dataset for an area with another often permits the infilling of missing data
- indication of the quality of individual GI datasets can be assessed through overlay
- It provides added value, almost for nothing.
- It is difficult to quantify the quality of some types of GI

18.5 GIS, GI, and Key Management Issues

- Details five different areas in which safe GIS use is impacted by management or where GIS can contribute to ameliorating management's difficulties

18.5.1 The Law

- Laws of various sorts have several roles to: regulate and incentivize the behaviour of citizens; to help resolve disputes; and protect the individual citizen
- Protecting innovation and liability are considered in relation to GIS

18.5.1.1 Fostering Innovation and Protecting Exploitation

- Two types of innovation are identified:
    - Where it is created internal to an organization and its exploitation is protected by law
    - Where its creation occurred through an open innovation process where the innovation results may not be protected (though there may still be some form of licensing—see Section 18.5.1.2).
- Applications box 18.4 details intellectual property rights

18.5.1.2 Owning and Exploiting GI

- The relationship between GIS and GI with IPR is complex because:
    - National or regional IPR laws may vary
    - The formal interaction between the private and public sector varies between countries.

    - Global databases are being built in some domains while many other geographical databases are national in scope, content, ontology, and reference systems. •
- Can geographic data, information, evidence, and knowledge be regarded as property?
    - Yes, but who owns the data is sometimes difficult to define unequivocally
- Can geographic information always be legally protected?
    - Whether the products and contents of GIS are in the public domain, are "facts", or are creative works can be disputed
- Can information collected directly by machine, such as a satellite sensor, be legally protected under copyright?
    - Possibly not because of the need for originality, however this is not the view taken by the major players, such as GeoEye.
- How can tacit geographic and process knowledge – such as that held in the heads of employees and gained by experience – be legally protected?
    - The only formal way to protect tacit knowledge is to write some appropriate obligations into the contracts of all members of staff – but it rarely works
- How can you prove theft of your data or information?
    - Data may be watermarked or finger-printed by the careful insertion of small bits of data which are carefully documented for this purpose or by incorporation of highly time-dependent forms
- Who owns information derived by adding new material to source information produced by another party?
    - The answer is the originators of both the first and resulting datasets
- Almost all GI is licensed somehow. Read the license before using the GI!

18.5.1.3 GIS, GI, and Legal Liability

- Liability is a creation of the law to support a range of important social goals, such as avoidance of injurious behavior, encouraging the fulfillment of obligations established by contracts, and the distribution of losses to those responsible for them.
- Other liability burdens may also arise under legislation relating to specific substantive topics such as intellectual property rights, privacy rights, anti-trust laws (or non-competition principles in a European context), and open records laws.
- Reducing liability exposure for creators and distributors of geographic software and data products is achieved primarily through performing competent work and keeping all parties informed of their obligations.

18.5.2 Trading in GI and the Role of Government

- GI is now a necessary part of delivering services

18.5.2.1 The Role of Governments

- Governments have been and are major collectors (and sometimes providers) of certain types of GI and could provide much more information that is presently "locked up" inside public-sector organizations.
- Remit of government data providers varies considerably across the world

18.5.2.2 Free Our Data?

- Reform of government has led to two approaches in regard to GI
    - "charging for everything"
    - "free access"
    - The advantages and disadvantages of these different approaches are outlined in applications box 18.6

18.5.2.3 Competition versus Collaboration

- the relationship between the state as a provider of GI and the private sector as a value-adder sometimes breaks up

18.5.3 GIS and Privacy

18.5.3.1 Geoslavery

- Constant monitoring of an individual's position via mobile (or cell) phones
    - Term 'geoslavery' coined by Dobson and Fisher
- The widespread availability of GI as in Street View and as handled in GIS is manifestly a factor in the loss of anonymity

18.5.3.2 Privacy versus the Case for Individual Data

- Most socioeconomic raw data are collected for individuals, and so privacy matters.
- The potential loss of privacy through misuse or loss of personal data has to be traded against the considerable benefits

18.5.4 GIS Ethics and Decision Making

- Ethics refers to principles of human conduct, or morals, as well as to the systematic study of such human values.

18.5.5 Public Trust

- The authors discuss how much trust is appropriate?
    - The GIS community seems to enjoy high public trust—but it could evaporate

18.6 Conclusions

ESSAY TOPICS

1. Differentiate between intellectual property rights such as copyright, database rights and patent rights. Which parts of a GIS are regulated by which legal instruments?
2. Outline a strategy for ensuring that you could detect and prove that some geospatial data had been stolen or your copyright infringed.
3. What are the ethical implications of GIS analysis at the level of the individual citizen, as might be obtained from a 'life style' survey?
4. When invited to comment on the role of GIS in society, a famous GI scientist wrote a 'position paper' entitled 'GIS and society: a lot of fuss about very little that matters and not enough about that which does' (see www.geo.wvu.edu/i19/papers/openshaw.html). Write a reasoned justification for this view (Note: if setting this as an examination question provide copies of the paper)
5. To what extent might a data supplier be liable in the event of a GIS induced commercial 'disaster' that can be shown to be in part a consequence of errors in data supplied to a second party? What are the legal arguments you would bring forward to support the case that the company is liable?
6. How would you go about reassuring the public that they can retain trust in what you are doing and that their privacy will be maintained?
7. What do you understand by the term 'framework data'? Give examples of national and international attempts to create them.
8. How can the legal risks associated with routine use of a GIS be minimized?
9. Find out from national and local (e.g., state) government Web sites what constraints you will have to operate within if you use GI produced by them.
10. How would you price GI and services based on it if you were running a business?

MULTIPLE CHOICE QUESTIONS (MCQ)

There are none for this chapter.

ACTIVITIES

1. This simple exercise has been used many times, and forms part of the UK Association for Geographic Information's (AGI) Continuing Professional Development (CPD) scheme. It is reproduced here by permission of the School of Geography, Birkbeck College's GISOnline program:

The Oxford English Dictionary has a long entry for the word *professional* that reads:

Adjective. Of, belonging to, connected with, a profession … usually or properly pursued from higher motives; maintaining a proper standard, business like, not amateurish.

Listed below are ten 'jobs'. First, can you rank them in increasing order of *professionalism as assessed by the lay public?* The jobs are:

- Bank Manager
- Realtor/Estate Agent
- GI Officer for a Local Authority/US County
- Policeman or woman
- High school teacher
- Encyclopedia salesperson
- Used car salesperson
- Senior religious figure (Bishop?)
- Attorney/Solicitor
- University Professor

It isn't possible to do this straight off, so what we suggest you do is a mental version of the algorithm known as a 'ripple sort'. Take the first pair of jobs and decide which is the most professional. If it's the first, then swap them round so that the more professional job is now second in the list. Next compare this second job with the third and repeat. Proceed down the list making comparisons until the most professional job is in the last (tenth) position. Now repeat until you have the second most professional job in the second to last place, and so on until no more moves are possible. It helps to do this in a spreadsheet, or, alternatively a class can do it as a 'line up' in which ten people each represent a profession, but then line up in professional order as agreed and negotiated). Based simply on the pair-wise comparisons you should have a list in the required increasing order.

Number your list from 1 (least professional) to 10 (most professional).

Now repeat the same process, but this time rank in increasing order by the extent to which you expect the person in that job to behave ethically. In the context in which the word is being used here, ethics refers to a set of principles or morals and associated rules of conduct. Again number the jobs from 1 (least ethical) to 10 (most ethical) and now write this second ranking against the list relating to professionalism. Do they look similar?

We can correlate these rankings using Spearman's Rank Correlation coefficient, ρ (rho), based on the differences in the ranks. First, for each job find the difference in the ranks, d_i. Next use these numbers to find ρ as:

$\rho = 1 - [6* \Sigma d^2 / (n^3 - n)]$

In this, *n* is the number of ranked pairs, in our case 10, and d^2 is the difference in rank squared. A value of +1.0 indicates that you have ranked them in the same order, so that the correlation between the ranks is perfectly positive. If you get a value of -1.0 it indicates a perfect inverse ranking. Most likely, you got a value somewhere in between and if you're into statistics you might like to note that at the 95% confidence level, you need a value in excess of 0.65 to be sure that the relation is significant.

Draw some conclusions from this simple thought experiment such as:

Whatever you think about the words when applied to the GI industry, you can identify something called *professionalism* and something called *ethics*. If you can't, how else were you able to rank them?

The key to both is what the people concerned do in their jobs.
Different jobs have different ethical and professional expectations.
There is a correlation between ethics and professionalism. When we speak of someone as a ‘professional’ we imply that they also behave ethically.
Many legal systems are adversarial, and rely on argument to establish the rights and wrongs of a case. Consider the following hypothetical sequence of activities:

2. A GI data aggregator company uses GPS to create a road navigation and related attractions data base for a capital city. It then creates a database from these

data, spending almost two years to do this.

At the end of the two years, it decides that it can no longer afford to continue the data collection and acquires additional data, under a license to use, from a second company.

However, a third company that operates using the original data under licenses from the first produce their own data product that includes, predominantly, the information originally provided by the second company.

At this point the second company alleges that this third company has abused their intellectual property rights and demand recompense.

Have they? In which company is the IPR invested? What is the position of the original (first) company in all this? Arguing through this case should convince you that we have entered a legal minefield!

This is another exercise taken by permission of the School of Geography, Birkbeck College's GISOnline program and the AGI CPD scheme:

3. Investigate the published ethical codes for the following GIS-aware organisations:

    a. Britain's Royal Institution of Chartered Surveyors at: http://www.rics.org/ethics
    b. The dominantly US-based Urban and Regional Studies Association (URISA) at: http://www.urisa.org/about/ethics
    c. American Society for Photogrammetry and Remote Sensing (ASPRS) at: www.asprs.org/membership/certification/appendix_a.html

Do these codes differ in any meaningful way? How are they enforced and what would be penalty be if a practitioner broke the relevant code?

4. Organize a debate on whether or not it should be necessary to be in some way licensed in order to practice using a GIS. Arguments for, and details of schemes that lead to certification, will be found at the ASPRS website: http://www.asprs.org/membership/certification/

The GIS Certification Institute at http://www.gisci.org/ has relevant materials, including a database listing of all those individuals that have gained certification, which could form the basis of an interesting study.

For a robust, dissenting view, see:

Barr, R. (1995) Excuse me, do you have a licence to drive that GIS? *GIS Europe*, February 1995, 16-17.

FURTHER READING

Cho G. 2005 Geographic Information Science: Mastering the Legal Issues. John Wiley & Sons Ltd., Chichester, UK.
Required reading for anyone with more than a passing interest in the legal implications of work with a GIS.
Photogrammetric Engineering and Remote Sensing. Special Issue on The National Map. 2003 (69).
Shapiro C. and Varian H.R. 1999 Information Rules. Cambridge, MA: Harvard Business School Press. The classic book on the nature of information and how to exploit it.

RELATED READING

Maguire D.J., Goodchild M.F. and Rhind D.W. (eds) 1991 Geographical Information Systems: Principles and Applications. Harlow, UK: Longman (text available online at www.wiley.co.uk/gis/volumes.html).
Epilogue, D W Rhind, M F Goodchild and D J Maguire, pp. 313-27

ONLINE RESOURCES

NCGIA Core Curriculum in GIScience, 2000 (www.ncgia.ucsb.edu/giscc)

3.2.1. Public access to geographic information (190), A Yeung

NCGIA Core Curriculum in GIS, 1990 (www.ncgia.ucsb.edu/pubs/core.html)

70. Legal issues