Unit 135 - Geographic Information Technologies in Society

Written by: Robert Maher

Advanced Organizer

Unit Topics

- contexts for GI Technologies
- use of GI technologies in society
- the British Columbia case study
- key issues

Intended Learning Outcomes

- after reading this unit, you should be able to
    - place GI technologies within the contexts of Information Technology, Information Management and the Enterprise
    - understand the different societal perspectives on the management and analysis of geographic information
    - through the British Columbia case study, direct attention to some of the key issues affecting the use of GI technologies
    - explore the network for resources which illustrate the values and issues associated with the implementation of GI technologies

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Metadata and Revision History

Geographic Information Technologies in Society

1. Introduction

Geographic Information Technologies (GIT) in society is a subset of the larger concern of Technology in Society. There are numerous popular texts on the implications of Information Technology in society, see for example the recent books by Tapscott and Dyson, both available over the Internet. (www.growingupdigital.com).

- Technology affects:
  - (1) communication processes;
  - (2) education processes;
  - (3) business processes.

Graves (1997), within the context of collaborative design, in a Geographic Integration and Connectivity project for Statistics Canada, follows the Open Distributed Processing (ODP) reference model with its definition of five viewpoints:

- engineering viewpoint
- technology viewpoint (see Section 1.1)
- computational viewpoint
- information viewpoint (see Section 1.2)
- enterprise viewpoint (see Section 1.3)

Three of these viewpoints are applied to GIT.

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2. Putting GI technologies in context

Goodchild (1998) equates Geographic Information Technologies to three technologies: global positioning systems (GPS), Remote Sensing, Geographic Information Systems (GIS). These tools need to be placed into their proper context. This can be done by following the ODP reference model:

- Technology viewpoint
- Information Management viewpoint
- Enterprise viewpoint

2.1 Technology viewpoint

Geographic IT needs to be viewed in the same manner as all other types of Information

Technology (IT). Within the IT world, one approach is to see the tools as part of a layered set of technologies, ranging from the hardware platform to a specific application. (Figure 1).

Within this technology context, GIT have been subject to current trends in the computer industry. Recent impacts are client server architecture, web technologies, common object models, component GIS software and industry standard API's, emergence of easy to use 32-bit operating systems Windows 95 and NT. (Poletto 1997)

2.2 Information Management viewpoint

Information Management offers a second point of view. The use of any tool has to make sense, in terms, of answering a question or making a decision. Figure 2 illustrates the framework of Environmental Information Management. It places GIT (GPS, Remote Sensing and GIS) within the context.

From the diagram, there are four elements:

- Concepts
- Technology
- Issues
- Applications.

Each element can interpreted from left to right: data to information, through the stages of Inventory, Database and Application. Within each component of Technology, there exists the same process cycle: Design , Development and Dissemination with a feedback loop. The feedback is affected by the user reaction to the output and by any external changes to the technology.

2.3 Enterprise viewpoint

Every Information Management (IM) problem is bounded by its geography on the earth surface. For example, in Canada, the Canadian Forestry Service has established a network of model forests (mf.ncr.forestry.ca). One of these forests, McGregor Model Forest lies west of the Rockies in interior British Columbia. For this enterprise, the focus is to develop and use advanced decision support systems for sustainable forest management. To try and satisfy this agenda, partnerships have been established between the government, the forest industry, the Geomatics industry and a variety of client groups. Given this problem definition, the purpose is to use whatever tools, GIT or IT, to meet the management objective.

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3. Identification of the error model

Society is a complex object, in a similar manner to GIT. Figure 3 offers a conceptual framework for dividing Society into a manageable number of component parts. It

makes no attempt to show the complexity of the interactions between the component parts.

- general public
  - mpacted by the technology(GIT)
    - e.g. changes in surveying (digital data collection)
    - e.g. GIS on the web
    - e.g. vehicle navigation systems

- non-governmental organizations (NGOs)
  - public groups with well-defined interests and values
  - seeking to use the same technologies as government agencies
  - demand access to digital data sources and standard methodologies

- government organizations
  - in Canada, three levels of government: federal, provincial and municipal
  - each agency has a mandate which includes Information Management
  - each agency has to deal with standards, quality, access, ownership and security
  - private sector and NGOs are seeking government digital data at an affordable price

- educational institutions
  - most educational institutions are public institutions. They include schools, colleges and universities.
  - educational institutions change their structure and processes in response to society's redefinition of the learning need and the types of resources available to deliver this need to the marketplace (educational technologies)

- private sector
  - there are two components to the private sector: GIT industry and other industry
  - GIT industry includes hardware vendors, software vendors, application developers, consultants
  - Other industry includes the resource industries (e.g. in British Columbia, forestry, fisheries and mining), service industries (e.g. retail, health care, tourism, transportation, education and social services).

    The distribution of these industries in British Columbia, for example, is a function of the provincial history and geography.

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4. British Columbia Case Study

The six component framework for society can be tested in British Columbia as a model for other jurisdictions.

3.1 General Public

One indirect measure of public awareness can be discerned from observing the use of GIT in the environment.
e.g. Are there government kiosks available which use GIT ?
e.g. Is GIS taught in the school system ?
e.g. Is Internet mapping available through the public libraries ?
e.g. what electronic geographic products are available in the marketplace ?

3.2 Non-governmental organizations

There are strong environmental NGOs in British Columbia. These organizations have formed the BC Conservation Mapping Consortium. Their activities and products are described on the web site: www.ecotrustcan.org. They are supportive of both the conservation and the First Nations agenda.

3.3 Government agencies

British Columbia is a resource based province. Its strength in the use of GIT can be found in the Ministry of Forests, Ministry of Environment, Lands and Parks and the Land Use Coordination Office. The recent history and successes in GIS implementation are published on the Internet. The key sites are as follows:

- Spatial Data Management Task Force: review of spatial data management capability in the Government of British Columbia. www.ista.gov.bc.ca/councils/Spatial/ToC.html. This electronic document makes some corporate recommendations to improve spatial data management. It also provides an inventory of current GIS across the province.

- GIS implementation at BC Environment and other conference papers can be found at www.env.gov.bc.ca/gis/

- New GIS initiatives within the Ministry of Forests, including INCOSADA and the Data Services Centre project, are accessible at www.for.gov.bc.ca

- The Land Use Coordination Office (LUCO) has responsibility for regional land use planning.

- Geographic Data BC is the agency responsibility for the availability of digital spatial information.

At the federal level, Natural resources Canada (cgdi.gc.ca/ceonet),Statistics Canada and other Ministries offer a similar service.

3.4 Educational Institutions

The province has five universities and a larger number of community colleges. Courses and programs in GIT are available through most of these institutions. Some of the key GIS initiatives at the university level are:

- University of British Columbia: support for the Virtual Campus project www.geog.ubc.ca/courses/klink/g370_472.html
- Simon Fraser University started its UNIGIS Telelearning Program in September 1997. www.sfu.ca/geography/unigis.htm
- University of Victoria has developed the G-Help educational product for undergraduate Distance Education.office.geog.uvic.ca
- University of Northern British Columbia is new university serving the Northern part of the province from Prince George.
- Royal Roads University in Victoria is seeking to meet the needs of the mid-career professional. www.royalroads.com

At the community college level, British Columbia Institute of Technology (BCIT) has offered a two year Advanced GIS diploma program for a number of years. gis.athena.bcit.bc.ca

3.5 GIT industry

British Columbia accommodates a combination of GIT companies with a head office in the province and regional offices for the larger national and international suppliers.

BC based suppliers (note: this is likely not a comprehensive list)

- Facet Decision Systems Ltd (product Facet)
- MDA Ltd (product LandData BC)
- Mercator Systems (product database design)
- Pacific International Mapping (product MAPS 3D)
- PCI Pacific Geosolutions (product PAMAP, EASI/PACE)
- RADARSAT Int (product radar data)
- VGI Inc (product QuickMap)

International suppliers with offices in BC

ESRI Canada (product Arc/Info, ArcView) www.esri.com
Geomatics International (product application development) www.geomatics.com
Intergraph (product MGE and Geomedia) www.intergraph.com

3.6 Other industries

In British Columbia, the primary resource industries are associated with Forestry, Fishing, Mining and Tourism. The best approach to the development of Geomatics understanding is either through the government agencies or the consulting industries which service these sectors.

3.7 Conclusion

- Some of the defining characteristics of the "information society" in British Columbia

are the level of accessibility of geographic and environmental data over the network and also the overall quality of information on the natural environmet, whether in terms of methodological handbooks or individual species guidbooks.

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5. Key Issues

Regardless of the geographic jurisdiction in western society, there are several key issues which influence the impact of GIT in society.

4.1 Local versus Global GIT

In British Columbia, as in other parts of North America, there has been a long history in the development of local GIT solutions (e.g. PAMAP, TerraSoft, Facet, MAPS 3D, QuickMap etc). With enterprise GIT implementation in government agencies, and with a rapidly changing IT marketplace, there has been some movement towards global GIT suppliers (e.g. ESRI, Intergraph). This dynamic between local and global technology solutions is an issue which goes beyond GIT. It lies in the political arena of free trade, global standards and the local decision making processes.

4.2 Public versus Private Interest

In Canada (and British Columbia) there remains a strong cost recovery mandate within the government agencies who generate digital geographic information.. Consequently, the NGO and academic community continue to lobby for access to the digital geographic files at an affordable price. The NGOs have acquired the technology but still need better access to data sources and methodology, if they are to present their views at public forums.

4.3 Technology availability

With the rapid evolution of technology, the general public cannot afford to keep current with GIT nor can they afford data access. Educational institutions have a vital role in support of a better understanding of the concepts and issues , and easier access to the technology and its application.

4.4 Learning for Life

Lifelong learning is the recognition that in a rapidly evolving marketplace, individuals will require continual education and training. If the "learning for life" expectation is to be met, there has to be an ongoing commitment to flexible inexpensive delivery of GIT education, within a rich supportive infrastructure. The NCGIA core curriculum is one ingredient in the changing relationship between work and education. Another perspective is the changing attitude of industry towards its intellectual resource and conversely the changing attitude of the educational institutions towards private (versus

public) education.

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6. Review and study questions

1. GIS contain spatial databases. Database technology is incorporating spatial objects. Evaluate these trends with regards the products from ESRI, Oracle and Microsoft.
2. Client server technology is separating the desk top mapping function from the data warehousing function. What are the implications for standards?
3. Consider a local resource management problem. Using Figure 2, working from right to left, identify the tools and data sources needed to address the problem.
4. The case study offers a snapshot of GIT in BC. Use this model, to assess GIT in your state, province or organization. What components are missing in your jurisdiction? What components are missing from the case study? Why is there a difference?
5. This unit has identified four key issues pertinent to the implementation of GIT in society. Write an essay on one of these issues

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7. Road Map to Units 136 - 176

Figure 4 shows the linkage between this unit and the subsequent units in the curriculum. Every Information System is comprised of data, technology, and an application to solve a problem within a human context. To meet our goal of appropriate use of GIT, we need technical staff educated in the data and database development tools, the application and application development tools, the technology - its capabilities and constraints and a society which fully understands the concepts and implications of decision making in this computer mediated world. This presents a remarkable challenge for society.

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8. References

Goodchild, M.F. 1998. NCGIA GIS Core Curriculum Unit #2.

Graves, R.B. 1997. Progress in collaborative design. Presentation to Mercator workshop in Victoria. (contact author gravron@statcan.ca)

Poletto, D.I. 1997. New technologies and approaches for developing custom information system solutions. Presentation to CCRS, Ottawa. (contact author dpoletto@skeinc.com

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this evolving project..

Citation

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Metadata and Revision History

1. About the main contributors

- Robert Maher

2. Details about the file

- unit title
  - Geographic Information Technologies in Society
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  - 135

3. Key words

4. Index words

5. Prerequisite units

6. Subsequent units

7. Other contributors to this unit

8. Revision history

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Back to the Unit.

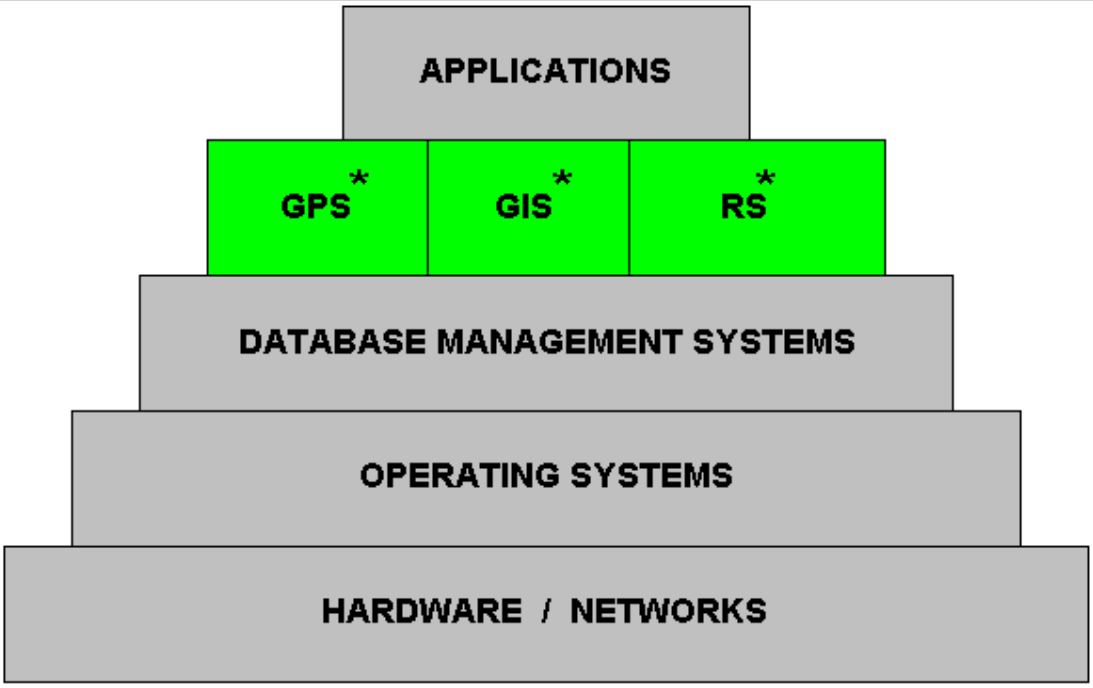

Figure 1: Information Technology View:*(GIT definition Unit 002 Section 1.3)

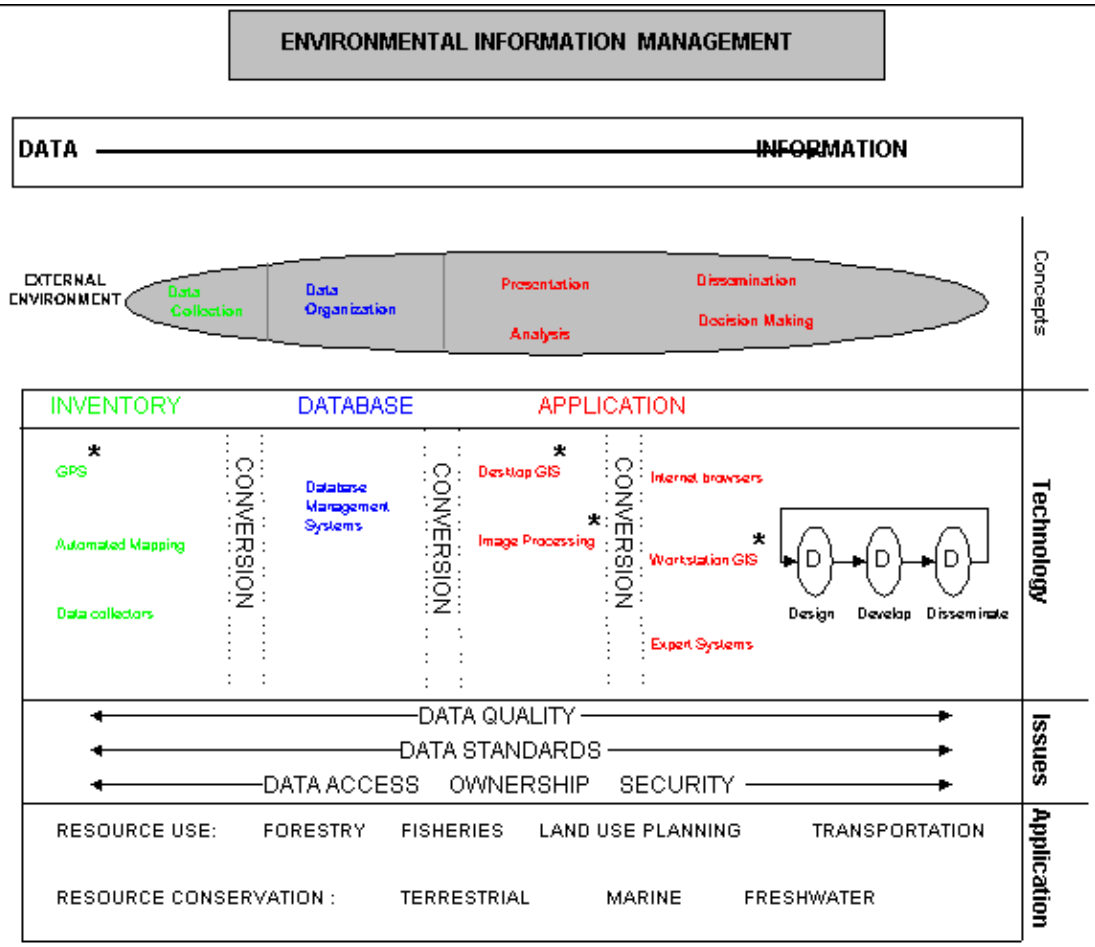

Figure 2 : Information Management View.* (GIT definition Unit 002 Section 1.3)

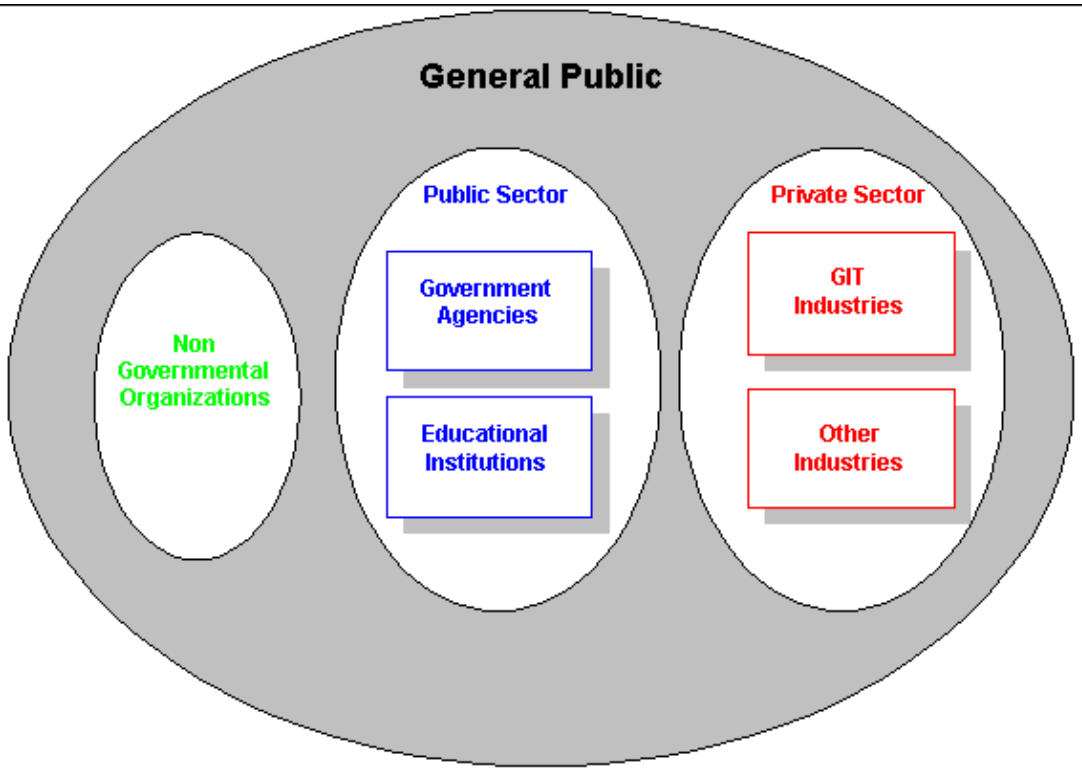

Figure 3 : Conceptual framework for GIT in Society.

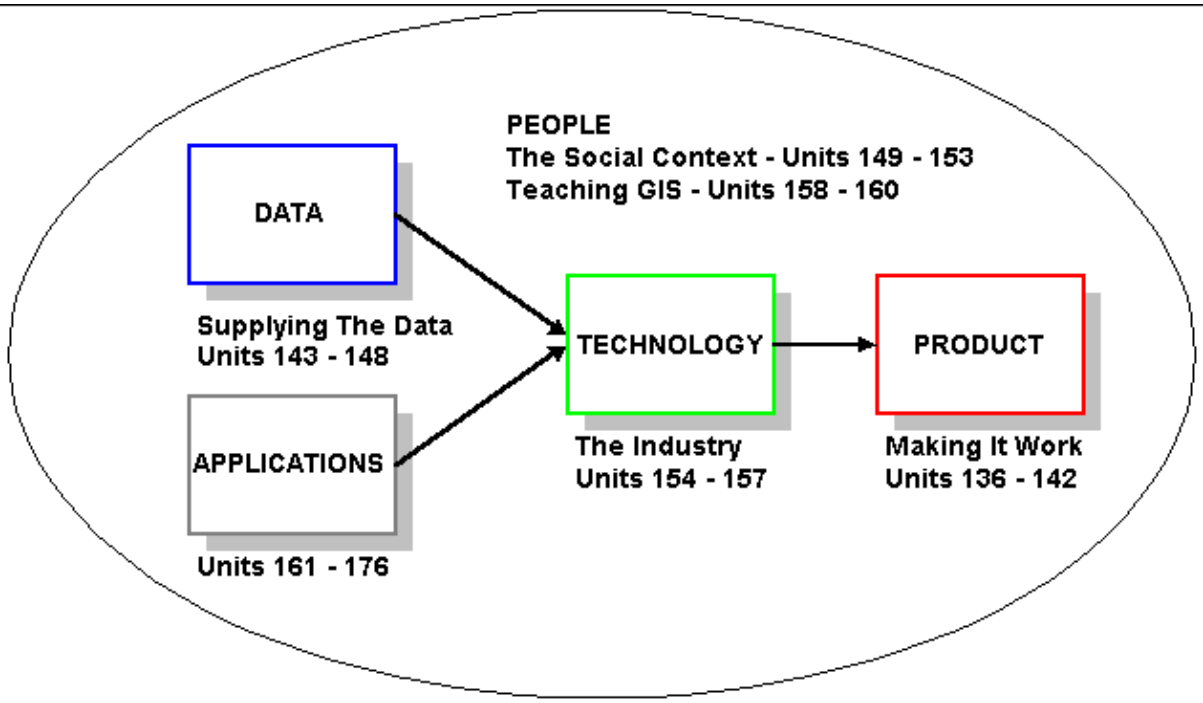

Figure 4: GIT in Society Road Map.