

1 Introduction

GIS technology has been used in a variety of government and semi-government organisations since the late 1970s. However it has only been in the last two decades that GIS has become a technology which has permeated almost all facets of government, utilities and commercial organisations which have an interest in matters relating to:

- land (e.g. ownership, leasing/licensing, etc.);
- services on, under or over the land (e.g. utility services – pipes, drains, power networks, telecommunications, etc.);
- commercial activities on or about the land (e.g. mining, agricultural, land development, property, banking, real estate, transportation, environmental, planning, etc.); and
- other matters which relate to land and property (e.g. policing, emergency services, etc).

As such, GIS has become a pervasive technology in a number of organisations. Along the way GIS has also become mainstream and now sits alongside Finance Systems, Human Resource Systems, Asset Management Systems and Customer Management Systems in the Information Technology (IT) environments of government departments, utilities and private companies.

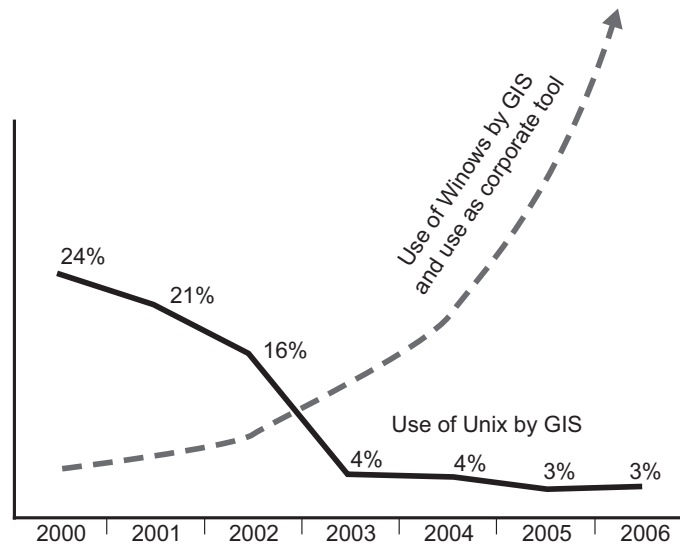
GIS now typically runs on Microsoft® Windows™ platforms on corporate networks and most desktops – a significant change from 5 or 10 years ago when GIS used to be very expensive technology running on isolated Unix-based workstations/networks used only by highly trained gurus. The demise of the use of Unix for GIS is shown in the following chart.¹ This can also be directly correlated with the use of the Windows™ operating system as the corporate desktop and the migration of most GIS software to this platform.

Since the 1970s, GIS has been used to computerise basic land parcel information, but has since grown over the last couple of decades to include a plethora of applications, such as using GIS for:

- managing assets and services;
- managing land-related information;
- managing customers for service delivery (whether it is for delivery of water services or postal items);
- integrating information from other (often disparate) systems;
- inclusion into Police and Emergency Services computer-aided dispatch systems;
- modelling transportation systems; and
- monitoring and management of environmental and forestry issues.

¹ Source: GIS/Spatial Best Practice Surveys, Australia and New Zealand, Corporate GIS Consultants 2000–2006.

ACHIEVING BUSINESS SUCCESS WITH GIS



As a technology, GIS is principally focused on:

- capturing/converting/storing spatial or geographic data (sometimes also called geospatial data), i.e. data which has a location on, over or under the surface of the earth;
- undertaking analysis of that data;
- integrating that data with other data types; and
- presenting that data for decision support, generally in the form of a map, perhaps with associated tables or charts.

Therefore a GIS can be defined as a computer system that stores, manages, displays, analyses and reports on information which has a 'where' component, i.e. a location, because a number of decisions undertaken by staff in land-related organisations often refer to 'what', 'where', 'how much', 'what does this relate to' and 'how does this relate to my other data'. The inclusion of the 'where' component into the decision-making process can be a powerful tool for providing a better understanding of the issues at hand and the implications of specific decision paths.

GIS environments most often consist of two major components: the spatial or graphic data which represents real-world entities; and the aspatial or textual data which describes the attributes of those real-world entities. This data is then accessed by software which can relate each item of both the graphic and textual data to each other to provide information to the user.

Because spatial data is just that – spatial – a key feature of a GIS environment is that each spatial entity intrinsically knows the relationship of itself to other spatial entities. For example, the relationship of a street to a bus stop on that street can be derived from the GIS without the need to have a specific relationship defined in the database that relates the particular bus stop to the specific street.

Case example

Spatial systems do not need to have relationships built to link data as do traditional IT systems which link data by 'common keys' in a textual database.

On a recent very large project (70 developers) to implement a national GIS, we found that some of the IT developers were designing and developing a method to build relationships between spatial data in a traditional Relational Database without understanding that they had a very sophisticated GIS system which did just that. Needless to say, I stopped them from doing this and arranged for them to have the requisite training so that they understood how spatial systems worked.

A GIS typically contains a considerable amount of spatial data, often referenced to a 'map base' containing data on topography, property, roads, railways, parks etc. to provide a map context to the data being used. The map base is usually a mathematically defined representation of the surface of the earth, typically represented as a map projection stored as Cartesian coordinates such as easting and northing or Latitude and Longitude coordinates.

The most obvious advantage of representing 'where' data in a GIS can be derived from the visual representation of data presented in map form. When this is also combined with other information about the data item, such as what the entity is, how much it costs, what it relates to, etc., more powerful relationships can be determined. For example, the location or spatial distribution of socio-economic data (e.g. income) can be a very useful tool in planning for the provision of government services, etc.

As such, the inherent spatial relationships within the map data can provide powerful benefits that might not be initially obvious, such as:

- finding the relationship of different data themes – e.g. *'show me the spatial distribution of car ownership compared with bus route locations for these suburbs'*;
- finding items at a given location – e.g. *'show me all the planning constraints on a property at this location'*;
- finding locations where certain conditions are met – e.g. *'show me where all the contamination is within 100 metres of this watercourse, particularly that contamination that has not been remediated within the last 5 years'*;
- identifying trends and spatial patterns – e.g. *'show me all water pipes that have failed more than twice in the last 2 years and correlate this information with telemetry data pertaining to pipe pressure'*;
- scenario modelling – typically used to assess or distinguish between a set of proposed options, for example assessing the merit of installing new infrastructure as opposed to upgrading existing infrastructure.

So GIS can be a powerful tool to represent and analyse spatial data. But in order to do this, the GIS must have a lot of data captured, and that data must be relevant to the queries being run (i.e. a query involving planning constraints must use the latest planning data) and must be as correct/accurate as possible.

Thus, although the business benefits that can be obtained from using GIS are significant, these benefits will only happen if the GIS has good data. GIS is a data-centric application which can provide substantial business benefits if, *and only if*, the data is available and it has a high degree of correctness and is suitable for the purpose to which it is going to be used.

In addition, when this good GIS data is combined with data from other systems (e.g. customer data, sales data, financial data, etc.), substantially more business benefits can be derived. All of this information, properly presented, can present a unique view on the data world, leading to this data becoming information which is then able to be used to derive knowledge to augment a number of business outcomes, and in some cases to provide business intelligence.

However, in the process of implementing/reviewing GIS, organisations often focus on the GIS software on the assumption that the software is the key to ‘solving GIS’ and that if the right software is purchased then all the rest will be easy. This is an incorrect assumption of course, but nevertheless one that I am frequently asked – i.e. ‘which is the best system’. The best system, of course, depends on what the system is going to be used for. Of the dozen or so GISs available on the market, probably over half of these would suit the functional requirements for most organisations.

Fact

There is no best GIS – just as there is no best motor vehicle. It all depends on the requirements of the user, the degree of sophistication required and the size of the budget. And just as the best motor vehicle for one user may be a heavy-duty 4WD (such as a Toyota Land Cruiser), the best motor vehicle for another user may be an up-market sports car (e.g. a BMW Z4) – each will have substantially different prices, substantially different functionality and substantially different business fit (quite apart from substantially different sex appeal) to meet the needs of the prospective owner (and his/her family).

Thus, there is no such thing as a best GIS. It all depends on the needs of the organisation, the use to which the system will be put, the data that is available to use with the system and the integration of the GIS with the other corporate systems. We are often asked whether the spatial information technology used by a client organisation is appropriate to their needs, and, if not, what needs to be done in order to make the technology more focused to the needs of the business. Often this is because organisations do not understand their current (and potential) business processes that may use GIS or the full capability of spatial information technology and hence do not understand the benefits that spatial information technology may have on the business.

GIS, like any other technology, should be based on meeting the business needs of the organisation, and all organisations, including public agencies, have business needs. Mostly these business needs will be expressed as corporate objectives or operational goals. The Annual Report of an organisation is always a useful place to start to review the Corporate Charter, i.e. the key goals, objectives, performance indicators, result areas and service commitments needed to fulfil the expectations of shareholders – particularly if

the government is the major shareholder (e.g. a government agency or government-owned business).

Good business planning often results in organisations defining Key Performance Indicators (KPIs) which can be used to measure the degree of compliance with these goals and objectives – i.e. ‘goalposts for the business’. How an organisation ‘measures up’ with respect to its KPIs is often a major factor in determining success. Meeting KPIs is also useful to gain additional budget or to obtain approval for new initiatives. As such, KPIs are often *critical to the longevity* of organisations or of staff in those organisations. And if an organisation does not meet its goals and objectives (or ‘measures up’ poorly against its KPIs), the question ‘why not?’ often follows – sometimes with disastrous outcomes.

Therefore all technology, particularly GIS, must be focused on meeting the needs of the business if it is to be successful. Why ‘particularly’ GIS? Because GIS needs a lot of good data for it to be really useful to the business and most of this data is usually spread across the organisation, in lots of different organisational silos. Unlike traditional IT systems, such as Financial Systems or Human Resource Systems which are often single-focus, GIS usually is multi-focus across an organisation and often requires organisational issues to be addressed in order for the implementation to be successful. And because GIS and related spatial technologies can be a powerful mechanism to assist organisations to meet KPIs, their use is becoming more widespread and more functionally rich.

If GIS is properly implemented it should be able to bring substantial benefits to the organisation. But this requires that the benefits be measured. This also requires that one knows the level of performance of these KPIs before the technology is installed, as well as being able to measure them after the GIS has been running for some time. That is, one needs to know where the goalposts are and when a goal has been scored.

To do this it is important to have:

- a strategy or ‘road map’ to ensure that the use of the spatial technology is aligned with the organisation’s business objectives and that the benefits that the technology might be able to bring to the business (and in the right timeframe) are identified;
- methodologies and business practices to implement the strategy and to manage the changes it will bring; and
- appropriate mechanisms to ‘measure’ the organisation’s use of the technology, both at any given point in time and as it progresses toward reaching the overall goal(s). Internal measures (to measure against internal expectations and/or teams) and external measures (to measure against other ‘like’ external businesses to ensure competitive edge is maintained) are essential.

In essence, this book therefore provides an overview of the *business basis* for implementing and using GIS.

The following chapters provide a review of the GIS/Spatial Information market predominantly in Australia and New Zealand, but also with reference to other countries in order to provide a contextual background for further discussions and consideration of key issues which will impact GIS in a typical organisation. All of these issues are then typically used as an input into the development of a GIS Strategy.

The Business focus, Data/Information focus, Organisational focus and Application/Technology focus all lead into the development of the GIS Strategy. For this strategy to be successful, it must meet the business needs of the organisation – Chapter 8 draws all the issue together into the strategy.

The Cost/Benefit Analysis (and Business Case) discussed in Chapter 9 is very important to gain approval of the overall strategy/roadmap and to gain access to the appropriate budget to implement the strategy. After further defining, refining and refocusing of the strategy and business needs, the selection of the most appropriate GIS technology can be undertaken, typically by a tender process. And at the end of this process, the system is (finally) implemented. But is this the end of the process, or just the beginning of a much larger process?

The following chapters provide a commentary on the best way to undertake the above tasks so that this process, and the resultant spatial technology, is focused on using it (the GIS) to deliver real outcomes for the business. Along the way, a number of case studies are cited to emphasise specific points.