GIS as a tool in business intelligence

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Over the past decade, geographic information systems (GIS) have become increasingly important as a supporting and enabling technology within the business environment and especially within the sphere of business intelligence (BI).

South Africa at first lagged behind this international trend with only a small percentage of companies that operate in industries other than resources, transport/logistics and communication using GIS to enhance their information technologies.

There are many reasons for this lag, notably the perceived cost and complexity of GIS, shortage of individuals skilled in both business IT and GIS, historical lack of spatial data and issues of data standards and software interoperability.

This is slowly starting to change as GIS technology and industry in South Africa matures. More and more companies, notably in the financial services and insurance industries have started to implement GIS in an attempt to get a better handle on the complex and dynamic business environment characteristic of our country. Today there is a greater choice of scalable GIS products and commercial spatial data sets. Business managers have become more comfortable with GIS technology as a result of widespread use of GPS for business and leisure and the introduction of map-enabled web resources such as Google Earth.

Location is a critical component in almost every business transaction. Although a lot of data have a location dimension, whether it be customers, stores, warehouses or other assets, this information is rarely exploited in traditional BI analysis. To gain maximum value from the ever-increasing volumes of data, companies need to make use of the location element to gain deeper business insight in order to improve competitiveness and business

Fig. 1: Geographic total view of business.
performance. The BI industry has recognised the potential synergies between their own and GIS technology and this has seen new versions of BI systems such as Business Objects and SAS designed to take advantage of GIS technologies like ESRI’s ArcGIS.

GIS and BI: converging technologies

The business environment is becoming more complicated through the effects of globalisation, growing customer education and sophistication and increasing competition. South Africa as an emerging economy is no exception. In our country we see a rapidly changing economic landscape with international players entering the arena and dramatic changes in the income and lifestyle profiles of our population.

To stay competitive companies invest in information technology, business operations become more automated and measuring technologies more sophisticated. The net result of this is that companies often acquire massive amounts of internal data relating to customers, business operations and financial performance. This data overload presents a challenge to the BI professional who is required to store, locate and analyse data and present meaningful information to decision makers.

The term "business intelligence" refers to technologies, applications and processes for gathering, storing, analysing and providing access to data. The aim of BI is to help enterprise users make better decisions. BI is the combination of processes, business rules and technologies that take raw data, organise it into meaningful and actionable information, while ensuring that it reaches the right people at the right time to support business decisions.

BI unlocks the value held in the business's disparate data depositories by turning it into knowledge and insights, and delivering it to whoever needs it, when they need it, where they need it, and in the format they need it in. BI applications include the activities of:

- Decisions support systems
- Query and reporting
- Online analytical processing
- Statistical analysis
- Forecasting
- Data mining

BI applications can be:

- Mission critical and integrated into a company's business operations, or
- Occasional to meet a specific requirement or answer a specific question, or
- Enterprise wide or limited to one business unit or project.

Any good research and information usually generates more questions than it answers. Therefore BI in a company is a journey that never ends. As BI systems become more sophisticated they put more of the business puzzle's pieces in place than decision makers have ever seen before. This raises the level of thinking about problems and inevitably leads to more questions being raised.

All business operations happen somewhere in geographic space, clients have physical addresses and branches are placed to service specific trade areas. BI officers in many companies recognise GIS technology’s ability to integrate data from different business units and source...
Even with MIS and BI systems in place, data exchange between silos may be inefficient, leading to managers having an incomplete understanding of the company’s internal environment. GIS can assist in bridging the gap between silos by utilising the common denominator of location to tie together data of varying types from different source systems thereby speeding up the process of finding, filtering and comparing data to find answers.

Understanding the external environment presents a bigger challenge. The external environment is the arena where potential new clients and opportunities exist and where competitors pose a threat. Many companies find it difficult to locate and integrate data on the external environment into their existing information systems which is usually designed to report structured internal data. This makes it difficult to build up a comprehensive “total view of business” and gain a real competitive advantage.

GIS is pivotal in bridging the gap between internal and external data assets. Vector and raster topographical maps, aerial photographs, census and other demographic data and even satellite imagery can become extremely valuable business information if analysed together with internal data in a common framework.

Businesses operate within an internal and external environment. Understanding the bigger picture of what the internal and external environment look like and how they relate to each other is critical to make correct strategic and tactical decisions.

Management information systems (MIS) and data warehouses are designed to acquire, store and distribute internal data to decision makers within the company. When these systems work, they can provide valuable insights allowing the company to maximise revenue from existing sources and improve operational efficiency to reduce costs. In reality the business units of many large companies operate in silos where internal data vary considerably in format, nature and volume.

The advantage of integrating GIS into BI

While GIS and BI have traditionally addressed different needs, these technologies have now converged, enabling business analysts to extend their view of the enterprise by integrating geospatial data with business information. At the same time, the growing consumer experience of mapping information is driving business awareness of location exploitation for commercial purposes. Consequently, merging GIS and BI technology produces results that extend beyond simply visually representing data on a map.

Combining the analytical power of databases with the geographic capabilities of maps, it allows business users to explore and analyse relationships between geographic data and business data. While BI tools are ideal for analysing who, what and when (customer, product, time), this analysis falls short of answering questions in relation to where, such as the relationship between where customers live and where they make their purchases.

Bridging the data gap to provide a total view of business

A picture is worth a thousand words

Business managers are under pressure to achieve more with fewer resources. They also have to assimilate growing volumes of information pertaining to increasingly complex business problems. Reporting is a mainstay of BI with “dashboards” currently gaining in popularity against management reports. The dashboard is a familiar graphic tool for business users to access key performance indicators, and can be used to better understand what has happened, when and why.

Enhancing these dashboards with mapping visualisation also offers businesses the opportunity to bring spatial analysis to a wider audience, moving from it being a tool for the GIS and BI specialists only, to a true tool for all business users. No other reporting format can match a map’s ability to condense information and compare multiple variables of a problem.

GIS is particularly suited to enhance management reports and “dashboards” with intuitive maps and graphics that take less time to evaluate and are easier to understand.

Getting answers fast

In the fast paced business world, the company who gets the answer to a problem first can sometimes gain a significant advantage over competitors. Information therefore only has value in the business environment if it reaches the right decision maker, at the right time and in an easily understood
format. GIS has the ability to help BI professionals locate more data and information faster by tying many internal and external data "pipes" together through location. In effect the GIS enhanced BI system becomes a true "one stop information shop"

Improving data quality and credibility
Due to the vast amounts of data stored by companies on almost every conceivable aspect of their business operations, it is maybe inevitable that errors sometimes occur which degrades the usefulness and credibility of information. With many data types such as large client databases some of these errors may be difficult or even impossible to detect in tabular database formats. Often it is only when this data is pulled into a GIS through a process like geocoding and mapped or spatially analysed that some of these errors can be detected.

Business areas where GIS can add value
Some GIS applications in business are readily apparent and well known. Examples include vehicle tracking and fleet management combining GIS with GPS technology. Location analysis for retail outlets have also utilised GIS with great success. There is however almost no area in modern business that cannot benefit from GIS integrated into BI with new applications being identified almost every day. Some of the business areas where GIS have proved immensely useful include:

• Retail trade area demarcation for traditional location analysis, customer segmentation and profiling, targeted marketing, branch merchandising etc.
• Target audience sampling in market research.
• Credit and geographic risk management.
• Market share estimation and resultant calculation of internal and external market potential to inform sales targets and estimate up and cross-sell opportunities to existing clients.
• Route optimisation, logistics and fleet management.
• Network planning optimisation for companies with branch networks.
• Physical asset tracking and management.
• Competitor analysis and threat assessment.
• Identifying areas of residential and retail growth and new business opportunities.

Using GIS at South African banks
South African Banks have used GIS for many years as a tool to inform business decisions. Traditionally, the use of GIS was restricted to network planning (placement of new ATMs and branches) within the domain of the distribution planning function. Over the last five years however spatial data and analysis have found a much wider audience across the spectrum of bank business units. As awareness of the technology grows the banks are finding more and more applications where GIS can add value by integrating the spatial component of information.

GIS have already played an important role in informing decisions regarding:

Financial Sector Charter – GIS technology has been invaluable in measuring and improving bank branch and ATM coverage in previously unserviced areas such as the former homelands and deep-rural South Africa.

Segment and product development teams – To understand the changes taking place in South Africa's complex demographic profile by area and over time, and to adapt existing or adopt new products to meet clients' needs and expectations. The technology is also very important in enabling realistic sales target allocation by product and branch.

Home loans and credit – As credit is extended to an ever larger proportion of the South African population it becomes important to track new developments in the residential market, determine market share of lending products and identify priority and problem areas.

Operations – The banks have large branch and ATM networks requiring considerable logistic support ranging from cash services to IT systems. GIS are very useful when needing to find answers for many logistics questions ranging from optimising of ATM servicing routes to managing courier and transportation costs.

Branch network – Branch and regional managers consume large amounts of information pertaining to the existing client base and residential, retail and industrial growth within their branch trade areas. This helps them to identify new growth opportunities and understand internal and external market potential to achieve sales targets.

Conclusion
You are a business manager asked to evaluate the merits of upgrading one of your company's branches at a considerable cost. Imagine being able to within seconds locate the branch on a digital map and your GIS enabled BI system allowing you to understand for instance:

• Staff productivity, sales and profitability of the branch as measured against a national or regional benchmark and possibly including a timeline comparison.
• Competitor branch networks within the trade or service area.
• Internal (up and cross-sell opportunities to existing clients) and external (difference between actual and required market share) potential of clients within the trade area.
• Client distribution within the trade area and their movement patterns from place of residence to point of sale.
• Client language, income and lifestyle profiles to assist with targeted marketing and merchandising.
• Logistics challenges, drive times and delivery routes pertinent to your branch.

To many business decision makers, having such a wealth of internal and external information available at short notice and within a single frame for analysis seems an almost impossible dream. It is however a fact that GIS enhanced BI can and has made this dream a reality for many companies. Imagine the possibilities.

References

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