

The Location Intelligent Enterprise Unlocking the value of location in data

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REPORT NOTE:

This report has been written independently by Quocirca Ltd in conjunction with Pitney Bowes MapInfo to provide an overview of the valuable insight an organisation can achieve from understanding the relevance of location data to its business.

The report draws on Quocirca's extensive knowledge of the technology and business arenas, and provides advice on the approach that organisations should take to create a location enabled enterprise.

During the preparation of this report, Quocirca has spoken to a number of suppliers and customers involved in the areas covered. We are grateful for their time and insights.

Knowledge of the location of customers, property, products or any other asset is invaluable intelligence for improving competitive advantage and operational efficiency. However, despite the proliferation of data that businesses generate today, the potential value of this location dimension is often overlooked in the business intelligence process.

With enterprises having access to ever greater volumes of historic data, to get maximum value from it they need to make use of the location element in order to drive deeper business insights to improve competitiveness and business performance.

- **Location is a critical component in almost every business transaction**
Although more than 80% of enterprise data has a location dimension, whether it is customers, stores, warehouses or other assets, this information is rarely exploited in traditional business intelligence analysis
- **Location intelligence is critical to fully exploiting the business intelligence (BI) process**
New and more valuable insights can be gained by adding the location dimension to data. Adding location capabilities to existing BI platforms can help leverage existing investments. Many business intelligence vendors are now providing location intelligence capabilities through partnerships.
- **Optimising the use of external data sources is the foundation for successful location intelligence**
For deeper insights into the environments external to the business, location intelligence enhances data by combining internal business information with external sources such as those regarding roads, rivers, rail networks, power lines, competitors or populations (from census information). This enables businesses to more accurately target marketing, develop personalised services, plan store locations and determine risk exposure.
- **Location intelligence is no longer exclusively the domain of Geographic Information Systems (GIS) users**
The growing consumer experience of mapping information is driving business awareness of location exploitation for commercial purposes. As a result, today's location intelligence solutions offer more flexibility and ease of use than traditional GIS. This enables more users to access location intelligence within the framework of their daily applications.
- **Location intelligence is more than desktop mapping**
Whilst free or inexpensive mapping tools such as Google Maps and Google Earth, Microsoft Live Local or MapQuest are becoming more widespread, enterprise location intelligence offers far greater business value. When geographic visualisation is combined with predictive analytics, organisations gain an insight into the impact that location has on future business performance.

Conclusion

Businesses continue to be challenged with gaining intelligence from the huge volumes of data they capture and manage. Those that have added location intelligence tools to their BI platform are reaping the benefits through optimisation of their operations by analysing and targeting products or services more effectively. The opportunity for location intelligence centres on capitalising on the location-specific information that is already available within this data, and now is the time for organisations that are yet to make the move to seriously consider the opportunity that location intelligence presents.

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1. Introduction: Unlocking the value of “where?”

The global digital age has had a profound impact on consumer access to maps, which are becoming an intrinsic part of everyday life. Many are familiar with web-based mapping applications like Google Maps, Yahoo Maps or Microsoft Windows Live Local, as well as 3D maps such as Google Earth or Microsoft Virtual Earth. Along with GPS (global positioning system) devices for leisure, in-car navigation and the emergence of mobile phones and handheld devices that offer GPS services, we are all being exposed to a wealth of location based information. The influx of these web-based mapping services and pervasive GPS data is bringing location to the masses and also stimulating the corporate appetite for exploiting location technology.

Location is relevant to all businesses – it is a common dimension of almost all business information and an important element for many business decisions. Where are my best performing stores? Where are my most profitable customers? Where are my competitors or suppliers? What is the potential revenue opportunity compared to investment costs necessary to enter a new market? Today, businesses are generating volumes of data, almost all of which have a geographic dimension, captured and processed through a myriad of business applications such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems. This, combined with the growing use of Radio Frequency Identification (RFID) tagging and GPS technologies to track business assets and events in real time, means that understanding the value and impact of location on business performance has never been more important.

Harnessing business data to measure and analyse business performance has long been the mainstay of business intelligence applications. However, all too often, the location dimension of business data is overlooked, meaning its potential impact and influence on business operations is left unexposed. Understanding the relevance of location is fundamental when deciding on store locations, developing marketing campaigns, tracking and managing assets or designating sales or delivery boundaries. This is the foundation of location intelligence.

Through combining the geographic dimension of business data together with external geographic data such as road networks, place names and attributes, demographic information, or other geographically dispersed data such as hurricane impact areas, location intelligence produces a visualisation in the form of a map that can be explored, manipulated and analysed to unlock the value of “where”. Whether it is best performing stores or sales people, capacity of utility networks, customer and market characteristics, or high crime areas, all of this information can be placed on a map to understand how it relates to other spatial information such as competitors, consumer segmentation information, daytime population patterns or delivery boundaries. Businesses that are able to exploit the context of this location information can gain valuable insights into business performance – not only where they are today but where they should be in the future.

The key elements of a location enabled intelligence platform

Location intelligence enables a business to measure, compare and analyse data from its business operations in conjunction with external reference data, to help make better, more informed business decisions.

Location intelligence comprises

- Scalable technology that is easy to use and integrated into business applications and systems
- Spatial function capabilities that enable the analysis, manipulation, visualisation and prediction of geospatial patterns
- Reference data such as geographic data (cities, streets, buildings) and their attributes (demographics, consumer buying patterns, exposure to extreme weather conditions)

The aim of this document is to outline the opportunity of location intelligence for the 21st century enterprise and how it can enhance decision making and business insight through leveraging existing investments in business intelligence tools.

2. Definitions

Before discussing the evolution of location intelligence, it helps to define some terms that are commonly used with reference to analysing location enabled data.

- **Geospatial:** Geospatial data represents objects that can be referenced to a location – either a specific point or a relevant area on the Earth’s surface. Spatial data, in contrast, represents the location of objects relative to each other in space with no Earthly context. However, the terms are often used interchangeably. Geospatial data can be about either natural or constructed features; examples include data representing roads, rivers and property boundaries. Geospatial data can also be derived – the probability of flooding zones, most profitable sales territories per capita, or the relative efficacy of special business development zones. Geospatial data is usually stored as single or multiple pairs of coordinates (longitude, latitude and often height above sea level), enabling it to be visualised on a 2- or 3-dimensional map as points, lines or areas. This forms the basis of geospatial analysis which enables a user to visualise, analyse and manipulate geospatial data. So, for instance,

the geospatial data may be a house, and the attribute data would be information such as the owner, address, postcode and value.

- **GIS:** Geographic Information System: A tool for accessing, manipulating and analysing spatial data. GIS systems represent geospatial information as thematic digital map layers linking this information to tabular data. For example, street information, census data, postcode boundaries and customer locations can each be stored as separate layers. This makes it easier to manage and manipulate data, as the power of geospatial analysis comes from being able to analyse the spatial relationships between different geographic layers.
- **Geocoding:** Geocoding is the process of assigning geographic coordinates (for example, longitude and latitude) to data such as addresses, postcodes or administrative boundaries such as cities or states. In a geocoded database, every record has a location given in latitude and longitude, enabling it to be displayed as a feature on a map. Through geocoding, an insurance company can determine the precise geographic location of properties from a customer address list, and map this in conjunction with information such as flood plain boundaries.

3. The evolution of location intelligence

Maps have long been a universal medium for communication, easily understood and appreciated by most people, regardless of language or culture. As humans, we have an innate capability to process information spatially and think visually. Throughout history maps have acted as a tool for data analysis, providing visual cues to show context and connections, whether it is identifying territorial boundaries for military purposes, or understanding the clusters of a disease outbreak in relation to its geographic context.

Not only do maps provide a meaningful way to display geographic information, they also are efficient high-density stores of information. And as well as offering a visual dimension for analysis, maps are also able to convey information on a particular subject in a much broader context. In a single glance at a map, a reader can tell what's going on over the whole map at a specific moment in time. Although maps are inherently static in nature, through careful interpretation they can lead us to new insights and discoveries.

The emergence of geographic information systems (GIS) in the late 1960s dramatically increased the amount of information that could be contained or manipulated in a map. Back then, GIS technology was primarily developed to support government, military and scientific organisations, before evolving in the 1990s as a tool for business analysts in commercial markets. GIS has long been established in a number of industries, with a relatively dedicated user community. For instance, the utility industry is an established user of GIS for asset management of their electric, gas and water networks.

GIS was traditionally restricted to the domain of technically skilled operators. GIS professionals did everything from creating spatial data sets and building spatially enabled databases, through to complex spatial analysis and cartographic design. Operations were generally confined to powerful, standalone computers, with the GIS database managed and maintained as a separate component within an organisation. As such, GIS systems were complex, used proprietary data formats and were not integrated with the rest of an organisation's IT infrastructure.

Today, location intelligence has evolved from this established community, beyond the realm of the expert single user, to enable the broader analysis of location information in an organisation. Location intelligence solutions extend beyond simply visually representing data on a map. They combine the analytical power of databases with the geographic capabilities of maps, allowing business users to explore and analyse relationships between geographic data and business data.

Database vendors such as IBM, Oracle and Microsoft have been quick to recognise the power of location data, offering extended spatial capabilities for their database products. Meanwhile business intelligence vendors are also integrating mapping analysis functionality through licensing geospatial capabilities from established GIS vendors.

The Industry Space

Today the location intelligence market is characterised by the growing trend to integrate geospatial capabilities into enterprise systems and business processes. The market can be defined in the following way:

- **Location Intelligence**
These vendors typically offer a full range of geospatial solutions from traditional GIS for workgroup or departmental applications, to enterprise location intelligence. The primary vendors in this space are Pitney Bowes MapInfo and ESRI.
- **Enterprise Databases and applications**
Several database products offer the capability for storing spatial data. Oracle Locator and Oracle Spatial provide core and advanced geospatial functionality respectively for Oracle Database products. IBM DB2 Spatial Extender and Informix Spatial Data Blade both enable geospatial data to be manipulated in the respective databases. Microsoft SQL Server 2008 will be the first version of SQL to support spatial data and operations natively. SAP also offers spatial capabilities within its ERP platform.
- **Business Intelligence**
Companies including Business Objects, Microstrategy, Information Builders and SAS Institute all provide some level of geospatial capabilities through partnerships with established GIS vendors. Other players in this market also offer spatial analysis, through, for instance, integration (or mashups) with services such as Google Maps, enabling enhanced dashboard visualisations.
- **Personal Productivity**
Solutions and services such as Microsoft MapPoint, Google Maps and Yahoo! Maps are increasingly making mapping and location search capabilities accessible to a wider audience (both consumer and business) at either low cost or for free.
- **Location Based Services (LBS)**
The mobile telecoms industry has been looking to capitalise on its knowledge of the location of handsets through solutions that can make this information available to new mobile services, from navigation to 'find my nearest...' applications.

4. The value of geospatial data

Data is the fuel that drives the engines of location intelligence. Geospatial analysis requires accurate and relevant data, which is achieved through the integration of an organisation's proprietary data – such as customer records, sales information or delivery routes from disparate databases – and cross-referencing it with third-party reference data.

Business proprietary data

This is information that is specific to the business, already stored in databases or used in planning or running business operations. In order for it to be integrated with a location intelligence system, this information must be "location enabled", that is, geocoded so that all information is referenced as X and Y coordinates (and Z, if elevation is needed). Examples of business proprietary data are:

- Static data: geocoded information on customers, suppliers, store locations, warehouse locations
- Business-specific reference data: business-specific categorisation of data, such as sales territories, geographic reporting areas (for example, defining which countries are covered by particular subsidiaries, resellers, partners or distributors), or authorised operating territories (for example, defining where a utility is authorised to operate)
- Dynamic data: information on the location of vehicles, parcels and other assets (on a local scale established with RFID or on a large scale by GPS)

Third party reference data

Ready-to-use geospatial data sets are provided either directly by the location intelligence vendor or through third-party partners. Data may be chargeable or free depending on the type of information (this varies by country – in the US most geospatial data is free, unlike the UK, where data sets are generally chargeable).

Static reference data includes:

- Mapping data such as country maps, street maps, road maps
- Boundaries – postcode areas, administrative districts or regions, constituencies
- Demographic data – including census information such as household records, average income levels, age
- Industry-specific – specialised data sets of significance for specific industries; historical flood zone probabilities, for insurance, or communications backbone and switching centre locations for telecommunications
- Lifestyle data for predicting patterns of consumer behaviour

Dynamic reference data includes:

- Weather information, traffic reports through web mapping services. Relies on continuous third-party service availability.

Sourcing Geospatial Data

Deciding what data and where to source it from can be a challenging and time-consuming task. There are many data providers promoting their own products. These include the location intelligence vendors and the third party vendors who create the data in the first place.

Using a data consultancy provider that is vendor-neutral can help define and source the data to address the relevant business requirements.

Some issues to address when choosing data are as follows:

- **Return on investment** – what is the balance between your investment in reference data and the return from using this data?
- **Accuracy and currency** – how up-to-date is the data?
- **Data content** – is it polygons (for example boundaries) or point data (coordinate locations)? What attributes does it contain? (For example the actual spatial data could be a store location, the attribute data could be store name, size, turnover, etc.)
- **Updates** – How often is the data updated or checked?
- **Licensing** – how is the data licensed, and how are updates charged for and provided?
- **Format** – is the data available in formats for the location intelligence system you use?

For the most commonly used UK, European and worldwide data the following are the largest providers of third-party data: Governmental sources for census and demographic data, Ordnance Survey [UK only], Royal Mail [UK only], TeleAtlas and Navteq.

5. Extending business intelligence with the visual power of maps

Business Intelligence (BI) solutions are designed to extract and analyse information from data warehouses, allowing decision makers to take action to improve business performance. BI tools are ideal for analysing dimensions of *whom*, *what* and *when* (customer, product, time). However, this analysis falls short of answering questions in relation to *where*, such as the relation of *where* customers live to *where* they make their purchases.

Whilst GIS and BI have traditionally addressed different needs, the emergence of location intelligence is converging these technologies to enable business analysts to extend their view of the enterprise by integrating geospatial data with business information. Combining the unique spatial analysis capabilities of location intelligence with the analytical capabilities of BI solutions helps businesses to more quickly assess, plan and make decisions, thereby gaining several benefits from using location-enhanced BI:

- **Leverage existing BI investments**

Location intelligence is designed to take advantage of geospatial information already stored within a database. So the location intelligence solution can operate within the existing BI environment, meaning users can use the mapping function as part of their existing application without having to be GIS experts. This also means that IT departments are not required to maintain, learn and use two sets of administrative tools or train users on different applications. This therefore saves both hardware costs and enhances user productivity.

- **Data enhancement**

This is the key to exposing the benefits of location intelligence – enhancing enterprise information through integrating with other sources of geospatial data. In site selection, for example, customer location data, combined with reference data on rail networks, power lines, and road network geography all integrated on a single map could quickly show where you might locate a manufacturing plant. This reference data can be delivered via web services, ensuring that reference data is accurate and up-to-date.

- **Enhanced visualisation and analysis**

The visual power of maps reveals trends, patterns, and insights that are not as easily detected in other data presentation formats such as tabular views, or even the ubiquitous bar and pie charts. In insurance, for example, only a map can easily expose the inherent relationship between customers, property and risks associated with a specific geography such as flooding or hurricanes. Similarly, potential risk areas for crime, healthcare issues and employment can also be best viewed graphically against maps.

Maps can be used for sophisticated queries, without needing to know a query language like SQL. For example, using reference boundaries (such as census or postal), together with customer locations, a user can select all prospects within a 15-mile drive-time of a series of store locations.

- **Map-driven dashboards**

The dashboard is a familiar graphical tool for business users to access key performance indicators, and can be used to drill down to understand what has happened, when and why. By adding a map dimension to the dashboards, users can also understand the dimension of “where?” 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.

- **Bi-directional interactivity between map and report**

Location intelligence enables users to interact with both map and data, with changes made to the map reflected in the report, and vice versa. For instance, via a graphical geographic representation an insurance company can zoom in on a particular location to identify policyholders who live in the path of a storm or flood plain. This is using both existing customer information, which will have been geocoded to a position on a map, together with third-party data on weather and climate changes.

The user can then drill down on the map and be presented with report data on the relevant policyholders, and then toggle between the map and report data to locate those policyholders who are most exposed to the risk of a storm or flood. This offers the scope for insurance companies to precisely target specific addresses and pre-warn policyholders on imminent risks and ways to mitigate that risk – so saving considerable amounts of money for the insurance company, while generating better relationships with the policyholders.

- **Predictive analytics**

Predictive analytics encompasses a variety of techniques from statistics and data-mining that process current and historical data in order to make “predictions” about future events. Predictive analytics enables organisations to gain valuable customer and market insight, to predict, for example, purchasing behaviour characteristics for any product or service.

Insurance companies use predictive analytics to forecast how long policyholders will live, or their likelihood of being involved in a car accident. Financial firms use predictive analytics to assign credit risk scores to

borrowers. Similarly, retail firms use spatial predictive analytics to model optimum sites for store locations and predict potential sales. Banks use spatial models to optimise location of bank branches and the mix of services offered at each, as well as to compare the operating performance of each branch to other branches in similar markets. Incorporating spatial modelling capabilities and techniques and using map visualisations enhances the power of predictive analytics by enabling analysts to quickly identify and explore findings using intuitive visualisation techniques.

Case Study – Guy Carpenter

Guy Carpenter & Company, LLC is the world's leading risk and reinsurance specialist and a part of the Marsh & McLennan Companies. Guy Carpenter creates and executes reinsurance and risk management solutions for clients worldwide through 2,600 professionals across the globe.

It has developed i-aXs, a web-enabled platform that integrates temporal data with its own risk analysis and catastrophe-modelling capabilities to help insurance companies to better use information for their strategic and operational advantage. The platform uses geospatial technology, to provide insurers with access to real-time exposure data and a range of customisable imaging, tracking, analysis and reporting tools.

i-aXs uses Oracle Spatial to store, organize and manage spatial data and leverages MicroStrategy's business intelligence technology. Guy Carpenter sought a way to more efficiently analyze and report data from a location perspective, so integrated the Pitney Bowes MapInfo Location Intelligence Component with its MicroStrategy business intelligence platform. As a result, insurance companies can now utilise location intelligence whilst also accessing a range of enterprise reporting and analytic solutions.

Pitney Bowes MapInfo enables users to perform multi-dimensional analysis of complex data using geographic visualisation. For example, users are able to quickly identify and visualise concentrations of policies around each other, as well as around known terror targets. In addition users can mine through their exposure and associated loss estimates by any geographic level available for the country in which the exposure lies.

The key mapping components that contribute to the platform's power are MapXtreme Java, the MapInfo Location Integration Component, MapMaker, worldwide geocoding data, worldwide administrative boundaries, and worldwide street data.

Guy Carpenter's competitive advantage and value proposition have improved markedly as evidenced by the increase in new business.

6. Location Intelligence in practice

Targeted marketing and market analysis

A location intelligence solution integrated with an existing customer database enables an organisation to visually identify its most valuable customers, see how demographics correlate with sales, then target where new customers with similar demographic characteristics are located. This can be used to predict sales, design sales territories, choose store locations or tailor marketing campaigns and sales techniques in a region with better allocation of resources.

Real estate planning

Location intelligence lets organisations quickly determine the best locations for services centres, stores, warehouses, or corporate offices, based on proximity to customers, transportation infrastructure, demographics, location of competitors and environmental risk factors. By combining existing customer and market data with demographics, drive time and trade area analysis, location intelligence enables a business to identify which locations will reach most customers – ultimately which sites will generate the most revenue.

Financial services/ insurance

Using the geographic visualisation capabilities of location intelligence, risk analysts can accurately identify and analyse the accumulation of risk by a geographic area, using a combination of policyholder data and external reference data such as weather, based on modelling techniques that may already be used.

Utilities

Utility providers (such as cable, gas and electric and wireless providers) can use location intelligence to optimise network planning and operations, marketing and sales activities and customer service.

The telecommunications industry in particular is characterised by high customer churn, so understanding customer needs and their geographic variations is key to improving service levels and enhancing customer loyalty.

Logistics

The increasing use of mobile devices, the growing adoption of GPS and RFID make it easier to identify the location of someone or something. These technologies generate more data that businesses need to analyse, and this data will naturally contain a location component.

Businesses can track vehicles and inventory, analyse delivery patterns, generate best-routing maps, predict and adjust for road traffic and project and manage transportation fleets and logistics.

Case Study – Addison Lee

Addison Lee is one of the UK's largest cab and courier companies, with 1,600 vehicles on the road, 400 office staff and 280 booking agents.

As part of an overall strategy to improve business efficiency, Addison Lee embarked on a project to rebuild its core systems in order to implement location intelligence for their booking and dispatch systems, which was traditionally a manual approach.

The MapInfo Envinsa platform has enabled Addison Lee dispatchers to access time critical information on the location of vehicles, leading to increased fleet productivity through more jobs per driver per day as well as reduced drive time.

Through optimising booking times, Addison Lee has strengthened its customer service through the ability to respond to customer bookings in narrower time frames. Booking times have reduced from 90 to 60 seconds and higher accuracy of driver and job positioning has resulted as drivers can be booked in proximity to their customer location.

For end users, training was minimal, ensuring fast adoption of the Pitney Bowes MapInfo solution. Addison Lee is now looking to enhance its current implementation, through future support for voice recognition bookings and identifying car sharing opportunities, which will further drive efficiencies in booking and dispatch capabilities.

Public sector

Geographic information is central to all public services, and organisations in this sector are already benefiting from analysing the huge volumes of data they capture and store, in the context of location. Some examples are:

- **Law enforcement**

Mapping the incidence of crime and integrating this with information from databases from other organisations. For instance, viewing the use of a credit card on a map enables better predictions on where a suspect may be going, or identifying levels of crime activity (such as crime hot spots) so that future trends can be predicted, enabling faster responses.

- **E-government**

Location intelligence can form the foundation for electronically delivering government services to the public, through consolidation of all service information and access relative to a specific geographic constituency. This can range from self-service web sites that allow citizens to determine the closest affordable housing or the appropriate school district, to planning delivery of public services.

- **Healthcare**

Location is the common factor that can bring health and community data together. This can range from offering insight into issues ranging from the geographic distribution of disease outbreaks, to healthcare access and delivery variations for different geographical areas.

- **Roads and infrastructure**

Public authorities are responsible for building and maintaining vast amounts of infrastructure, from roadways, pedestrian areas and parks to water and electrical networks. Identifying where these assets are, the condition and/or need for repair and schedule for preventive maintenance is critical to the effective delivery of services to the public.

7. Location intelligence directions

There are a number of areas which promise to change the landscape for location intelligence. These changes will not only make geospatial data and analysis accessible to more users within an enterprise, but will also promote the collaboration and sharing of geospatial data that is essential to reducing the costs often associated with traditional GIS.

Open standards

Open standards have encouraged the development of interoperable, enterprise geospatial applications for the analysis of geospatial data.

Some of the open standards include:

- **Open-Source Geospatial Foundation (OSGeo)**, a non-profit organisation that aims to promote the collaborative development of open geospatial technologies and data. Beyond software development, it also promotes more open access to government-produced geospatial data and free geospatial data such as that created and maintained by the OpenStreetMap project.
- **Open Geospatial Consortium (OGC)**, an international industry consortium of over 300 companies, government agencies and universities participating to develop publicly available interface specifications. OpenGIS specifications support interoperable solutions that "geo-enable" the web, wireless and location-based services, and mainstream IT.
- **Geographic Markup Language (GML)**, an XML data standard that enables internet-connected devices to access geographical information, such as store locations and traffic conditions.

Web services and Service-Oriented Architecture

Future development of location intelligence may centre on the use of service-oriented architectures (SOAs). Through web services, location intelligence solutions can offer a single environment for accessing external services and analysing enterprise information. A services-oriented architecture (SOA) enables the integration with online data sources, especially where real-time data is needed to support operational systems. For example, inventory control systems using RFID represent an opportunity to integrate real-time data with location technology, with the results being visualised as a service provided through a portal or dashboard.

Enterprise mashups: opening spatial analysis to more users

Today, geospatial technology is beginning to be delivered as standard components that can be integrated into enterprise information systems. This composite open application integration/mashups capability is a dramatic departure from the traditional proprietary nature of geospatial applications.

A mashup is an integration of at least two disparate web sites or services into a single web-based application. Mashups offer easy online access to data and processing services via openly accessible application programming interfaces (APIs). Essentially, they are an evolution of business-customised applications, making use of Web 2.0 technology standards such as JavaScript, AJAX, open APIs, RSS and Atom feeds, and the growing volume of web-based information to layer multiple web data sources on a single site, making the combined data more relevant.

GIS mashups have been around for as long as web services, as combining data from multiple sources is central to GIS applications. Map-based mashups have seen growing popularity due to companies like Google and Yahoo, which offer free application programming interfaces that make it both easier and more affordable to publish online maps. Creating mashups is becoming far simpler, and different functions can be brought together from multiple different web sites and providers through graphical means without the need for much, if any, additional coding. This means that the advantages and opportunities offered by GIS, LBS and LI can be accessed by many more end users – this can then provide greater effectiveness and efficiencies for the organisation.

For businesses, mashups offer the opportunity to combine existing business intelligence data with external geospatial data into a dashboard-like view. By using an Enterprise Mashup, a user can "drag and drop" weather reports from the National Weather advisory, maps from Google Maps and the company's national hardware inventory data into a composite application that will show, for example, which stores will be hit with the storm or which stores need inventory, enabling the manager to prioritise deliveries.

Although enterprise mashup adoption is still in its infancy, it offers a number of benefits for businesses that wish to combine their business data with external geospatial information.

- High-quality maps at little or no cost: using remote services avoids the need to purchase and host expensive data/software locally.
- Scalability: opens location intelligence to a wider audience.
- Easy to use and deploy: mashups offer a familiar user interface, and do not require high levels of technical knowledge to develop or use.

- For enhanced application functionality, mapping mashups can be connected to other spatial services such as geocoding, routing and address validation services.
- Valid, current data sets with external organisations taking the responsibility for the currency and accuracy of the data, leaving businesses free to focus on core activities.

However, fundamental to the benefits of using a mashup is the user experience, beyond simply mashing two or more sets of data. For business-critical decisions data quality is vital, and today much of this data is only available at a premium. Other challenges with mashups are:

- Exposing data over the internet poses possible security risks, if not done correctly.
- Since web availability is a requirement of access, the possibility of denial of service is increased if a third party is responsible for providing a service over the public network. Therefore assessing the reliability and integrity of the providers of geospatial data is vital.

Mobile GIS: using location intelligence in the field

Mobile GIS is essentially an integration of hardware and software for the access of spatial data and services through mobile devices. Field-based Mobile GIS essentially focuses on data collection, validation and update.

Traditionally, the process of field data collection and editing has been time-consuming and error-prone. Geographic data has been captured in the field using paper maps, and edits are typically characterised by manual notes or sketches on maps or clipboards. Typically these field edits are then decoded and manually entered into a GIS database, meaning the data may not be either up to date or accurate, ultimately delaying geospatial analysis and decision making.

Today, the mobile device is rapidly becoming a key to increased productivity in business and promises to drive the adoption of mobile geospatial services and applications.

Recent developments in mobile technologies have enabled location intelligence information to be taken into the field as digital maps on compact, powerful mobile computers, providing field access to enterprise geospatial information.

This enables organisations to capture real or near-real time information into their enterprise database and applications, improving the decision making process through using up-to-date, more accurate spatial data. These devices promise to drive the adoption of mobile geospatial services and applications in the near future.

8. The location intelligent enterprise: fundamental steps

The following approach outlines key steps to creating a Location Intelligent enterprise.

1. Establish where location is relevant to your business

Assess where and how location information is used in your business. What are the critical business decisions faced that involve location? Understand the different user profiles and their information needs.

2. Evaluate location intelligence products and technologies

Determine criteria for evaluating vendors and their solutions. For example, does it offer complete end-to-end capabilities such as desktop mapping, external reference data, advanced analysis and reporting?

Does it offer ease of deployment? Is it scalable so that once it has been proven, it can be rolled out quickly to more users?

How easily will it integrate into existing environments? In order to work effectively with current solutions it should support open standards as well as offer modularity, in case more functionality needs to be added at a later stage as requirements change.

Also, assess the track record of the company – can the chosen provider show multiple proof points; how solid are the company's financials; can it show a strong road map for future development?

3. Conduct a data audit

The successful implementation of any location intelligence solution is dependent on the data it uses. Perform an audit of the spatial data within an organisation in order to establish what spatial data is already stored. Is it up to date? Consider how frequently your organisation will need to receive updates – automatic refreshes ensure that the most up-to-date geospatial data is available. Is it cost-effective? A data audit should also focus on integration, quality and master data management (MDM) issues.

Identify the external reference data that is relevant to your business (e.g. census information, customer purchasing patterns, postcode and street boundaries).

4. Spatially enable enterprise data

This process involves identifying if the raw data that is stored in the data warehouse has a geographic element, and adding fields for longitude and latitude (and elevation, if applicable). So, for example, this coordinate information could be added to customer records, prospect databases or to information on store locations or distribution outlets. At this time, custom boundaries can be created to identify sales territories or delivery boundaries. This geocoding of information enables the data to be visualised and analysed graphically on a map.

5. Implement and measure improvement

A relevant measure of success is the number of users who are now accessing and manipulating geospatial data to support decision making. Broadening the adoption of location intelligence in this way empowers end users to gain faster and deeper insight into business performance, which ultimately enables organisations to improve both their business processes and operational performance.

9. Conclusion

Businesses continue to face demands for faster and more accurate insight into business performance, and as a result, to be able to both predict and react faster to market changes. Location intelligence plays a critical part in this decision making process, as almost every business decision has a location element to it. Through dynamic geographic visualisation organisations can harness the power of location intelligence to understand where their most valuable assets are located, and predict and respond faster to the impact of external market forces.

Although the move to embrace location intelligence requires careful assessment, for most companies who already have invested in a business intelligence platform for their reporting needs, location intelligence is simply an extension to this. Businesses need to consider where location is relevant to them and get started with spatially enabling their business data, then identify which external data sources would be most appropriate in gaining a fuller picture of the market environment that the organisation operates within. Although this is not a trivial task, the investment in time spent doing this is outweighed by the benefits of location intelligence, gaining better insight into an organisation's competitive environment, reducing business costs, minimising risk and adding business value to operational decisions.

Data continues to drive business value today and it is the way in which this data is analysed that sets the most effective business apart from its competitors. Enterprises should consider the relevance of location to their business and its strategic value to decision making; only then can they truly realise the benefits of location intelligence.

About Pitney Bowes MapInfo

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Pitney Bowes MapInfo, part of Pitney Bowes Inc. (NYSE:PBI), is the leading global provider of location intelligence solutions, integrating software, data and services to provide greater value from location-based information and drive more insightful decisions for businesses and government organisations around the world. The company's solutions are available in multiple languages through a network of strategic partners and distribution channels in 60 countries. Visit www.mapinfo.com and www.pb.com for more information.



About Quocirca

Quocirca is a primary research and analysis company specialising in the business impact of information technology and communications (ITC). With worldwide, native language reach, Quocirca provides in-depth insights into the views of buyers and influencers in large, mid-sized and small organisations. Its analyst team is made up of real-world practitioners with first-hand experience of ITC delivery, who continuously research and track the industry in the following key areas:

- Business process evolution and enablement
- Enterprise solutions and integration
- Business intelligence and reporting
- Communications, collaboration and mobility
- Infrastructure and IT systems management
- Systems security and end-point management
- Utility computing and delivery of IT as a service
- IT delivery channels and practices
- IT investment activity, behaviour and planning
- Public sector technology adoption and issues
- Integrated print management

Through researching perceptions, Quocirca uncovers the real hurdles to technology adoption – the personal and political aspects of an organisation's environment and the pressures of the need for demonstrable business value in any implementation. This capability to uncover and report back on the end-user perceptions in the market enables Quocirca to advise on the realities of technology adoption, not the promises.

Quocirca research is always pragmatic, business-orientated and conducted in the context of the bigger picture. ITC has the ability to transform businesses and the processes that drive them, but often fails to do so. Quocirca's mission is to help organisations improve their success rate in process enablement through better levels of understanding and the adoption of the correct technologies at the correct time.

Quocirca has a proactive primary research programme, regularly surveying users, purchasers and resellers of ITC products and services on emerging, evolving and maturing technologies. Over time, Quocirca has built a picture of long-term investment trends, providing invaluable information for the whole of the ITC community.

Quocirca works with global and local providers of ITC products and services to help them deliver on the promise that ITC holds for business. Quocirca's clients include Oracle, Microsoft, IBM, Dell, T-Mobile, Vodafone, EMC, Symantec and Cisco, along with other large and medium-sized vendors, service-providers and more specialist firms.

Sponsorship of specific studies by such organisations allows much of Quocirca's research to be placed into the public domain at no cost. Quocirca's reach is great – through a network of media partners, Quocirca publishes its research to a possible audience measured in the millions.

Quocirca's independent culture and the real-world experience of Quocirca's analysts ensure that our research and analysis is always objective, accurate, actionable and challenging.

Quocirca reports are freely available to everyone and may be requested via www.quocirca.com.

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The logo for Quocirca, featuring the word "quocirca" in a lowercase, sans-serif font. The letters "quoc" are in blue, "irca" is in red, and the "c" at the end is in black.