

Spatial Data a New Frontier in Business Analytics

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Abstract

Spatial data and analysis is used in the planning and management of natural resources for decades. The advent of sophisticated data acquisition technology along with development in communication technology has brought the spatial data in the ambit of businesses. Global corporations are increasingly using Spatial data as a vital decision-making tool. It is important for businesses in India to recognize the potential of Spatial data and its relevance in doing business in the twenty-first century. This paper is an attempt to illustrate the nature and potential of spatial data and its relevance to businesses.

Introduction

Trying to understand our surroundings and location is an age-old process. Location is fundamental to our existence as human beings. We attach not only practical but emotional bond with locations. These practices are extremely important for businesses to understand as they make up the influence of choices people make. Spatial data that is manipulated through a series of technology tools collectively known as Geospatial technology. Location-based information is used predominantly in natural resources, forestry, agriculture, and regional and environmental management (Jensen 2013). The organizations in India are slow to adapt GIS even though a substantial component of business data is spatial. The spatial data is an integral part of logistics, facility management, location and allocation of resources, marketing, and decision making (Chang 2007). The spatial data analysis tools need to be adopted more widely and routinely by organizations to improve the quality and efficiency of decision making. The GIS can help with numerous business processes such as in marketing GIS can be involved in activities such as the location of promotions, improving accessibility to the target audience, analyze markets through demographics or location stores and managing logistics. GIS can improve resource management and help manage inventories. According to Mennecke (2007), between 50 and 85 percent of data used in industry is spatial in nature. GIS tools are powerful when it combines data storage, analysis, and visualization, with the mapping systems to analyze and model complex phenomenon. (Goodchild, 1991). In the era of globalization, the global

supply chains are increasingly becoming more complex and critical for successful business. Geospatial technology can provide the vital backbone for such diverse networks. The purpose of this paper is to highlight the importance and application of Geospatial Technology in business functions and decision making.

Geospatial Technology

The Geospatial Technology encompasses Geographic Information Systems, Remote Sensing and Global Navigation and Satellite System. These systems help acquire, analyze and display spatial data. Geographic Information System is a computer-based system that captures, prepares, manages, manipulates, analyze and visualize spatial data. (Aronoff, 1989)

Spatial data is employed in business analytics in various ways. Some of the core business functions are more in line with many government sectors that are using GIS for many years. Functions such as operations and logistics, the location of new facilities, allocation of resources, planning, and decision making all involve a certain degree of spatial data analysis. GIS can harness the ability of spatial data map the non-spatial or attribute data (Old, 2001). GIS also provides the ability to form linkages between spatial and non- spatial data, for example, the location of stores can be linked to sales data from each store will reveal the service area or reach of individual stores.

These various applications are unique to business activities (Oracle 2010). First and foremost is the data acquisition which enables the businesses to collect spatial data related to their activities, for example, a transport company can track all their shipment through acquiring location data from their vehicles in real time. Network analysis allows for efficient route planning and monitoring. Such spatial data can be harnessed to increase efficiency through better routing decisions and building an efficient logistics network. Automated mapping and facility management commonly known as AM/FM, is a utility-specific subsection of a GIS system that caters to the need of organizations managing utilities such as water, electricity, and sanitation. The GIS relays real-time location specific digital information to help manage networks efficiently (Murray 2010). Such systems have proven to be very cost effective.

Nature of Spatial data

Spatial data as the name suggest relates to the location of an object in space. It helps put context to our world. For businesses, it shows the location concerning its customers, competitors, resources, etc. The spatial data helps visualize patterns and understand what role the location plays in given business. The spatial data such as satellite data helps to visualize, measure, and manage large assets such as special economic zones or acres of farmland. It helps us size up our assets about surroundings. It also helps us understand the distribution of assets such as stores, branches or ATM locations. (Figure 1).

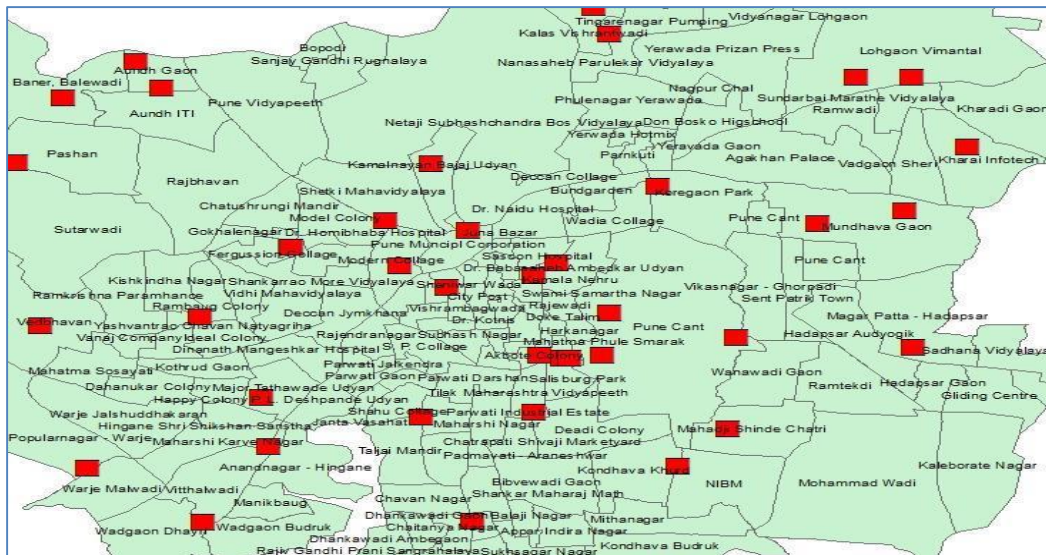


Figure 1.

Spatial data when coupled with other nonspatial attribute data can bring out patterns that are vital for decision making. It is coupled with demographic data for customer insights or climate data for potential threats or historical data for predictive analysis. The spatial data not only specifies locations it can build a network. For example, it can represent a network of roads, pipelines or corridors (Figure 2).

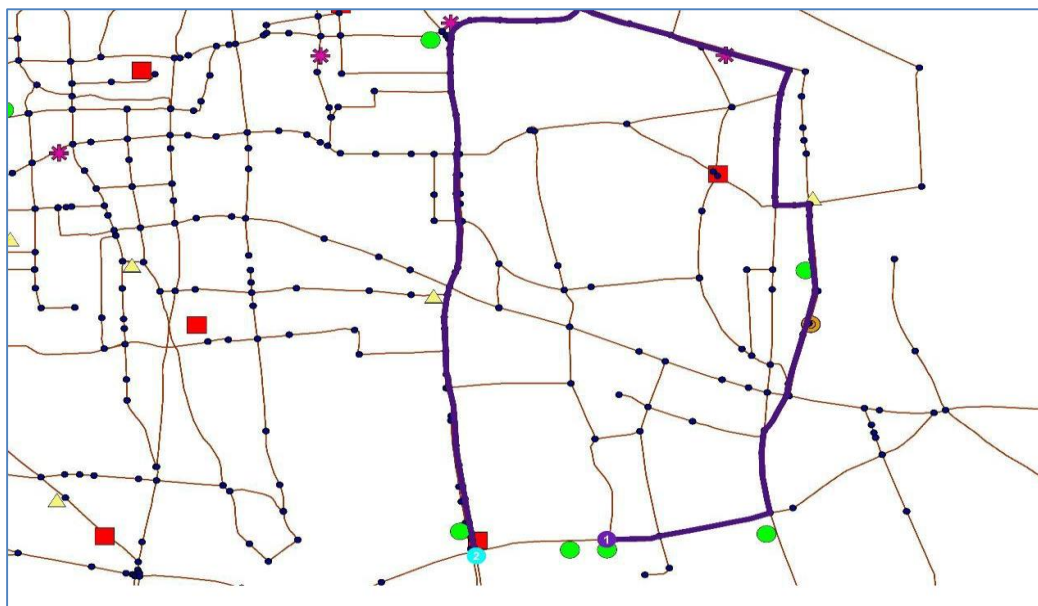


Figure 2.

Spatial data is especially adept at detecting and quantifying spatial patterns such as agglomeration or clustering. It can show hot spots and outliers concerning locations which are analyzed through time for predicting trends (Figure 3).

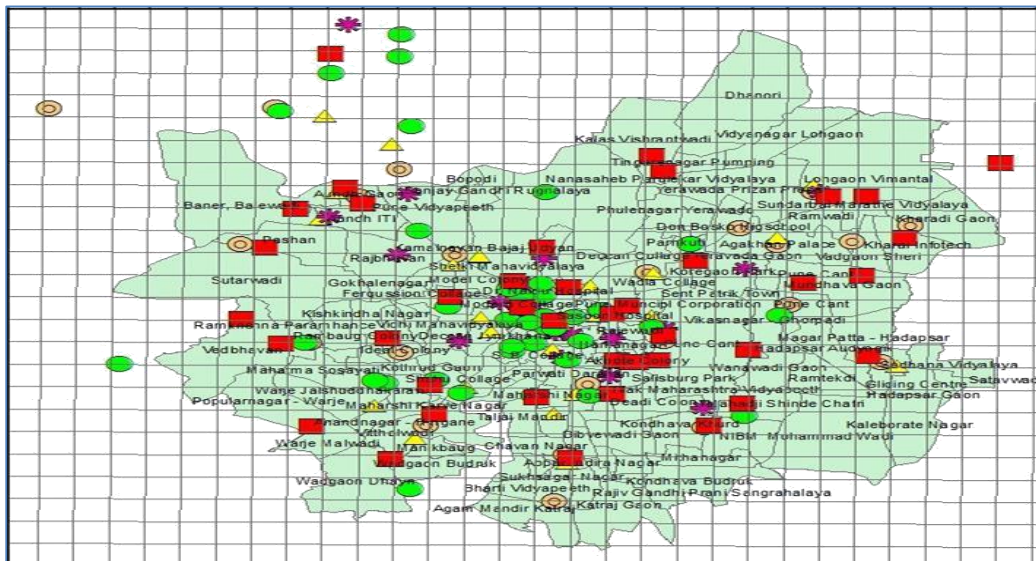


Figure 3.

Spatial Analysis and business

The breadth of spatial analysis and its usability can be illustrated in the following cases. The cases are nominal, simplified for describing the most basic utilization for this paper.

Case 1.

Spatial analysis is extremely useful when it comes to mapping store locations and calculating market segmentation. For example, in the case of banks, if we map the location of branches, it can give us insight into the distribution and pattern of bank location concerning the demographics of the locality. One can augment the location data with nonspatial attribute data such as the type of customer, utility patterns, financial history, etc. This addition of spatial data helps banks better locate and maximize customer access. Careful analysis of market segmentation can avoid cannibalism between branches. Spatial data visualization through maps better illustrate the patterns for decision making.

Case 2.

One of the most challenging aspects of running a business is to manage assets and logistics. The spatial data allows managers to manage a network of assets. The same network can be built to plan logistics and keep track of all the vehicular assets and their movement. Such analysis can be coupled with historical data to provide predictability of trends for improved performance.

Case 3.

Businesses such as restaurants or retail stores often live and die with locations. The locational awareness is extremely important for the viability of the business. Along with other logistical issues, the location of the restaurant or store becomes essentially, a market optimization function. Locating a store or restaurant requires an analysis of a very complex mix of variables that can only deal with quantitative techniques offered by spatial analysis. The analysis can be designed to target specific customers or class of customers. It can be designed to optimize other competitors in the area. It can also be used to manage the operations by managing assets and logistics efficiently. Often businesses need to make adjustments concerning changes in demographics, infrastructure or other developments happening in the localities. Such changes are crucial for the growth and survival of the business. Location-based data can provide insight into the impact of such development on the customer base and as a consequence on the business.

Case 4.

Businesses such as insurance require sophisticated techniques to do predictive analysis. The insurance company, dealing with natural disaster are greatly impacted by the location of the assets. The spatial analysis can link vulnerability of particular asset to a particular disaster helping the company in the assessment of risk and thus premium. The insurers can improve the spatial data by coupling it with historical attribute data to enrich the risk models. Location-enriched data such as proximity to threat (river, forest fires, hill slopes) along with topographic features and historical events ensure a higher level of predictability.

Case 5.

One of the most widely used spatial data is navigational data. The advent of cheap GPS trackers and mobile devices has enabled tracking of moving assets possible. Logistics companies are no longer reliant on operators for real-time information. But it has ready tools that can map the location of movable assets in real time. In addition to tracking maps provide a network of roads and network analysis can provide the most efficient routes, alternative routes or even provide information on traffic conditions or weather effects. Cab sharing companies are utilizing spatial network datasets to not only track the vehicles but also to communicate and locate customers.

Observations

As illustrated in the cases, GIS has a wide-ranging role to play in business processes, which are adopted across the world. In India, however, we find scant evidence of such system that is deployed and used. One of the constraints is the cost of adaptation. Adopting GIS is not only costly from hardware and software perspective but also costly from the perspective of hiring personnel. Although the efficiency will more than cover for the initial costs, there is reluctance

on the part of managers to take the initiative. People with deep knowledge of GIS are few and far between, and hence there is a reluctance by Managers to adopt GIS in their respective process. Also, the spatial data may force the organization to redesign the existing system which can be costly and time-consuming. There is a lack of confidence among the managers to propose and handle such endeavor (Sieber, 2000, Tomlinson,2007). Other constraints include the availability of spatial data, which is widely available in developed countries but not in India. Our data collection remains woefully low, and it is especially true in the case of spatial data. Also integration of spatial data in an existing database might require costly updates. Lastly, the spatial data can bring in efficiency only if the existing infrastructure can support. For example, in the case of transportation, the efficiency gain from GIS can be minimal compared to the uncertainty of traffic management.

Conclusion

There is an explosion of data in the current technology-driven world, and spatial data is no exception. The power of spatial analysis is evident in the way business is conducted today. According to Forbes (Oct 2018), 86 percent of companies are reporting the significant use of spatial data in one or more departments. Out of companies surveyed, forty to fifty percent expect high usage of spatial data during the next three years in all aspects of business such as business research and development, sales, marketing, and operations.

However, there is still a lack of trained personnel for handling spatial data analytics. There is a pressing need for Business across India to harness the power of spatial data. For such adaptation, Business Schools need to inculcate spatial thinking and analysis in the curriculum. The spatial thinking will also present an enormous opportunity to conduct original research and create a distinctive program.

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