

Business Geomatics: A Burgeoning Discipline

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Geomatics is the science and technology of gathering, analyzing, interpreting, distributing and using geographic information. (Geomatics Canada 2006). It encompasses a range of disciplines, including; geodesy (precise measurements of Earth), photogrammetry (measurements taken from airborne photographs), remote sensing (measurements taken from satellite images), satellite positioning (to locate objects or phenomena on Earth), cartography (maps) and geographical information systems (to store, visualize and analyse spatial data). Geomatics is used across a variety of industrial sectors. Research and development in geomatics has focused been heavily within the physical resource, environmental and engineering domains (GEOIDE 2006), with an emphasis on natural resource extraction and management (oil and gas), geology and mining, civil engineering and construction, environmental monitoring, agriculture, forestry, oceanography and marine biology. In the realm of human geography, geomatics has centred on property, transportation, health studies, urban planning, commerce and education. *Business geomatics* refers to the application of geomatics-based approaches to decision-support activities within the business sector, ranging from new methods of data collection to data mining and visualization. As Yeates notes (2001: 378), business geomatics is 'concerned with the testing of theories, and the discovery of patterns and regularities, that explain and predict both spatially and aspatially referenced information'. The purview of geomatics extends to; retailers making multi-million dollar decisions related to new store expansion; the optimization of bank networks; the identification of markets for the development and distribution of new products and

services; the modeling of residential and commercial property valuation; and, the delineation of travel impacts of new commercial developments - to name but a few application areas of business geomatics. The potential size of the business geomatics market within the retail and service sector is illustrated by the 1.7 million (12.3%) of the Canadian labour force employed and 5.9% of GDP accounted for by the retail sector (Statistics Canada 2006). The service-producing industries (including retail and consumer services) in Canada account for approaching 70% of GDP.

In 2004, the geomatics industry was estimated by Natural Resources Canada (2004) to have generated \$2.8 billion in revenue, of which over \$1 billion dollars was generated within the oil and gas industry. The value-add to GDP of the geomatics industry was estimated at a further \$2 billion, with over 2,200 establishments and just over 23,000 employees in the geomatics industry across Canada. The geomatics industry is comprised mainly of small firms with 70% of firms having less than 10 employees; 94% of firms having less than 50 employees, and 97% of firms having less than 100 employees. The business sector (private sector) is the main client of geomatics products or services, accounting for 68% of sales revenue to the geomatics industry (\$1.9 billion) in 2004, followed by all levels of governments and public institutions representing 23% (\$634 million).

This special issue of the Canadian Journal of Regional Science (CJRS) is devoted to geomatics in the business field. In Autumn 2001, the CJRS published the first special issue on 'Business Geomatics' edited by Dr. Maurice Yeates, this current issue builds on a number of the themes examined previously, and reports on developments, approximately five years on, in business geomatics research with a focus on the retail sector. The issue is essentially divided into two sections, reflecting the multi-disciplinary nature of business geomatics. The first section presents a series of three papers that address structural change in the retail and service landscape using geomatics-based approaches. The four papers in the second section detail emerging techniques and technologies that enhance business geomatics.

Gomez-Insausti sets the scene in the first paper by providing an overview of the Canadian retail landscape. The paper, based on corporate location data held at the Centre for the Study of Commercial Activity (CSCA), Ryerson University, focuses on the locational activities of the major corporate retail chains in Canada. The research highlights a retail environment that is heavily influenced by major chains, with these chains accounting for approaching 80% of total non-automotive retail sales in Canada. The wide ranging locational strategies adopted by the key retailers are examined on a sector-by-sector basis. The paper fundamentally assesses market concentration and location preferences of the leading retailers, with many opting to develop large format (big-box), Americanized retail across Canada.

Lorch further develops the themes described in the first paper by providing an assessment of the evolution of big-box retailing. The case study approach adopted provides a unique insight into the Winnipeg market, tracing the development of retail activity in this market, and detailing the rapid emergence of big-box retail. The analysis underlines the integrated nature of the retail growth that has taken

place, with the co-location and co-existence of clusters of traditional big-box retailers (power centres) and the traditional planned shopping hierarchy of regional and super-regional malls. The evidence forwarded questions the impact of big-box retailers at a system-wide scale, essentially noting that much of the new retail growth has followed similar development patterns of previous years - the retail system has not been fundamentally altered, but instead evolved, with the existing retail hierarchy adjusting to new market entrants.

The theme of commercial transformation is continued by *Jones and Gomez-Insausti* in examining the provision of services (with a focus on banking) in smaller communities across Canada. While the previous two papers largely reported on trends that have been taking place within major metropolitan markets across Canada, the evidence provided by *Jones and Gomez-Insausti* point to deep-rooted change in smaller town markets (defined for the purposes of their paper as markets with less than 50,000 residents). The analysis uses data from the five largest nationwide banks, with the research conducted in partnership with the Canadian Bankers Association. The paper quantifies the extent of change, and provides preliminary models of the lag-effects associated with the opening and closure of service facilities in small town markets.

Farber and Yeates' comparison of localized regression models in an hedonic house price context starts the second section of the special issue with emphasis on emerging techniques and technologies in business geomatics. Using data on freehold housing sales for the City of Toronto, they compare the results from two sets of models: the first set with stationary parameters (a global ordinary least square model and a model with a spatial autoregressive term); and the second set with non-stationary parameters (a geographical weighted regression (GWR) and a moving windows regression (MWR)). The models are constructed from a traditional hedonic perspective, with comparison based on a combination of multiple R^2 , sum-of-squared errors and a measure of the spatial autocorrelation of the residuals (the Moran coefficient). The GWR model proves to be the least spatially biased, however, the presence of irrational coefficients hamper the application of GWR to real-world valuation. *Farber and Yeates* highlight the need for further research into the calibration of GWR models.

Moulin and Walid continue the theme of modeling and decision support in detailing their research into the development of a geo-simulation approach to modeling consumer behaviours and retail location dynamics within the enclosed shopping mall environment. Based on developments in the areas of geosimulation and multiagent systems, they present a multi-agent geosimulation approach and integrated decision support system (MallMAGS) that is used to model and simulate customers' shopping behaviors in 'virtual' malls. The retail demands and composition of virtual consumers can be manipulated, along with the configuration of the mall environment to visually explore alternative decision scenarios (e.g., what impact does changing the mix of stores within the mall have on shoppers' behaviours?). The paper provides a glimpse into the future of retail planning within enclosed environments, with the approach outlined clearly having the scope to be applied to commercial applications beyond the mall environment (e.g., system-wide modeling and simulation of consumer retail behaviour).

Building on the 'visual' message, *Hernandez* provides a paper on the development of geovisualization techniques and technology to visualize trends in business-related spatial-temporal data. Geovisualisation encompasses a range of visual techniques (e.g., animation, 3D rendering, spatial-temporal sequencing) that aim to transform heterogeneous data into information and knowledge. The paper details the design and development of the GeoVisualizer system, providing examples of its application in the retail industry at four scales: national, regional, market and micro-level. The potential benefits and pitfalls associated with geovisualization are discussed, with specific reference to retail location decision making, and a number of areas for future research identified.

The final paper takes a critical look at the use of geomatics technologies by businesses. *Bergeron, Gingras and Caron* examine the strategic dimensions of investment in location-based technologies, with reference to their use within business applications. The paper provides the organizational context of business geomatics by proposing an approach to assessing the success or failure of location-based investments. The authors' propose a GEOGRID framework, a structured approach, to spatial technology adoption, implementation and use. The paper reinforces the need to clearly align business needs with the location-based technologies available, with the GEOGRID approach forwarded as a means of identifying strategic opportunities in the context of the competitive positioning of the business. The central message of the paper is that the potential benefits to be accrued through the use of business geomatics-based approaches will only be realized if they are undertaken within a setting in which the business goals have been clearly articulated.

The intention of this special issue is to provide the reader with a broad cross-section of research from the business geomatics discipline. As more businesses adopt spatial technologies, the scope of business geomatics will continue to expand. The exponential growth in the amount of spatially referenced business-related data will promote the development of business geomatics, presenting many challenges along the way, and a great number of opportunities to develop further research.

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