

GEOGRAPHICAL INFORMATIONAL SYSTEMS - APPLICABILITY IN INVESTMENTS AND BANKING

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Abstract: Supported by information systems, the regional or world economy transformed itself in a global economy. Taking fast and optimal decisions is needed for each step an individual or an organization makes in order to support competitiveness in the context of radical evolution of the world economy. When dealing with fundamental decisions, spatial information plays an important role because it allows integration of data from various domains, having multiple connections, as well as their visualization and analysis in a useful, suggestive and efficient manner. Decision support systems (DSS) are spatially based computer applications and data which assists managers in making decisions. Since Geographical Informational Systems technology has a great deal to offer to the mortgage finance industry the goal of this paper is to analyze the main theoretical and practical approaches regarding the role of the geographic location and spatial relationships over the outcomes of the banking, housing and mortgage market.

JEL classification: C31, C63, G21, G24

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1. INTRODUCTION

In the last decades, the human society has modified itself mostly because the evolution of the information technology and of the computer technology. Informatics and the information systems have conquered the daily life, being used not just by big corporations, public national or local administrations, but also at the level of the private users.

Supported by information systems, the regional or world economy transformed itself in a global economy. In the context of the global economy, the interconnections and the complexity of information raised. Also taking fast and optimal decisions is needed for each step an individual or organization it makes. Obtaining fundamental/key decisions is depending on the quality of information which is forming its main source of data. This

needs in the same time innovative instruments for accessing data and adequate instruments for presenting the results in a secured and useful way.

In the context of fundamental decisions, the spatial information plays an important role because it allows integration of data from various domains, having multiple connections, as well as their visualization and analysis in a useful, suggestive and efficient manner. Likewise the traditional information systems, the geographic information systems have evolved, no longer being dedicated just to the research fields or being toys for some experts, but today they have conquered all fields of activity representing not just instruments dedicated to store and administrate spatial information, but also key instruments for decision assistance.

2. GEOGRAPHICAL INFORMATIONAL SYSTEM - DECISION SUPORT SYSTEM

Geographical Information System (abbreviation GIS) represents a powerful set of tools for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world. GIS extends the limit of computer aid design (CAD) and automat mapping (AM) with the possibility of retrieving geospatial data at request and with the possibility of “what if” analysis and scenarios.

Developed initially, few decades ago, for digital spatial data storage mainly for military and R&D, now the GIS technology can be find in different forms, reaching almost each human being, from the mobile phone, car navigation systems or the weather report from the TV till the public utilities management systems, traffic management system.

The usage of geographical informational systems as support systems for decision making in various fields such as planning (urban planning, investment planning, infrastructure planning, economic development, taxation, SWOT analysis, etc.), resource management, fiscal impact delivering services towards the population, public administration and other critical domains, lead to the need of searching fast and optimal problem solving solutions as well as the necessity of interoperation between similar GIS systems.

Now the research in the GIS field is focused mainly in optimizing the creation and processing of operations over maps, of instruments needed for spatial modeling and in spatial analysis. In the same time the research is focused, as well in increasing the capacity of interoperability between different GIS systems.

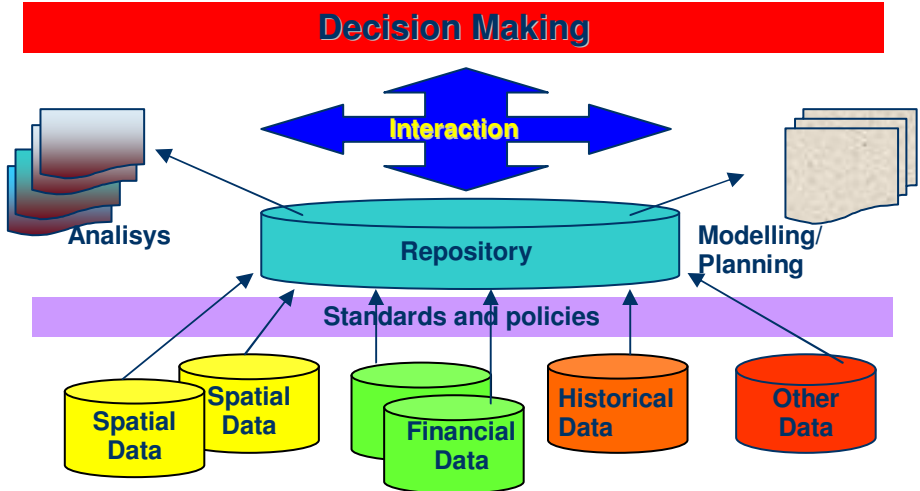
2.1 Decision support systems and spatial decision support systems

The capacity to create decision and knowledge begins with the operations regarding collection, storage, organizing and displaying relevant, up-to-date and accurate information. The decision support tools (DSS) are spatially based computer applications and data which assist researchers and/or managers in the decision making process.

Decision support systems are built over these premises and have database, model base, and interface components. GIS could support spatial decision-making with a wide array of capabilities during decision-making processes as presented by Crossland and all (1995). The capability of GIS to manipulate and analyze the spatial and attribute data using various statistical, mathematical, geometric, and cartographic methods can be referred to as spatial analytical tool, which makes GIS unique.

GIS provide interactive map presentation that, in conjunction with analytical tools, could be used to probe maps at various levels of specificity, a feature that is missing in

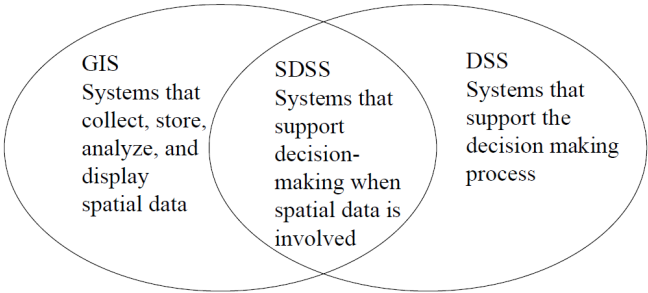
paper maps as presented by Crossland and all (1995). The spatial analysis tools can be used for many different forms to answer questions or issues related to location. These questions can range from simple calculative questions, such as the distance between two locations, to more complex quantitative problems, such as the most suitable location of a new retailer.



Source: Droj G., S. Suba, *Role of Data Quality in GIS Decision Support Tools*, Szekesfehervar, Gisopen 2009

Figure no. 1 Structure of Decision Support System

GIS are natural complements for DSS in providing visualization support in areas where traditional DSS lack the appropriate tools. Combining GIS capabilities with DSS modeling and data support results in Spatial Decision Support Systems, or shortly SDSS. Given the fact that many decision tasks and problems have some spatial or location components, the development of SDSS could enhance the quality of support for decision-making.



Source: Droj G., S. Suba, *Role of Data Quality in GIS Decision Support Tools*, Szekesfehervar, Gisopen 2009

Figure no 2. Relation between Decision Support Systems and GIS

3. GIS IN BANKING

Banking is a competitive business. Market share and brand recognition alone aren't enough to attract and retain customers. To be more effective, many banks, credit card companies, credit unions, and other financial services organizations are turning to GIS to help them understand their data better than ever.

Banks can benefit from using the geographical informational system as presented by Belsky and all (1998) and Can (1998):

- Enhance the *understanding of risk*, customer interaction, and economic conditions using spatial models based on geography and geo-demographics.
- *Improve profitability* and operational performance by sharing knowledge-based decision making across departments.
- *Grow line-of-business* collaboration across departments with economic forecasts, neighborhood studies, and territory analysis.
- Reduce business complexity through a more *accurate analysis of real-world market conditions*.
- *Increase market understanding* based on a single, common view of business performance using geo-extended workflow and business processes.

GIS enables better service planning and optimization; extends the effectiveness and profitability of customer management; improves customer retention; brings customers to the ATM and branch network. Using GIS, banks should generate maps depicting the geographic distribution of loans and to correlate that information with income demographics. GIS can help banks perceive market geo-demographics and to correlate loan and deposit data with demographic information. Then bank can see where the customers, the competitors, and the prospective customers are, and compare this data to build new branch locations, or marketing focus, etc.

GIS plays a crucial role in various functional areas by providing support in decision-making and strategic planning, thus banks can achieve their business objectives. GIS may play different roles in the banking industry. These roles are always used in some major areas such as market analysis, customer analysis, competitor analysis and housing and mortgage finance as presented by Belsky and all (1998), Can (1998), Fu (2007) and Kalinski.

3.1 Market Analysis

Marketing for the banking industry is also a question of demand and supply which indicates the relation between customers and financial products or services such as customer services through branches and ATMs. Usage of GIS can help to analyze the relationship between demand and supply easily because the information is based on geographical location. For example, GIS can help banks to rely their business expansion planning, by finding the best new bank location, as presented by Fu(2007) and Jafrullah(2003).

In the following picture we present the location of all banks which have regional headquarters or branches in the city of Oradea. As observed, in the city of Oradea over 30 banks are represented and more than 100 different branches were opened in the last years.

A simple visual analysis of the map shows a high density of different bank branches in the Central Area and Rogerius Neighborhood, sometimes two - three different banks are located in the same building. The south part of the city is not covered by banks excepting the commercial centers/malls located on the ring road. In contrast dense populated neighborhoods such as Iosia have banks only at the limit of the neighborhood.



Figure no. 3. Banks in ORADEA

By using GIS to select possible new branch sites, it helps the decision makers from banks to identify risks for opening or closing a branch, perform targeted marketing campaigns, navigate customers toward their spatial locations, gain better understanding into markets, as presented by Fu(2007) and Jafrullah(2003).

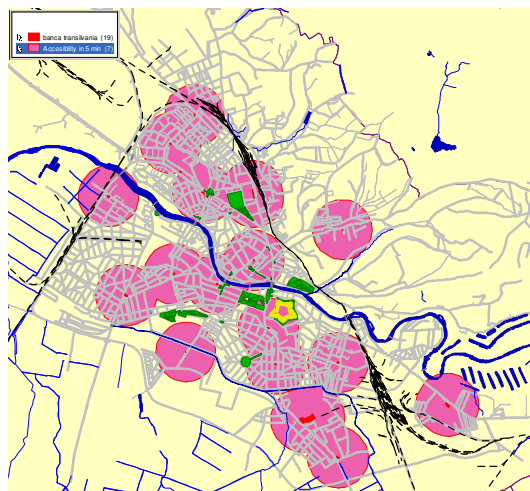


Figure no 4. ATMs of BANCA TRANSILVANIA in ORADEA

In the following we present an extension of this analysis to a single company: Banca Transilvania the most present bank on the local market, with fifteen branches in Oradea and nineteen ATMs. In the following figure we are presenting the distribution of

ATMs belonging to Banca Transilvania in Oradea and the accessibility area in less than 5 minutes traveling time for customers.

The visual analysis of the map, presented in figure no.4 , shows very low accessibility of ATMs in very dense populated areas such as parts of Central Area and Rogerius neighborhood. Also it highlights the absence of Transilvania Bank ATMs in the commercial areas (malls) along the ring road.

In order to establish new bank branches and new ATMs, the decision makers from banks, should analyze through the usage of GIS and take into account different spatial components such as:

1. The commercial land use of the area.
2. Locations of residential and business areas.
3. The road network.
4. Land value, or socio-economic condition

3.2 GIS in Mortgage Finance

GIS technology has a great deal to offer towards the mortgage finance industry because geographic location and spatial relationships have a central role in housing and mortgage market outcomes. Housing is fixed in its location and is durable, as presented by Can (1998) and Rahaja.

As a result, a home's location relative to employment opportunities, mortgage finance and housing market intermediaries, public services, and amenities exerts a strong influence on its price. The location of a home also influences the choices and opportunities of its residents and of those seeking to own or rent it. Neighborhood characteristics also influence house prices and choices. These characteristics include the types of homes available, quality of the housing stock, quality and extent of the community infrastructure, quality of public services, and social and economic conditions in the neighborhood. Decisions such as where to buy a property, its price whether to maintain or improve it are all tied to location as presented by Can (1998).

A typical residential property mortgage loan processing workflow comprises the following steps, as presented by Jafrullah (2003):

- Identification of prospects and approaching these prospects
- Loan application
- Preliminary approval and providing good faith estimates for the loan processing related costs
- Loan processing / underwriting involves mainly three steps:
 - **Title Search:** Check the records for the ownership to the property and whether there are any other claims against that property;
 - **Appraisal:** Estimate the property valuation based on different factors using a combination of automated / manual processes;
 - **Flood / Other Natural Hazards Assessment:** Check whether the property is located in a natural hazard risk zone and whether catastrophic insurance is required. This step often involves a credit history check
- Final loan review and closing of the loan
- Loan servicing (often done by another department / company)

Some parts of this workflow overlap with the workflows of the real estate (appraisal / property evaluation) and insurance industry (catastrophic risk assessment and insurance).

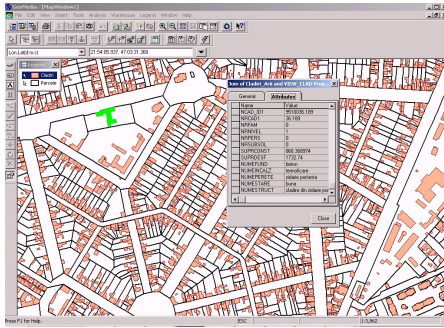


Figure no 5 – Cadastre data

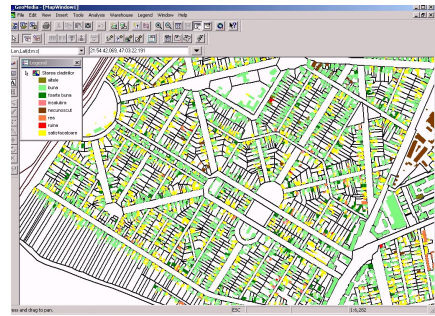


Figure no 6 – Building condition

GIS can be integrated in these key steps. GIS based cadastre maps can assist bank employers to identify:

- The ownership of the property (figure nr 5)
- Estimating the value of properties based on neighborhood, utilities, pollutions in the area, different infrastructure development projects so on (figure nr 6, 7,8),
- Estimate hazards assessment (figure nr. 9).

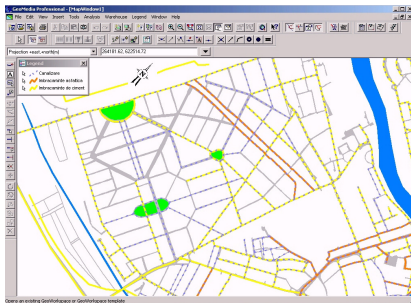


Figure nr 7 – Utilities

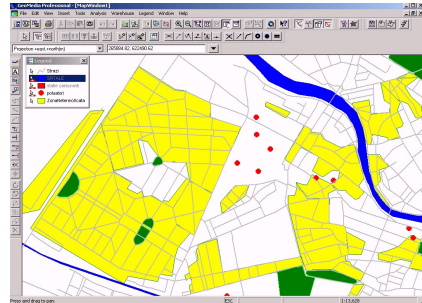


Figure nr 8 - Pollutions

Integrating GIS in these key processes involves expertise in business process analysis, GIS data and applications. “GIS-enabled” processes are now well integrated into the overall mortgage servicing workflow. Business benefits for the client included cost reduction, increased efficiency, and leveraging of GIS technology and skilled GIS resources to implement innovative GIS-enabled processes in the overall workflow. Location is a key factor for property mortgage loan/real estate/ insurance industries and an effective usage of GIS applications is often a part of the overall business process analysis and reengineering to optimize and streamline the workflows, as presened by Kalinski.

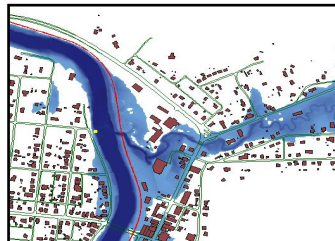


Figure no 9 – Flood risk

5. CONCLUSIONS

There has been an emerging trend in GIS for becoming part of the overall software architecture used by banks and companies. In these cases, the usage of GIS data and applications has been providing an opportunity to enhance some of their key processes that can benefit from spatial intelligence. Integration of GIS-enablement makes processes more efficient and enables extracting maximum possible ROI from company's investments. The process of conceptualizing, designing and implementing GIS-enabled business processes is increasingly becoming a part of the overall business process reengineering in many industries, particularly in the property mortgage loan and analytical market research industries.

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