

## **Development of Geoinformational Tools for Competition Environment and Consumer Streams Analysis**

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**ABSTRACT.** The article says about using GIS-technologies in small business. The tools for electronic map creation have been offered. The suggested software allows to create layer-by-layer vector topological model of town space containing essential information for the following analysis and modeling of customer streams and competition environment.

However, important and, in many cases, irreversible decisions about sales outlets in small business are still frequently made using subjective data and visual information. The grounds for such decisions (if it comes down to them), at best, come to prognosis concerning configuration and the size of the sales outlet with the help of well-known method of Convers. The analysis of the consumer streams and their cyclical changes within 24-hours, week, and the time of the year is already conducted at the stage of the range adaptation and operating conditions to the chosen terms.

Necessity of new approaches for the analysis of entrepreneurial activity environment based on modern technologies is now obvious. From this point of view the decision of city electronic map creation provided by Program of Entrepreneurial Activity Development in the town of Zhovty Vody, Dnepropetrovsk Region is symptomatic. Implementation of this project will make it possible to create data base necessary for businessmen as well as municipal government. The usage of this map in Management, Marketing and Market Researches courses in the institute “Strategy” (Zhovty Vody) is considered to be very important.

The main demands for solving this problem are as follows:

- the shortest possible time of its development;
- wide accessibility for users and data presentation convenient for analysis;
- possibility of consumer streams analysis, their density, demographic structure, and direction in the different periods of time;
- possibility of competitive environment analysis in the different spheres of sales and domestic services;
- possibility of consumer streams modeling under changing conditions of competition or other factors;
- provision of consumer environment monitoring.

The aim of this article is outlining functional features of the toolkit developed by the author which allows to create a dynamic model of consumer environment basing on cartographical information, information about shop allocation, measurements of density and directions of consumer streams.

The software mentioned above was developed considering the following circumstances:

1. Doubtless leaders on geoinformation systems and technologies (GIS) market are the software products ArcView GIS, Arc/INFO, ArcCAD, Data Automatin Kit (DAK), MapObject which are usually used in such spheres as geodesy, geology, ecology, macroeconomic research [Inf]. The systems mentioned above are very expensive and are not designed for a general usage due to their specificity. Unfortunately, not all the programs embody the principle of topological correctness, and maps created by these programs cannot be considered models and cannot be used for solving analytical problems. This is caused by traditional orientation of such systems towards zoning of the land relief or location plan and towards level-by-level data representation and processing. A characteristic example of using ARCVIEW in business is creating maps of the serviced areas and consumer demographic characteristics maps [ESRI].

2. There are examples of successful creating of GIS using less specific tools (Delphi, C++, DB ORACLE etc.) [SAM, DLF]. There is a trend of ceasing to use universal and expensive foreign GIS.

3. Consumer streams research task imposes certain requirements on the ways information is represented within the system, and requirement for wide data access allows the usage only of such software as Microsoft Office, popular graphic packages and Internet browsers. Necessity of enabling possibility of the system development, especially in creating new information layers of a map for corresponding departments and users, is apparent.

Considering the listed circumstances, the author has chosen CorelDRAW to be the tool for graphic information coding. This graphic editor offers vector and layer-by-layer data representation, and additional functional opportunities are

provided by built-in utilities (object database, Visual Basic for Application-VBA, and scenario editor).

The process of creating an electronic map has been divided into several phases:

**1) Vectoring the street map.** The tool “Curve” was used as a vectorizer-tracer. Scanned town map was imported into the first layer of the document, and the second layer (Streets) contained curves imitating location and width of the streets. The map contains not only streets and lanes but also within the blocks of buildings passages which are usually not shown on maps but which have significant meaning for future consumer streams analysis. Curve nodes (Nodes) were placed at the junction points with other streets.

**2) Street map parameterization.** Separate input of graphic and attributive information is a basic condition for creating the electronic map. Information about street names was entered after they had been marked on the map. A separately created macro registered a street name and its width (field Width) in the object database. To provide the model’s topological connectivity it was necessary to specify linking addresses with other streets (object number, node number) of the first and last curve node for each street (in object database – fields o1, n1, o2, n2).

**3) Entering measurement results.** Consumer streams density measurements were performed according to the same technique by students of the institute for entrepreneurship “Strategy”. The observers were located at crossroads. This let control the results’ reliability. Zones for repeated analysis were determined while performing control. The streams were being registered for 15 minutes 3 times during 2 preset periods (7:00-9:00 and 17:00-19:00) on both sides of a street. When registering density of the motor-vehicle transport stream its direction was ignored. A special scenario for entering the results has been developed. Consumer streams’ data was coded as symbol lines (fields to1, fro1, to2, fro2, Cars) considering an opportunity of entering data on 8 time periods from 7:00 to 23:00.

**4) Entering reference text information.** The fourth document layer contains text objects – street and district names.

**5) Shopping centers’ allocation.** The third document layer contains special markers – shopping centers and consumer service enterprises. Databases for such objects include data on their names, trade format, range of goods, price level, etc. The markers’ localization was performed due to 3 parameters – street number, node number, and distance between the marker (shopping center) and the node.

**6) Database creation.** A procedure for filling Microsoft Access database has been created using VBA. It is more convenient for analytic work than intrasystem object representation in CorelDRAW. However, for simple tasks of

information analysis (shopping centers selection according to specific attributes, representing the consumer streams' density with color depth, etc.) appropriate macros were created.

Database structure provides differentiation of geographic (streets' and blocks of buildings' allocation), attributive (streets' and shopping centers' names, referential information), and factual information (measurement results, shopping centers' characteristics, etc.).

Thus, within the graphic package, using the software developed by the author, a layer-by-layer vector topological model of the town space containing essential information for the following analysis and modeling of customer streams and competition environment has been created. Offered intersystem representation of geographic, attributive, and factual data creates basis for derivative spatial objects analysis (e.g. residential blocks of buildings organized by street segments). It is possible to underline secondary linear objects – routes (united street segments) and dynamic segmentation (automatic topology rebuilding).

The suggested tools are now being developed in two directions: database on consumer stream measurements is being worked out in details, and analytical system module is being created applicable for both solving educational tasks and information support for making management and marketing decisions.

## References

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