

GIS for Rural Marketing

Author: Suruchi Raina/Vijay Amanna

Suruchi.raina@igenesys.com

Vijay.amanna@igenesys.com

Genesys International Corporation Limited, SEEPZ, Mumbai –96

1. INTRODUCTION

In today's business marketplace, effective use and flow of information is the key to success. Business information parameters like sales, customer inventory, potential market segmentation and demographic profile form the defining factors for all industrial segments like FMCG, Retail, Real-estate, Insurance, Pharmaceutical, etc. Since most of this data has geographical location, it becomes important to use GIS for analyzing them spatially (Bal Krishna & Pia, CSDMS). Business GIS and mapping have evolved into a formidable tool by which corporate world can use spatial information to manage their business.

GIS customized to corporate requirements, holds immense potential for improving productivity of any organization. Especially for companies trying to identify uncovered markets, GIS would efficiently assist in identification of new customers, optimize media campaigns, cutting costs, finding new retail distribution centers, aligning sales territories to utilize the sales force efficiently and monitoring business trends/performance spatially.

Conventional database management software can only answer statistical questions like how many potential customers are out there and which territory has the highest growth. GIS applications, in contrast can relate all this information geographically. It also allows the user to spatially visualize data thus revealing hidden relationships, patterns and trends. For example GIS

can answer queries like which locations in the city are suitable for a certain retail outlet location? What route should distribution trucks take to minimize delivery cost and time? Which are the potential rural areas having great scope for marketing particular product?

This paper presents a case study to show how implementation of GIS has helped a multinational advertising agency in improving understanding, productivity and efficiency in Indian market scenario. It also looks into the details of how GIS has been customized to fulfill user's requirement.

Requirement Analysis

This case study demonstrating the advantages of Business GIS, explores a GIS application devised for marketing and sales. This application was conceptualized when an advertising agency took decision to move to GIS as the information system to improve their work system in the field of rural marketing campaigns in India. Market analysis and designing route plans for Rural and Semi-urban campaigns being their main stream of working, required Geo-demographic analysis. Following requirements were recognized:

- Planning for maximum coverage of area.
- Identifying uncovered markets and locating them,
- Designing route plans, based on available road information and demographics on these markets,
- Planning optimum routes for delivery to whole sale/retail

outlets and product promotional campaigns.

- Addressing congregation like haat, mela, mandi along with normal route plan.

Limitation of the exiting system.

The existing system, allowed to analyze the data but lacked relation with their respective geographic location. This impeded the user to analyze the target areas geographically and overlooked many hidden spatial factors.

Time consumed in manually assessing the potential customers and designing of the route plan/campaigns was enormous and resulted in erroneous orientations.

Design Requirements.

With intensions to provide an end-to-end solution, a thorough study of current work procedure was done.

The study results helped in setting following design criteria for the software.

Functions

- **Market analysis:** Assist user to analyze, identify target areas using various parameters.
- **Route designing:** Function to design various type route plan having maximum coverage according to given criteria.
- **Future expansion facility:** Facility for future expansion, such as adding and removing data.
- **Prioritization system:** Facilitate in prioritizing the states and districts based on the desired parameter.
- **Congregation:** Allows user to include mela, mandi and haat in the coverage plan.
- **Multi -State Coverage:** Allow user to cover multiple states or districts in the same route plan.

- **Route calculation:** Tool for deciding number of days and places to be covered
- **Diverse route plan:** Function to create route plan with different combinations.
- **Tips on database:** Provision for regular prompt function to indicate the type of data and remark associated with places to help user in giving necessary input.
- **Report generation:** Automatic generation of reports displaying required information.
- **Print facility:** Function to print or copy route plans and reports.
- **Save & storage facility:** provision for saving all the reports and route plans created by the user.
- **Integration:** synchronize the exiting system and the proposed to make the best use of available methods

Moving to GIS - Advantages

- **Wide-range information:** Creation of extensive spatial and attribute database having information up to village level.
- **Accuracy:** correctness in various map and associated information.
- **Flexibility:** Allows the user to adopt any procedure or options at any stage. The user can run 'n' number of iterations before finalizing the route plan within 10-15 min of time.
- **Swift working:** Allows speedy analysis and drilling huge database.
- **User Friendly:** simple process and effortless user interface.
- Database to be created was of enormous size. 15 states were to be covered which consisted of 374 districts. Each district comprised of over 1500 villages

on average which made entire data of approximately 6,00,000 villages having various information in 189 fields. Creating such massive data and to make it operational was not easy.

Challenges.

Time limit for developing application and creating database was just six months, which was a short period.

User was a hardcore technocrat in media and had no experience in the usage of any software.

As per the requirement and the user's limitation, demand was more on flexibility of the application.

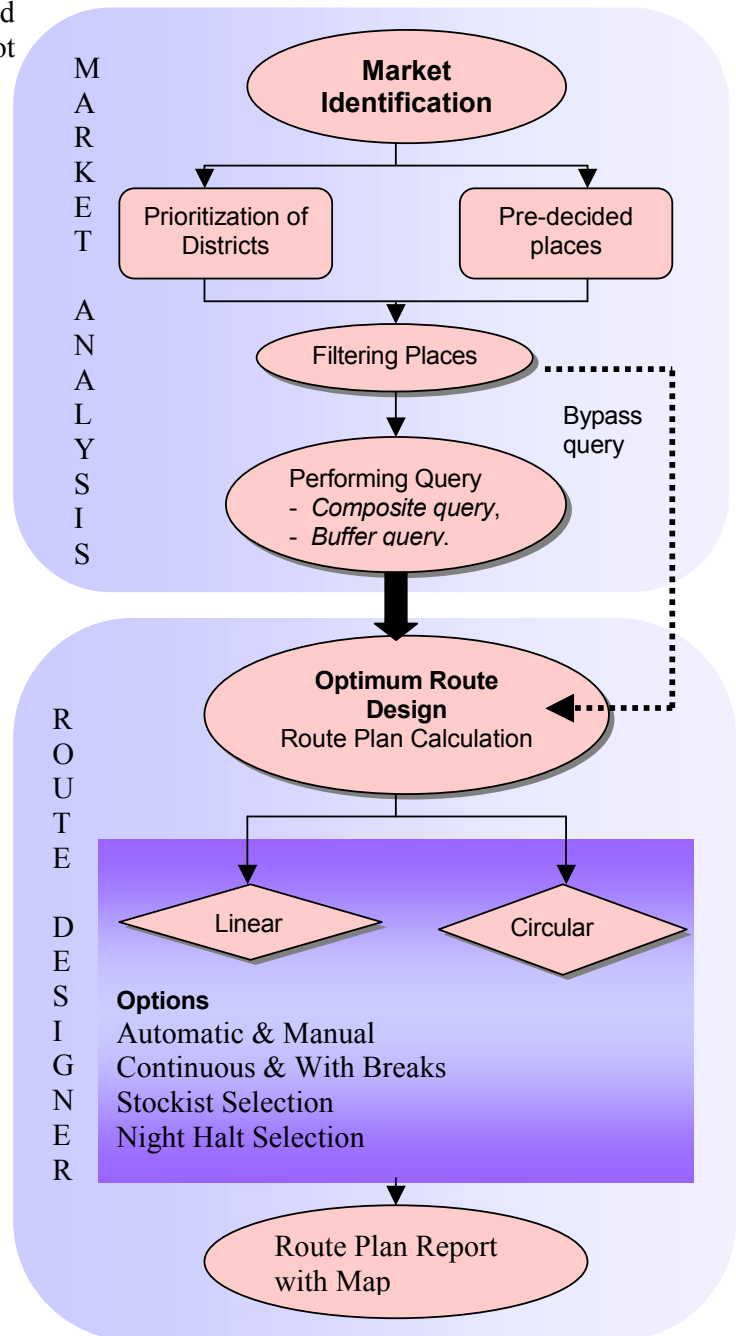
DESIGNING A GIS BASED MARKETING SOLUTION:

“LinCompass” application was developed as a complete solution covering all the requirements. The system was designed to allow the user to analyze the market statistics based on the various data (including demographics) and eventually help in identifying the market areas for brand promotion based on the selected parameters. The application enables the user to prepare a route plan for covering the target places in the predefined time period. Refer

fig. 1 for schematic diagram of the application.

“LinCompass” runs on ArcView, desktop GIS software. It has been developed by using avenue, a customization language of ArcView.

Making of “LinCompass” involved data collection, map conversion, data normalization and customization to meet the requirements.



Schematic Diagram of the Application.

At various levels problems were encountered mainly the non-availability of data at one source. For some of the districts, desired data could not be found for which either data was gathered manually or was processed. Process of collection took approximately two months.

Also there were errors in the data: such as missing figures etc. Data was then cleaned and errors removed.

This study further describes in inclusive functionalities of the application and its features.

2. APPLICATION LAYOUT AND FUNCTIONALITIES:

“LinCompass” is designed as a modular application. Modules are based on three broad requirements:

Requirement.	Module.
Identification of potential market.	Market Analysis
Function to design various type of route plan having maximum coverage.	Route Design
Facility for future expansion.	Data Updating

2.1.MARKET ANALYSIS:

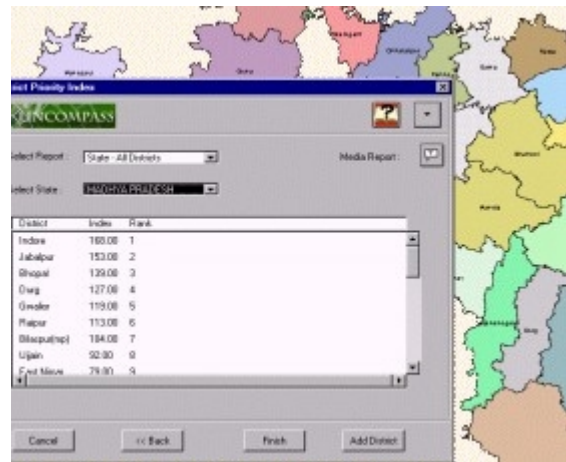
To identify the potential markets application offers various procedures such as prioritizing districts according to the required parameters or assigning the pre-decided list of places to be covered for further analysis. Thus making selection process flexible. These procedures as a result provide user with identified potential market on the basis of desired parameter depicted on the map.

2.1.1. Identification of potential market - Prioritization of districts.

The Function of district prioritization enables the user to rank the districts based on desired parameters and weightage. User can prioritize districts with the option of national or state level considering only the rural areas, or urban areas or both. “LinCompass” has identified approximately forty parameters related to demographic, infrastructure, agriculture, civic, and economic information.

User can prioritize districts by selecting any or all of these parameters and by assigning desired weightage to them.

Finally the application ranks the districts based on the composite Index value (index provided by the client). This facilitates selection of below the line district. District priority index becomes the first step towards Below the Line (BTL) campaign planning.



Map showing Districts of MP State ranked as per priority and the accompanying report displaying the Index & rank.

2.1.2. Drilling down to the places of visit - Analysis by query

“LinCompass” allows different kinds of query for analysis purposes. It has the option of composite query and/ or buffer query for further filtering areas based on census indicators.

Composite query

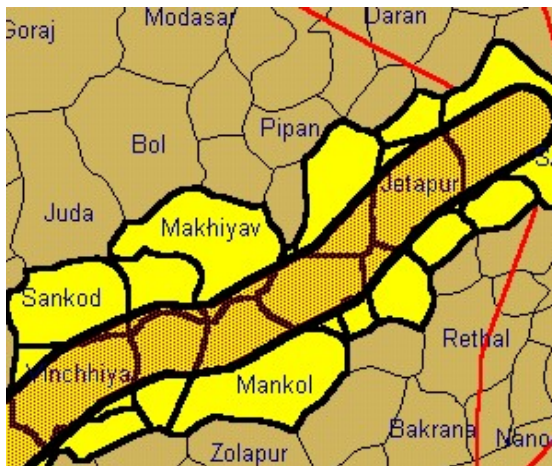
Composite query gives user the option to drill into the data by running queries based on certain parameters. The user can have five parameters to run the query. This query can be invoked from within the buffer query as well as separately. User can generate 25 reports using varied AND/OR combinations.

The query is very user-friendly, fast and assists the users to enter the query without knowing the structure of the tables.

Buffer query

This function is useful to perform spatial query. User can select places falling within a certain buffer distance from a nodal town or a certain highway by creating a buffer of desired distance. Application identifies all the places falling within the given range. It also gives the provision to further filter down the identified places by performing composite query.

Query results can be stored as new maps that can be retrieved later for analysis. The query function is very flexible allowing users to go back and forth reselecting and performing queries using different set of parameters.



Map showing Villages within 1 km from a State Highway, identified by using buffer query.

2.2.ROUTE PLANNING

This function provides the facility to generate route plans for marketing campaigns. The user can create any number of route plans based on various

parameters. The software has the facility to save and store the route plans generated in iteration. The user can then evaluate each of these plans individually and select the best. It generates route plans on the basis of shortest path and assigned weightage to the selected parameters. It provides user the facility to specify the 'Start Place' and the 'Start Date' of the route.

Example of a typical route plan:

The required route should cover villages of population less than 4000, and each day it should visit three villages that should have either a haat day or a primary school or primary health center. The total travel distance should not exceed 60 Km and the distance between two villages should be less than 15 Km.

- Duration of route cycle = 25 days
- District to be covered = Lucknow
- Tehsil to be covered = Malihabad & Lucknow

As a result application will identify all the villages with population less than 4000 in Malihabad of Lucknow District having either haat day, primary school or primary health center and create a optimum route to cover maximum villages in the assigned days.

2.2.1 Features of Route Design Module

Route Design Module contains the following options for designing the route plan, which gives user flexibility to have desired route plan. User can use any option with any combination at any stage of the process:

- a) Route plan calculator:
'Route Plan Calculator' helps user in optimizing the number of places and deciding campaign days. It first prompts

user to provide necessary inputs like number of places to be covered per day and duration of campaign. It also shows other relevant information like number of days to be spent in the towns and corresponding values of the parameters selected during query. This helps user in deciding the duration of halt in the identified towns and to do the desired alterations. This feature is particularly helpful while designing route plans covering multiple villages per day and in the same plan having longer duration for a town.

Finally it displays a route plan report having summary of places to be covered and the ratio of actual time required against the time allotted by user. Based on this the user can either proceed or go back to try different iterations for designing a more optimum route plan.

b) Route Plans:

i) Stockist option:

In all mobile unit operations there is a limitation on the amount of Stock, branding material that it can carry. When covering villages the unit might have to keep coming back to the feeder market to collect stock. 'Select Stockist' option, contains the 'Feeder Town' function for selecting towns to replenish stocks and to specify the stock replenishing period.

ii) Linear & Circular Route options:

'Linear' option is provided to design a linear route with start place and the end place different. It identifies the next destination on the basis of the assigned weightage, nearest place with the consideration of traveler covering 80km per day and night halt, which should be within distance of 25 km. 'Circular' option plans circular route, having the same start

and end place. It works on the Traveling Sales Man Problem (TSP) model covering maximum places with optimum travel distance.

iii) Continuous and with break Plan selection:

'Continuous' option is provided to plan a single continuous route. 'With Break' option divides the route into multiple simultaneously executable plans.

iv) Automatic & Manual Route options:

'Automatic' option generates the route plan automatically based on the specified start and end dates and the input given in the route calculator. 'Manual' option allows user intervention to confirm the selection of places to be visited on a day. In the situation of disagreement, the user has an option to select his preference.

v) Night-halt selection:

The night halt place can be either the nearest town or the last village of the day or user specified. User also has the option to select night halt from any other desired place.

vi) Route plan for covering Mela Mandi:

This feature allows the user to create a special route plan to cover all mela or mandi places in the desired duration. User also has the flexibility to attend a congregation completely or partially. The application accordingly identifies and designs the route plan. This feature can be also used with the normal route plan. As and when a mela or mandi or haat falls within the travel distance and within the same time period, the application includes automatically or prompts the user about the event in the near by villages.

vii) Route plan along Highway:

This feature creates a route plan for the identified places around the specified distance from any national and state highway. This helps the user to create a route plan if he/she wants to cover places along the major roads or between two major places.

ix) Combination of any of the above

With several options mentioned above and flexibility to use one or any combination of options permit to create number of route plan with varied assortment.

For instance route plan can be created (automatic, manually) with both the methods having break or without break, with stockist option or without it, linear or circular.

This route plan can also include normal route or can be created along the highway and can also cover congregation such as Mela and Mandi.

“LinCompass” allows user to cover different states in one route plan based on the distance factor.

2.3.Flag function:

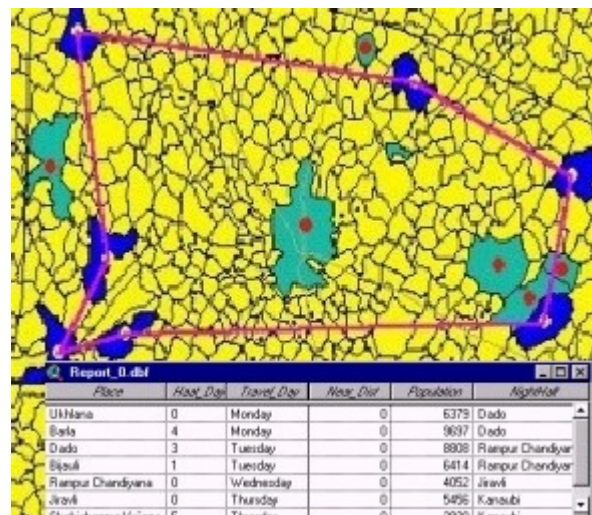
This function helps the user in making decision while selecting places in the route plan. User here can insert any remark associated with the place such as largest sale in particular village or else experiences in the village such as villagers were non-cooperative etc. So that the while making next plan by another user this remark will be automatically indicated and will hence enable the user to take appropriate decision regarding covering the place.

2.4.Run time attachment and detachment of data

Relational Database Management System (RDBMS) has been used for database maintained in this application. The application attaches and detaches data automatically on run time as per the user selections, which reduces time consumption while performing queries.

2.5.Reports generation

“LinCompass” automatically generates reports of all route details along with the other required information. This report is created in the .dbf format and the application provides the option to export report to excel.



Map displaying circular route plan along with the generated detailed report.

2.6.Creating & updating data

Designed for the purpose of future expansion “LinCompass” has the facility to create and link additional table / fields. Fields such as sales information, work status in each village, states, etc with the database and regularly update it, which will be automatically attached with the map and changes of the data can instantly be viewed and queried in the map.

Tables created externally (i.e. in some other system/location but within “**LinCompass**” environment), can be incorporated with the existing database and automatically linked with the map.

This function also allows user to edit existing user-created tables. As this function involves adding and editing of records there may be a possibility that an unknown user may misuse the data. Hence security is provided up to an extent so that only an authorized user is allowed to add/edit the records. Facility has been provided for the database administrator to change the user password.

3. DATABASE FOR LINCOMPASS APPLICATION:

Map data:

Application comprises of several thematic maps prepared to serve the user specific purpose.

It contains maps showing the administrative extent of state, district, tehsil and villages along with the road network. Subsequently, It also shows physical features such as water bodies, deserts, hill areas, and forest boundaries. These maps have been created from the hard copy of census village maps.

Agricultural and socio economic regions have been created showing various crop patterns and socio-economic zones respectively.

Tabular data:

Census data having demographic, infrastructure, agricultural and economic information.

Census data has been obtained from various sources such as International Institute of Population Science (IIPS),

Census Department of respective states, Land Record Department, Road Department, etc.

Congregation data giving information on the various melas and mandis held at various places.

The entire database has been linked to the relevant map features through unique identification numbers. Database creation and development of application took about 6 months of time with a team of 35.

LinCompass at glance:

Module	Analysis	Route Designer	Data Updating	Other feature				
Components	Prioritization	Select Place	Query	Route Calculator	Plan Designer.	Plan Designer.	Plan Addition & Updating	
Functions	<ol style="list-style-type: none"> Rank the district based on the desired parameters and weightage. Has approximately forty parameters 	<ol style="list-style-type: none"> Directly assign predefined list for further analysis 	<ol style="list-style-type: none"> Composite query: to identify places on the basis of certain criteria. Buffer query: spatial query, to identify the places falling with certain range. 	<ol style="list-style-type: none"> Helps in optimizing number of places and deciding number of days. This feature particularly helps while designing route covering multiple villages per day and in the same plan having long duration for a town. 	<ol style="list-style-type: none"> Maximum coverage Route plan. Creates route plan for including mela mandi or haat if it falls within the distance and traveling dates. 	<ol style="list-style-type: none"> Facility to create and link additional data. Facility to import and link data created at other location. Facility to update and edit data. 	<p>Security: no map data or tabular data can be exported or can be taken out from the “LinCompass” environment.</p> <p>Password facility to avoid unwanted editing in the database.</p> <p>Print: Printing facility of the route plans and reports.</p> <p>Reports: generates reports of all queries and route plan.</p> <p>Flag: to indicate any remark associated with the place.</p> <p>Tool tip: it display the range and type of the data at varies level to assists the user to provide necessary input.</p> <p>Save and store: store query and route plan generated in iteration.</p>	

Module	Analysis	Route Designer			Data Updating	Other feature
Components	Prioritization	Select Place	Query	Route Plan Calculator	Route Plan Designer.	Plan Addition & Updating
Flexibility (Options)	<ol style="list-style-type: none"> 1. Can prioritize area taking only urban area or rural area or both. 	<ol style="list-style-type: none"> 1. Can directly select the list of desired place from various state and district. 	<ol style="list-style-type: none"> 1. User can generate 25 reports using varied AND and OR combinations. 	<ol style="list-style-type: none"> 1. User can change the duration of campaign or number of places to be covered at any stage 	<ol style="list-style-type: none"> 1. Stockist Option Linear or circular option With break and without break option Automatic and manual Night selection automatic and manual. 	
Swift working	Run time attachment and detachment of data which allows speedup the process time					
User friendly	Simple process and effortless user interface.					
Data Range	Data covering 15 states with information till villages level.					

4. CONCLUSION

It is evident from the study how user friendly and flexible application is. Application allows the user to intervene at any level, analyze by different methods, apply copious options and prepare different type of route plans with different combinations. Application provides the functions to streamline analysis process by giving the option of analyzing only rural, or urban, or both the data.

User can make abundant addition or changes in the tabular database and this gets automatically linked with the map. User can also easily import or export data created at other location.

Application is fast and simple to use.

Implementation of this application made identification of potential markets in the targeted population strata much easier.

Number of route plans with desired options could be worked automatically with the application within minutes. This resulted into radical cutback in the time between data processing, planning and implementation.

Prior to development of this application, planning a marketing campaign took eight to nine days to produce single route plan. This involved tedious scanning of demographic data of all the rural and urban areas with the desired parameters to prioritize the areas. Route was designed manually on the hard copy maps resulting into consumption of time.

Possible route plans could be chalked out on the screen and modification of the routes from existing markets and stock points became much easier. Thus various alternatives can be tried easily through

iterations before finalizing on the route plan.

Thus study shows how application has radically improved the process of the analysis and creation of route plan for rural marketing. By continuous upgradation of information (spatial and aspatial) and developing more modules, many other areas of work can be improved.

Technical Details:

Operating System	: Windows NT
Minimum RAM	: 128 MB
Processor	: Pentium III
Min. HDD	: 10 GB
Software	: ArcView (3.2a)
Programming Language	: Avenue.