



Recommendation for a GIS-based Decision-Support-Tool for the Administration of Primary and Secondary Schools under State Governments

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Abstract

Government office's day-to-day operations require a continuous information processing and decision-making that involve policy formulation, transfer of staff, monitoring and control of different projects and enforcement of policy decisions. Time for decision-making and response to various queries is high. This can be attributed to low availability or accessibility of adequate information.

Therefore, in the current Primary and Secondary Education System run by state governments, it is evident that there is an urgent need for a central information system which can be accessed by schools, district offices, regional and secretariat offices etc. As the information needed consists of spatial (location, accessibility, etc.) and non-spatial (population, infrastructure, etc.) data, the use of GIS-tools will be detailed in this presentation.

1. Introduction

Rise in the use of spatial technology based on Maps and satellite imageries has secured acceptance for Geospatial technology in the several organizations as an effective Decision Making (DM) tool. Many Government agencies have now realized that this technology can provide them much-needed tool to address the ever-increasing demand for more precise analysis.

Data presented in tabular format alone fails to attract the depth of its nature. Looking at the same data in spatial context convey the essence of data in self-explanatory manner. Hence, strong need is felt to convert this spatial information into a Decision Support System (DSS) as this information will improve the accuracy of decision-making by adding the third dimension of information in the form of spatial data. With the advent of web technology, the information distribution has become cost effective and easy to manage. So, the web technology will be the right technology to be used for implementation of DM Tool with spatial information.

This study is conducted to explore the possibility of using spatial component in various analyses, part of decision-making process to perform in effective operation of schools' administration. The accuracy of decision-making is very much depending on quality of data, type of data and adequacy of data. It is expected that this tool will assist to decision makers on different tiers of



administrative hierarchy to deliver instantaneous decision with more accuracy. The district level, secretariat level administrators and common users depending on the permission granted in Web Application can access this centralized data.

2. Present situation study

To achieve full literacy, more focus is required to give to rural areas. It is observed that different offices of Educational Departments do not dispose the necessary data, which can be viewed in spatial context. Hence, emphasis is given to explain the role of web GIS in the following analysis in relation to School administration and policy making rather than just providing geographic position of schools -

- Analysis for availability and establishment of school
- Decision-support for planning and conceptualize school development at all levels
- Visualize and analyze the school, students and teachers data with Geospatial components for effective and efficient management
- Analysis for school infrastructure augmentation and funding
- Analysis of accessibility of transport (e.g. nearest bus stop or railway station to assist in placement of female Teachers in remote areas)

3. System Implementation Process

- Need analysis to be carried out by involving various stakeholders so that one can ensure a complete DM Tool to provide information on different tier of administrative structure.
- Defining the procedure for collection of information, approval from client, Application Development and Implementation plan.
- Preparation of maps consisting information of school's location, road networks, landmarks and administrative units such as Village boundaries, Tehsils boundaries, and District boundaries.
- Collection of Census data, school information from district offices, information from survey data like nearest bus stop, railway station and other type of commutation services point near to school location.
- Development of web application with the use of standard and proven GIS and Database software.

4. Data creation



Map India 2010

19 - 21 January at Epicentre, Gurgaon, India

4.1 Creation of Spatial Data - Spatial information should be captured with remote sensing and survey methods. Before starting data collection process, Geodatabase should be designed to avoid mismanagement of data. Digitization and map attribution can be performed in standard GIS software such as ARC GIS, Map info etc.

Map can be classified in following six layers -

- **Location of Schools** – Location of schools can be collected either by capturing from digital data consisting of Road Network and landmark feature or through the GPS.
- **Administrative boundaries** – Administrative boundaries in village level, Tehsil level and district level can be either captured from Toposheets or updated and incorporated from already available digital data.
- **Road Network** – Road Network can be digitized taking reference of satellite imagery or already available data from secondary source can be updated.
- **Nearest Commutation points** – Through survey method, information of nearest commutation point along with type of transport facility can be collected with GPS coordinate. It can also be captured from the digital data consist of Road Network and Landmark feature.
- **Landmarks** – Landmarks can be collected from Toposheets and later on, additional information near school location can be incorporated in the surveying process.
- **Annotation** – Annotations include road name, village name, tehsil name, district name, nearest commutation point viz., bus stop, railway station, landmark information or any other type of transport.

4.2 Collection of Non spatial data

Some of the information can be collected from district or secretariat offices but remaining information need to be collected from survey methods .The information collected from survey can be utilized only after the approval from the Principal of schools or Head Masters of School and then from the office of district administrator of education.

Data parameter of schools -

4.2.1 Primary School

- School Infrastructure
- Number of rooms
- Availability of playing field
- Hand pumps or other drinking water facility



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- Number of toilets
- Existence of electricity connection
- Total strength of teachers (Male and Female)
- Total strength of students (Male and Female)
- Strength of students in last five years.
- Average percentage of dropout in last five years

4.2.2 Secondary school

- School Infrastructure
- Number of rooms
- Availability of playing field
- Labs availability
- Academic Results of last five years Schools (10th and 12th)
- Total Strength of teachers (Male and Female)
- Total Strength of Students (Male and Female)
- Co-education
- Subjects/Streams in school (for 10th and 12th standard)
- Average percentage of dropout in last five years
- Computerization of Account Office
- Power Backup facility

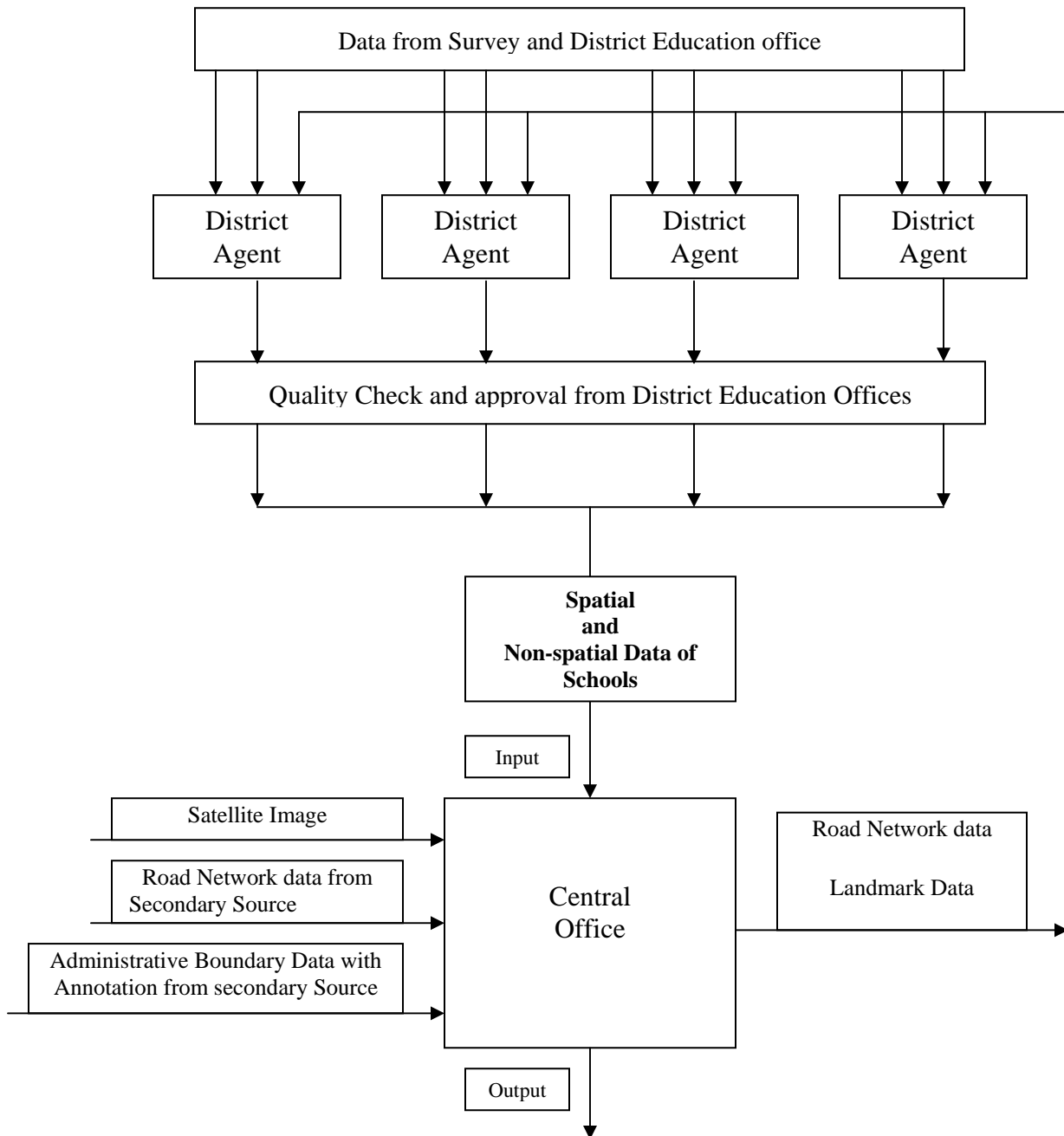
4.2.3 Data Collection on village level

Census data 2001 with interpolation can be utilized considering population growth rate. Only few parameters are required to be part of DM tool as mentioned below -

- Total population
- Child population with age groups
- Male child
- Female Child



5. Process of Data Creation -





Final Spatial and Non-spatial Data

Fig 1.0

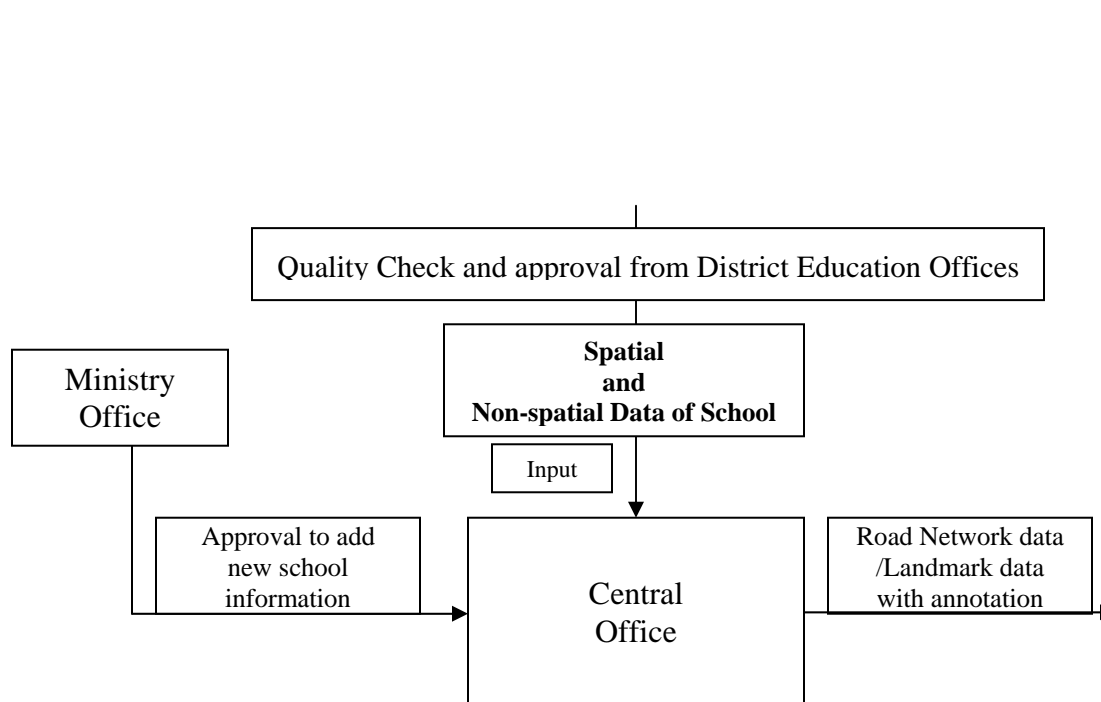
5.1 District agents

Data collection process will be commenced with the fresh digitization or updation of Road Network data, if available from secondary sources, along with Landmark features, satellite image and Topomaps etc., in Central Office. This data should be delivered to district agents to assist in survey process to add other required information in same data base .The information gathered from survey process related to nearest commutation point, school location and important landmark, can be stored as softcopies or can be marked in hard copies. Surveyor is required to collect some information from school authorities, which is not available with School's district offices and the information from District Education office in Standard format. Final Spatial information of nearest commutation point, Location of School and Landmarks should be delivered to Central Office in standard formats.

5.2 Central office

Primary responsibility of Central office is to collect, generate and mange the data received form district agents in standard formats. The final data should be transformed as per the Data model, designed for Web application.

Addition of New School information -



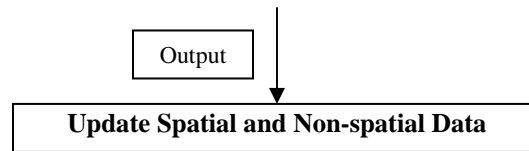


Fig 2.0

After receiving approval from the authority from Education Ministry, process of addition of new information should be initiated from central office, which provides the road network, Landmark data etc. to assist the surveyor for collection of school location, nearest commutation point and other attribute data. Information of new school can be appended in database either once in a year or twice in a year, depending on the agreement between the Government and the firm.

5.3 Updation of School attribute Database and Spatial database

Web application should provide the module through which district agents or School authority itself, can update the data of schools. Information of road network or landmark and nearest commutation point should be updated once in a year.

6. Web Application Architecture

The overall architecture is shown in Fig 3.0. Data served through a web interface can be accessed in the client offices through a web client. Central office consists of production application environment and Database server. The production application environment involves spatial data creation, updation and attribute data creation and management to ensure the availability of data in standard format for web application.



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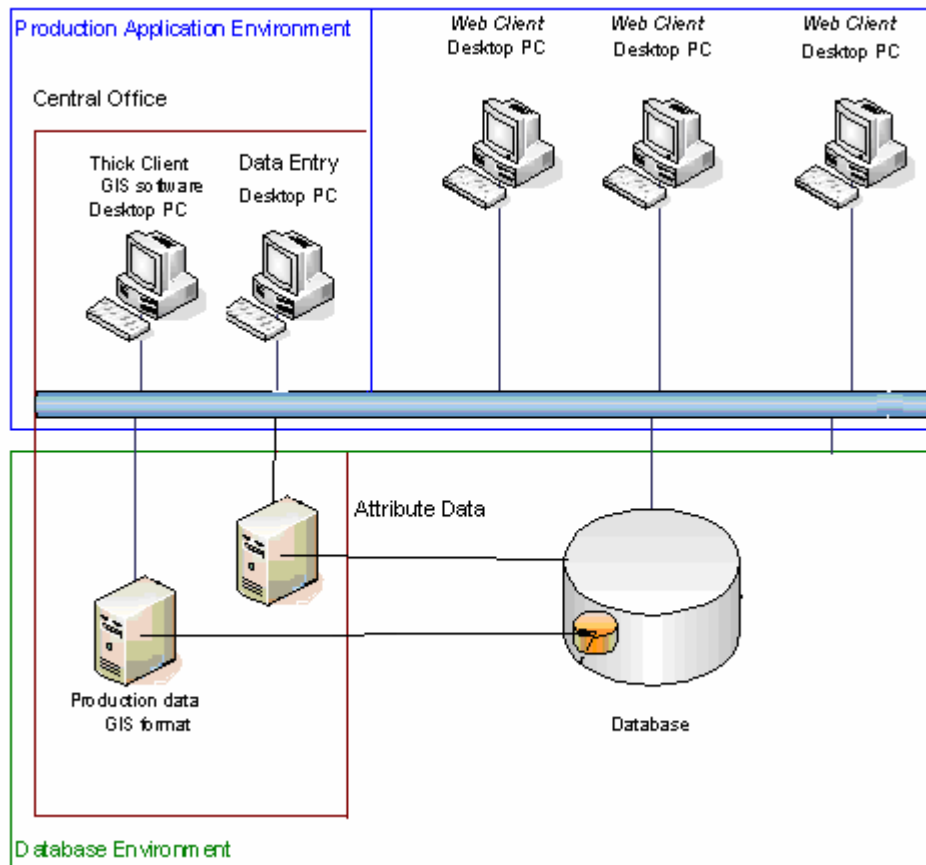




Fig 3.0

7. Modules

7.1 Data Entry

To provide the non-spatial data input for creation of database and updation of data on regular interval requires a one GUI. Operators placed in District agent offices and authorized person in schools can provide the input data depending on the permission granted.

7.2 Browse Map

Through this interface, user will able to browse maps and use some of the functions such as measuring the distance between two schools, distance of school from localities, Zooming IN/OUT, locating the desired road or commutation point through querying the text information, calculation of nearest commutation point for Teachers and students, nearest school from a particular village.

7.3 Spatial Query

Based on the selection of spatial features, user will be able to extract the information of non-spatial data. For e.g. villages covered by school in specific buffer zone (under state/block/district), number of schools covered in specific range etc.

7.4 Non-spatial Query

This function involves selection of spatial feature based on the query on non-spatial data. Some of the example of queries can be built to display the geo-spatially distribution of result according to theme and range in different color-coding –

- Distribution of Infrastructure of school
- Distribution of Academic subjects
- Distribution of student's strength in School
- Distribution of Teacher student ratio
- Distribution of Female and Male Teachers ratio village wise
- Distribution of Female and Male students' ratio
- Distribution of Schools academic performance



- Comparison Analysis using Census data and school data

8. Conclusion

The use of Decision Making (DM) tool in the policy formulation of Primary and Secondary Education System run by State Governments will open the paths for disseminating, sharing, displaying and processing continuous information to the Decision Makers. This system will increase precision and transparency in decision-making, which will be beneficial to all departments. Utilization of DM Tool will encourage the organization to come up with their need for implementation of such type of GIS system to be integrated with e-governance in future. The last but not the least, the entire system will help the department in a big way.

References

1. Discussion with former Education Minister of Utter Pradesh
2. Discussion with District inspector of school
3. Discussion with Basic Shiksha Adhikari of Utter Pradesh
4. Discussion with Principal of schools in different Districts of Utter Pradesh.