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ABSTRACT

This paper examines Blue Valley School District's (Overland Park, Kansas) use of geographic information systems (GIS) to help it manage and plan for rapid growth and development areas. The GIS program helps school districts realize several planning related benefits that include an increase in the cooperative planning activities among stakeholders in the school planning process, achievement of a democratization level utilizing GIS technologies, and improvement in the planning process for school district residents, the Planning and Facilities Committee, and the school district's administration. Appendix contains 28 references. (GR)

GIS in Community-Based School Planning:

A Tool to Enhance

Decision Making, Cooperation, and Democratization

In the Planning Process

By

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Abstract

The Blue Valley School District (BVSD) in Overland Park, Kansas, is a fast growing suburban area south of Kansas City. With rapid population growth comes a burgeoning student enrollment, a significant challenge to the school district. The BVSD utilizes geospatial technologies called geographic information systems (GIS) to help manage and plan for its growth and development. Through its GIS program, the school district has realized several planning related benefits. These benefits include an increase in the cooperative planning activities among stakeholders in the school planning process, achievement of a democratization level utilizing GIS technologies, and improvement in the planning process for three groups in particular — school district residents, the Planning and Facilities Committee, and the school district's administration. Despite some current limitations, geo-spatial technologies utilized along with a public participation process can advance cooperative and community-based school planning among all stakeholders and policymakers involved in the procedure.

1.0 - Introduction

The Blue Valley School District (BVSD) in Overland Park, Kansas, is the fifth largest school district in Kansas, with a 1999/2000 enrollment of over 16,500 students. The school district, located in parts of the cities of Overland Park, Leawood, and Olathe, as well as in part of unincorporated Johnson County, covers ninety-one square miles, 52% of which is vacant, undeveloped land.

For many years, the BVSD has witnessed significant residential growth. In the past ten years, the school district's enrollment has increased by 136%. Of the student enrollment growth reported by Johnson County's three major school districts over the past five years, Blue Valley has accounted for 46% of the new students. This is significant because Johnson County, Kansas, is one of the Midwest's fastest growing counties. Johnson County's population has increased by an estimated 62,000 (17% growth) over the last five years.

In 1988, BVSD's planning department obtained and developed a geographic information system (GIS) for school planning applications. The system was housed on a personal computer and offered significant, but somewhat limited, analysis capabilities. In 1994, the district's Planning and Facilities Department switched to a UNIX-based GIS, and chose ARC/INFO (Environmental Systems Research Institute, Redlands, California) for its GIS software solution. This acquisition greatly enhanced the department's ability to conduct more complex GIS-based analyses. Since then, Blue Valley's Planning and Facilities Department has developed several GIS applications to aid its planning operations and has benefited dramatically (ESRI, 1997a, 1997b; Higginbotham, 1996; Slagle, 1998, 1995a, 1995b).

The purpose of this paper is threefold. First, the paper defines GIS and its use by public school districts. Second, the paper shows how GIS has impacted the Blue Valley School District's planning operations and its relationships with other governmental entities and stakeholders in the planning process. Third, the paper asserts that despite current limitations with accessibility, modeling, and technology (Armstrong, Lolonis, and Honey 1993), community-based school planning can improve through a GIS-based planning process.[1]

2.0 - GIS In School Planning Activities

A GIS can be an indispensable tool in school planning. GIS can be used in school planning activities for a variety of day-to-day and specialized applications.[2] It is apparent from the many sources of GIS literature that many definitions of GIS abound (see Appendix A for a sampling of sources). However, from a school planning perspective, GIS can best be described as a system that allows for the capture, storage, retrieval, analysis, and display of spatial data for the purpose of advancing school planning activities.

The most important part of this definition deals with the aspect of "spatial" data. For the most part, education professionals are not taught to think in spatial terms. Many databases and sources of digital information for education professionals exist, but not many deal with the matters of location and space. For example, it is not uncommon for school districts to develop a student records database. This database will deal with such things as student name, address, grade level, report card, health records, test scores, and the like. Users of this database could perform such aspatial queries as "Find all of the ninth-grade students who scored 95% or above on a standardized test." If, however, it were possible to map

[1] This paper and thesis were first developed in the spring of 2000 in conjunction with the Stein and Schools Lecture Series at Cornell University, Ithaca, New York. (See http://www.crp.cornell.edu/steinandschools/).

[2] For the most part however, GIS applications for school district planning have not been too widespread. Some possible reasons exist for this which will be discussed later in this paper (see section 4.4).

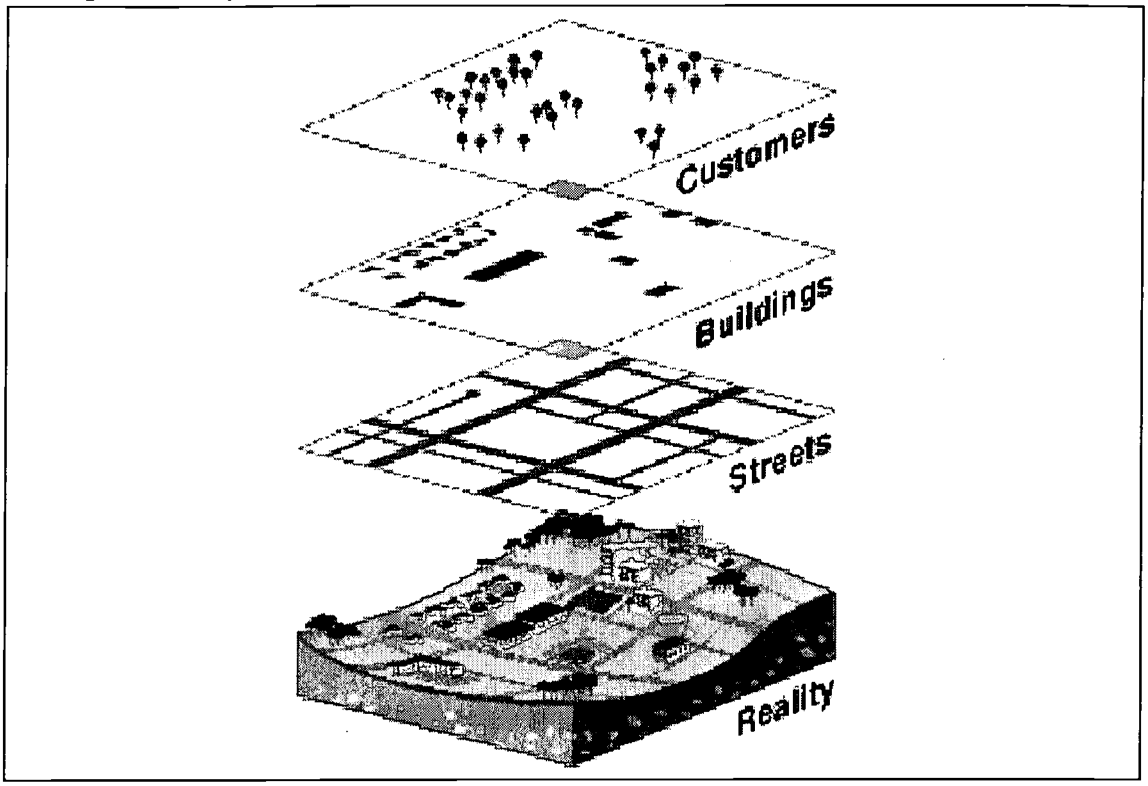
where these students are located, a spatial query could ask "Find all of the ninth-grade students who scored 95% or above on a standardized test and who live in the northeast part of the school district." Once the researcher has identified these students, additional spatial data (e.g., census tract data of the northeast part of the district indicating the percentage of adults who have a college degree) could be examined to see if there are any underlying reasons and correlations for the subject under study. By spatially enabling the database, new ways to look at old problems can be found, and often hidden trends can be discovered.

As a spatially enabled database that blends geography and policy analysis, a GIS is made up of four primary features — data, hardware, software, and human resources.[3]

A GIS begins with data. The data attempts to capture and represent earth's physical reality. Two types of GIS data exist, spatial and nonspatial. Spatial data is information stored within a GIS about an entity's unique location on the place of the earth. Spatial data can be used to represent point locations (such as a bus stop), linear features (such as a road), and units of area (such as an attendance zone). Spatial data is organized around a system of location that ties all the data together. GIS data is stored in layers and, because of the location system, can be overlaid in such a way as to give new meaning to subjects and issues under study (see Figure 1).

[3] Many works exist which explain in greater detail than will be presented in this paper about what a GIS is and what it can do (see Appendix A for a sampling of references).

FIGURE 1
A Sample Overlay of GIS Data



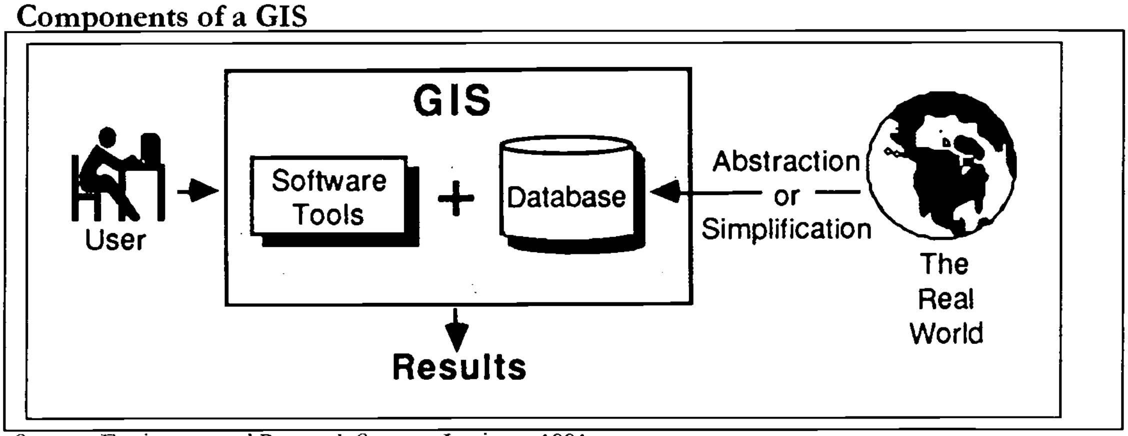
Source: ESRI website (www.esri.com); Downloaded by M. Slagle, 2000.

Within a database management system (DBMS), nonspatial data refers to information that describes spatial data. A GIS can be described as a DBMS with a spatial component. For example, a point in a GIS may represent a bus stop, but an attribute in a GIS-related DBMS may describe this bus stop as stop #20. A line in a GIS may represent a road, and this data is augmented by the attribute in the DBMS that describes this road as Metcalf Avenue. An area unit, such as an attendance zone, may exist in a GIS, and an attribute in the DBMS may describe this area as belonging to West High School. Nonspatial data is crucial in a GIS for describing the features stored.

Another component of a GIS is software and hardware. For the data to be manipulated and analyzed, a GIS software package must be used. This software is used on a computer, and may utilize a printer, modem, and other hardware peripherals. Software packages are available from GIS companies such as Environment Research Systems Institute, MapInfo, and Intergraph.[4] The hardware on which a GIS operates can range from a desktop personal computer to high-end Unix and NT workstations.

Perhaps the most important part of a GIS is the people who use the system — the human resources. To work with GIS data and gain the most from the technology, one doesn't necessarily need a degree or formal training in computer science, statistics, geography, or cartography. Though such a background may be of help, the person should at least have an understanding of how to think spatially and how to ask spatial questions. Examples of spatial questions will be given later in this paper. Figure 2 illustrates the components of a GIS.

FIGURE 2
Components of a GIS



Source: Environmental Research Systems Institute, 1991

With the correct data, a GIS can help a school district analyze the following types of issues:

[4] The top 5 GIS companies in the world, based on revenues in 1999, according to Daratech, Inc:
1. Environmental Systems Research Institute
2. Intergraph
3. MapInfo
4. Autodesk
5. Smallworld.
Source: Geospatial Solutions, June 2000, page 58. www.geospatial-online.com.

Housing development trends — Data on building permit records and home sales can help a school district understand not only where a student population is changing, but how that population is changing as well. A school district can combine data on an area's housing turnover rates with the the same area's number of students, to better understand the demographic dynamics at work that influence student enrollment change.

Enrollment trend analysis — Mapping student locations on a computer map can help a school district learn where clusters of students are located and where they may be located in the future. Such knowledge can help determine the needs for future school buildings and/or attendance area changes.

Site selection for new schools — Data on topography, hydrology, proximity to transportation links, student enrollment potential, and land use plans can help a school district determine an appropriate location for future schools as well as help negotiate for land acquistion. A GIS can combine layers of digital map information in such a way as to create a new layer of information that can be crucial in answering spatially related questions.

Transportation (bussing) coordination — A GIS can be crucial in helping a school district with such locational and logistical problems as school bussing coordination. Many GISs have the capability to design effective bus routes and to analyze fleet and route efficiency. Data needed to accomplish this task includes student locations, street network, bus stop locations, speed limits, school locations, and travel constraints.

Enrollment and staffing management plans — GIS can also help other departments within the school district. For example, in a rapidly changing area, GIS-derived data on student enrollment and potential enrollment increases can help the school district's human resources better decide how to allocate teaching staff to existing schools.

Boundary analysis — Where school attendance areas must be altered, a GIS can be a valuable tool in determining which boundary plan may meet a school district's objectives. For example, a GIS can help display to administrators and the public the implications of competing boundary scenarios in terms of multiple constraints such as racial equality, transportation distance, enrollment overload or underload, fiscal constraints, staffing implications, feeder system issues, and the like.

3.0 - GIS Based School Planning at BVSD

This portion of the paper will describe the GIS operations of the Blue Valley School District, with a focus on how it has affected district-wide planning operations. Specifically, this section will describe how the BVSD GIS program has fostered better relationships with other governmental entities and stakeholders in a community-based school planning process.

Since 1994, the Blue Valley School District has created several GIS applications for its school planning activities, but the primary application centers on school boundary analysis. Few decisions that a board of education can make evoke more highly charged emotions on the part of district patrons than that of changing school attendance area boundaries. Board members are faced with the unenviable task of determining, based on projected future enrollment growth and current enrollment pressures, which school boundary configuration will be best for the district in the long run. This task is even more difficult if the district is large and growing rapidly. The possible combinations of school attendance areas are seemingly endless, and each combination differs from the others in terms of what it means to the school district and its ability to provide for its patrons. For a board of education to serve its patrons with the greatest level of service possible, a tool is needed that allows access to current information on present and anticipated student enrollments as well as allows the future student enrollment impacts of attendance boundary decisions to be viewed and analyzed. The BVSD Student Enrollment Decision Support System (SEDSS), a GIS-based application, was designed with this end in mind.

SEDSS can be best described as a system that allows decision makers the ability to analyze the potential impacts of competing boundary scenarios. Prior to its development, considerable effort was expended to calculate the fiscal, educational, managerial, and transportation impacts of potential boundary changes. SEDSS currently allows such impacts to be analyzed immediately. SEDSS also offers a group-based school attendance area creation and analysis system allowing significant interaction on the part of decision making bodies to change assumptions and/or boundaries and to analyze the results immediately.

SEDSS was developed to meet the major components of any spatial decision support system (SDSS), including what-if modeling, image and data capture, database management, analysis, display, and interaction with decision makers (Bracken and Webber 1990, Ryan 1992, Anjomani and Saberi 1992, Armstrong et al, 1993).

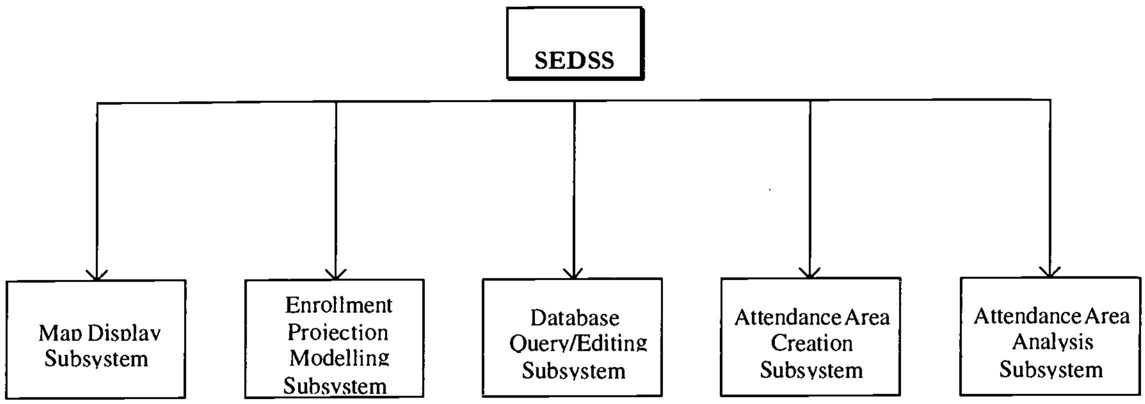
3.1 - How SEDSS Works

SEDSS is a menu driven system and was programmed by the school planning staff using the Environmental Systems Research Institute's Arc Macro Language (AML). The system consists of five subsystems: map display, database editing and query, enrollment projection modeling, attendance area creation, and attendance area analysis.

The attendance-area-creation and attendance-area-analysis subsystems of SEDSS allow users to interactively assign residential subdivisions to certain schools and to immediately analyze the long-term impacts on the school district. For example, in Boundary Committee meetings, a SEDSS computer file of the school district is displayed on a six- by eight-foot overhead screen. Committee members use SEDSS to discuss boundary issues, move planning areas from school area to school area, and analyze the short- and long-term effects of such scenarios. Under this arrangement, committee members are able to see the new boundary configurations graphically and can examine what the new configuration means to the school district from a broad perspective. This method enables the committee to explore and debate several boundary alternatives in a time efficient manner. Moreover, the use of SEDSS facilitates discussion and school boundary conflict-resolution among committee members.

As Figure 3 indicates, the five subsystems of SEDSS allow users to accomplish multiple interrelated planning tasks. With the map display subsystem, users can view the school or subdivision boundaries and/or change the boundaries interactively. Maps can be displayed using a variety of scales. Other maps can display information about a particular study area, such as a school attendance area. With the enrollment projection modeling subsystem, all of the tasks involved in the projection process — from data input and maintenance to changes in assumptions and adding new model variables — can be accomplished. This subsystem resides in a database outside of Arc/Info, and is imported to SEDSS prior to beginning the boundary study process. The enrollment projection model is based on traditional cohort-survival techniques and is augmented by measurable growth factors in the district (such as housing starts and existing home sales). The database query/editing subsystem allows users the ability to ask questions of the database (i.e., what subdivision is here, what is the subdivision's future projected enrollment by grade level, etc.), update subdivision information, and add new or future subdivisions to the system.

FIGURE 3
The Five Subsystems of SEDSS



Abilities (Map Display Subsystem)
- Display school and subdivision boundaries.
- Display school locations, road network, the locations of students' homes.
- Change school boundaries interactively.

Abilities (Enrollment Projection Modelling Subsystem)
- Conduct enrollment projection modeling.
- Change model assumptions.
- Incorporate new model variables.
- Track and update model inputs (i.e. building permits by subdivision).

Abilities (Database Query/Editing Subsystem)
- Query database for information by subdivision (i.e. number of students produced by the subdivision).
- Update subdivision information (i.e. subdivision codes and numbers).
- Add new or planned subdivision areas to the system.

Abilities (Attendance Area Creation Subsystem)
- Interactively change attendance areas.
- Conduct what-if analysis on future attendance areas and/or potential new school site impacts on attendance areas.

Abilities (Attendance Area Analysis Subsystem)
- Analyze the effect of boundary changes on current and future school enrollment.
- Analyze seven boundary criteria.
- Identify potential enrollment overcrowding areas.
- Conduct what-if analysis.

Source: Created by Mike Slagle, 2000.

The attendance-area-creation and attendance-area-analysis subsystems are the two most important analysis activities of SEDSS. These subsystems allow users to interactively assign subdivisions to certain schools and to analyze the long-term impacts of the boundary changes on the school district. The Blue Valley School District currently has seven boundary criteria that are important in determining new school attendance areas. These criteria are described in Table 1. All of these criteria are quantifiable and can be analyzed by SEDSS for any boundary option.

TABLE 1
Blue Valley's Seven Boundary Criteria

Projected enrollment and target/operational capacities
λ Attendance boundaries should reflect the projected enrollment and the target/operational capacity of the building as well as of all facilities within the district. This factor addresses facility usage, student enrollment, staffing needs, and the educational program.
Duration of boundaries
λ This factor addresses the ability of an attendance area to accommodate the anticipated enrollments for a projected period of time. Where possible, attendance areas should be stabilized to limit the number of schools attended by students.
Subdivisions intact within attendance areas
λ Where possible, boundaries should be structured to maintain a subdivision within one school's attendance area.
Distance from schools
λ Whereas students may not necessarily attend the closest school, distance, transportation time, and routing should be considered in formulating attendance boundaries.
Fiscal considerations
λ Where possible, boundaries should be structured to minimize the financial impact on the overall district. This factor should address staffing requirements, building modifications, and educational program needs.
Student options considerations
λ Student options may be considered when and where appropriate. During a boundary change, special consideration may be given to students at the 5th, 8th, and 12th grade levels.
Feeder system considerations
λ Where possible, the committee will attempt to create boundaries between elementary, middle, and high schools in an effort to have as many schools as possible, at each educational level, advance students as one group to the next higher educational level.

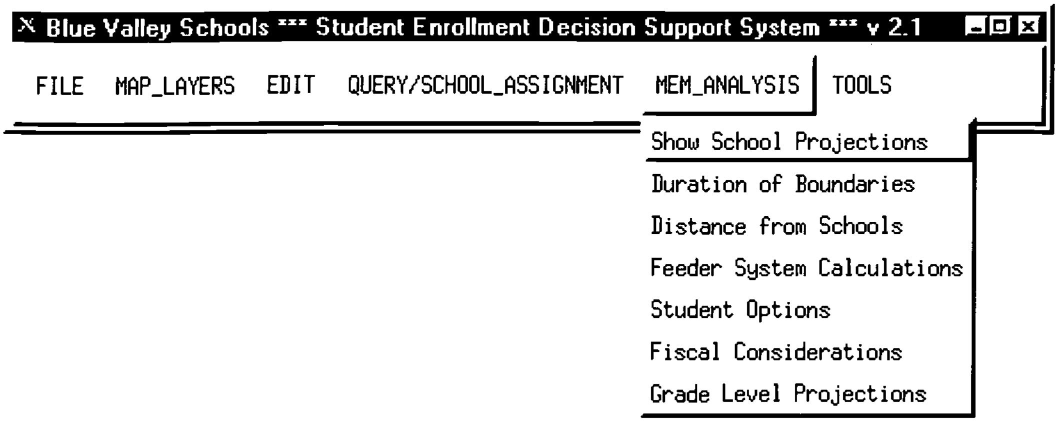
Source: Blue Valley School District, Approved 1996.

3.2 - SEDSS and the Multi-criteria Evaluation Model (MEM) Analysis Menu

The district derives significant value from the Multi-criteria Evaluation Model, a subsystem application of SEDSS. This selection tool, shown in Figure 4, allows the user to analyze and evaluate any boundary proposal in light of Blue Valley's seven boundary criteria. The development of this part of SEDSS has made it a truly invaluable part of the planning process. The selections available with this menu tool include the following:

- λ The Show School Projections selection allows the user to inspect and analyze the enrollment projections based on the boundary scenario under study. The enrollment projections are updated on the fly as new boundary configurations are explored.
- λ The Duration of Boundaries selection displays those schools that are projected to exceed their capacities in any given year.
- λ The Distance From Schools selection analyzes and returns to the user the total student distance traveled from home to school under a given boundary scenario, as well as the average distance traveled by each student from home to school for that same boundary option.
- λ The Feeder Systems Calculations selection examines and returns values describing how well each boundary scenario conforms to a true feeder system.
- λ The Student Options selection tool allows the user to examine the number of students who may be eligible for special transfer options. When school attendance areas change, the Board of Education may opt to allow certain groups of students to stay at their current school. This tool allows the user to analyze how many students may be involved in these special transfer options.
- λ The Fiscal Considerations selection analyzes the costs associated with any boundary configuration. These costs include additional teaching staff needed, utilities, custodial staff, school professional and support staff, and administration.
- λ The Grade Level Projections selection allows the user to examine the grade level breakdown at all of Blue Valley's schools for any given boundary scenario.

FIGURE 4
The MEM Analysis Menu



Source: Blue Valley School District SEDSS, 2000

Without SEDSS, the school planning operations at the Blue Valley School District would be executed in the same time-consuming manner in which it was in previous years. SEDSS has greatly streamlined the boundary process, thus freeing time for school planning staff to use its human resources in other important areas of school planning management activity. In a rapidly growing school district, the use of available technology to accomplish difficult tasks is a win-win situation for all those with a stake in the planning process.

3.3 - Using Geospatial Technologies for Demographic Analysis

Another GIS application the Blue Valley School District has utilized is more specialized in nature and uses a fairly sophisticated spatial analysis methodology (Slagle 1998). The BVSD tracks demographic and development information on a monthly basis. This includes building permit information, home sales data, and student enrollment counts by planning area. Traditional ways to analyze this data included trend analysis and descriptive statistics. Though these techniques yielded much information regarding some of the intricacies of enrollment change in the district, a method was needed for gaining a more thorough understanding of some of the residential development and demographic changes at work.

The BVSD property database was merged with various data sets the school district tracks using a GIS overlay procedure. The result was a spatially-enabled database about residential development and student enrollment — information that normally is not analyzed in a spatial context.

This spatial database was very useful for school administrators examining district changes. Information from this analysis was directly responsible for changing a school site decision in 1997. Prior to employing this application, the district was prepared to build its next elementary school in the east-central portion of the school district. The analysis indicated, however, that a more western location was needed. The school planning department and the district's executive leadership discussed the analysis findings, and the location for the school was changed. Without this GIS analysis, it is likely the school district would have gone forward with its original school site choice.

4.0 - Improving Community Based School Planning Through GIS

The BVSD has achieved three significant benefits by utilizing GIS in their community-based school planning model. These benefits include the following:

- An increase in the cooperative planning activities among stakeholders in the school planning process.
- An achievement of a level of democratization.
- An improvement in the planning process for three groups in particular — school district residents as a whole, the Planning and Facilities Committee, and school district administration.

As discussed in the previous sections, school districts' use of GIS advances the accuracy and expedites the completion of most planning related activities. Geospatial technology use does have limitations, and these limitations will be discussed later in this paper. However, a geospatial database along with appropriate public processes can be of tremendous benefit for relating school district planning to broader issues of community development planning.

4.1 - Towards Cooperative Planning

GIS has played a major role in increasing the cooperative planning activities of entities not only within the Blue Valley School District, but also with organizations outside this district. Cooperative planning, as it applies here, means engaging in a planning process primarily aimed at achieving common benefits. GIS has benefited the school district with both its internal and external relationships. The internal relationship benefit will be discussed in a later section of this paper. The primary external relationships that have been enhanced by cooperative planning and GIS are evidenced by three examples.

λ Automated Information Mapping System (AIMS) — In the late 1980s, the Johnson County, Kansas, Automated Information Mapping System — AIMS — was initiated by the Board of County Commissioners. The major reason for developing AIMS was to enable the county to meet the rigorous mapping and documentation requirements of the complete property reappraisal mandated by the Kansas State Legislature. As a biproduct of this effort, county management recognized that the availability of accurate, current maps would provide many benefits. These maps could assist utility construction and maintenance projects, property valuation and parcel-related research, land-use planning, site selection and economic development, and general strategic planning.

AIMS has evolved into a consortium of several partners, including such entities as cities, engineering firms, utility districts, school districts, and developers. The Johnson County AIMS department makes available diverse sets of GIS data for these entities' planning purposes. In turn, these entities share with other members of the consortium data sets created using the AIMS data. For example, the Blue Valley School District employs such AIMS data as property records, street centerline files, an address-matchable GIS database, land records, sales data, and digital aerial photos.

This data has assisted school administration with several important decision making tasks. These tasks range from boundary and enrollment management to decisions regarding school site choices. The decision making culture has changed within the school district's planning department to the degree that whenever an issue or decision with a spatial component is encountered, GIS analysis and the data from this arrangement with AIMS is used early in the process. In turn, the district has shared with the AIMS members its GIS files on current and future school locations, student locations, and network road improvements needed. GIS data has been the common theme helping AIMS participants advance their planning functions.

λ City of Overland Park, Kansas — The City of Overland Park (OP), Kansas, is also an AIMS member and participant. The school district shares a special relationship with Overland Park, as 70% of the district's student enrollment comes from the city. Overland Park has developed a sophisticated GIS program, which has produced information and data sets that have helped the school district in some of its planning functions. For example, OP makes available to the school district its GIS data on future land use plans and current zoning. This information helps the school district in making important site decisions. The school district uses this data in its GIS to determine which areas may be more appropriate sites for school building construction. In turn, the school district has shared with OP its GIS data sets on school locations, student locations, and future school sites. This data helps OP plan and program for capital improvement projects such as traffic signalization and road improvements.

The school district also receives non-GIS data from OP, which it transforms into GIS spatial data valuable to the school district's planning process. For example, OP allows the school district access to its building permit file. In a process called geocoding, SEDSS gives this file a digital spatial location. Geocoding pinpoints to a location on a computer map the address of each building permit record in the file. The result is a GIS data file that shows by their locations on a map all the addresses with new residential construction. The implications of this data are tremendous. The school district can track housing starts and incorporate those new starts into the enrollment projection process. Because enrollment projections form the backbone of all planning activities in the district, the ability to improve small area projections with more accurate data on housing/population changes is quite valuable. The most basic questions as to where and when new schools will be built are also answered using this GIS-enabled data set.

λ Wastewater Department — The Johnson County Wastewater Department, also an AIMS member, also has developed an extensive GIS database. Because the school district, as a result of working with GIS data sets from AIMS and OP, has determined where and when new schools are going to be built, the Wastewater District strives to provide sewer service to meet those openings. The Wastewater Department will use the school location GIS data set from the school district to help plan for the need for future sewer extensions. The Wastewater Department in turn keeps the school district informed of the status of sewer district creation through the use of maps produced from a GIS.

4.2 - Improving Democratization through GIS Technology

Each year, the Blue Valley School District works with a sixteen-member Board of Education advisory committee (BAC) to develop a school attendance area recommendation plan. Committee members are appointed by the Board of Education from four geographical regions in the district. The BAC's purpose is to provide opportunities for patron involvement with issues affecting the district (Blue Valley School District Advisory Committee brochure). The BACs were first organized in the early 1980s and span several school district functions: curriculum and instruction, planning and facilities, finance, community relations, personnel and policies, technology integration, and student activities (ibid).

An obvious application of computer and GIS technology in the public sector is the empowerment of its users to do things better, faster, cheaper. For example, computerized word processors produce the written word better, faster, and cheaper than did the old technology's typewriter. Likewise, computerized spreadsheet applications can keep track of more data and process this data faster and less expensively than paper-and-pencil ledgers ever could. The ability to do things better, faster, and cheaper should be a basic level of return from technology. SEDSS has indeed allowed the school planning staff to do its analysis activities better, faster, and cheaper. However, it may be argued that a higher level of technology's return is in the enhancement and achievement of democratization.

Democratization can best be described as a change in people's interaction with pending governmental decisions because of the use of available technology and/or non-technical systems (Tulloch, Niemann, and Epstein, 1996). Improving equity in public decision making is a central tenet of democratization. Equity in public decision making can best be thought of as a process in which all concerned individuals and their respective interests are heard and are dealt with fairly and equally. In regards to Blue Valley's school planning situation, equity is hearing all patrons' concerns about a school boundary issue and making a recommendation based on that input and on the situation's objective facts.

Tulloch, Nieman, and Epstein (1996) contend that democratization is characterized by several factors:

- λ improved access to records
- λ better understanding of both previous and planned government actions
- λ increased equal treatment in government decisions
- λ reduced conflict over decisions
- λ increased trust in decisions
- λ increased participation in government decisions

Using these factors as a framework, a system can identify the extent to which democratization has or has not occurred with the SEDSS application.

4.3 - How SEDSS Has Enhanced Democratization

— *Improved Access to Better Records*

The programming and implementation of SEDSS has allowed the BAC and the community to access more information relevant to boundary changes than ever before. Information such as students per planning area, projected numbers of students, current numbers of homes, and the impacts of boundary changes on the district's fiscal and administrative workings are just a small sample of the records now at the BAC's disposal. The BAC uses this information to make recommendations to the Board of Education. The result is a committee-based strategic plan, based on access to this data, that attempts to guide the school district in its important attendance area setting activities.

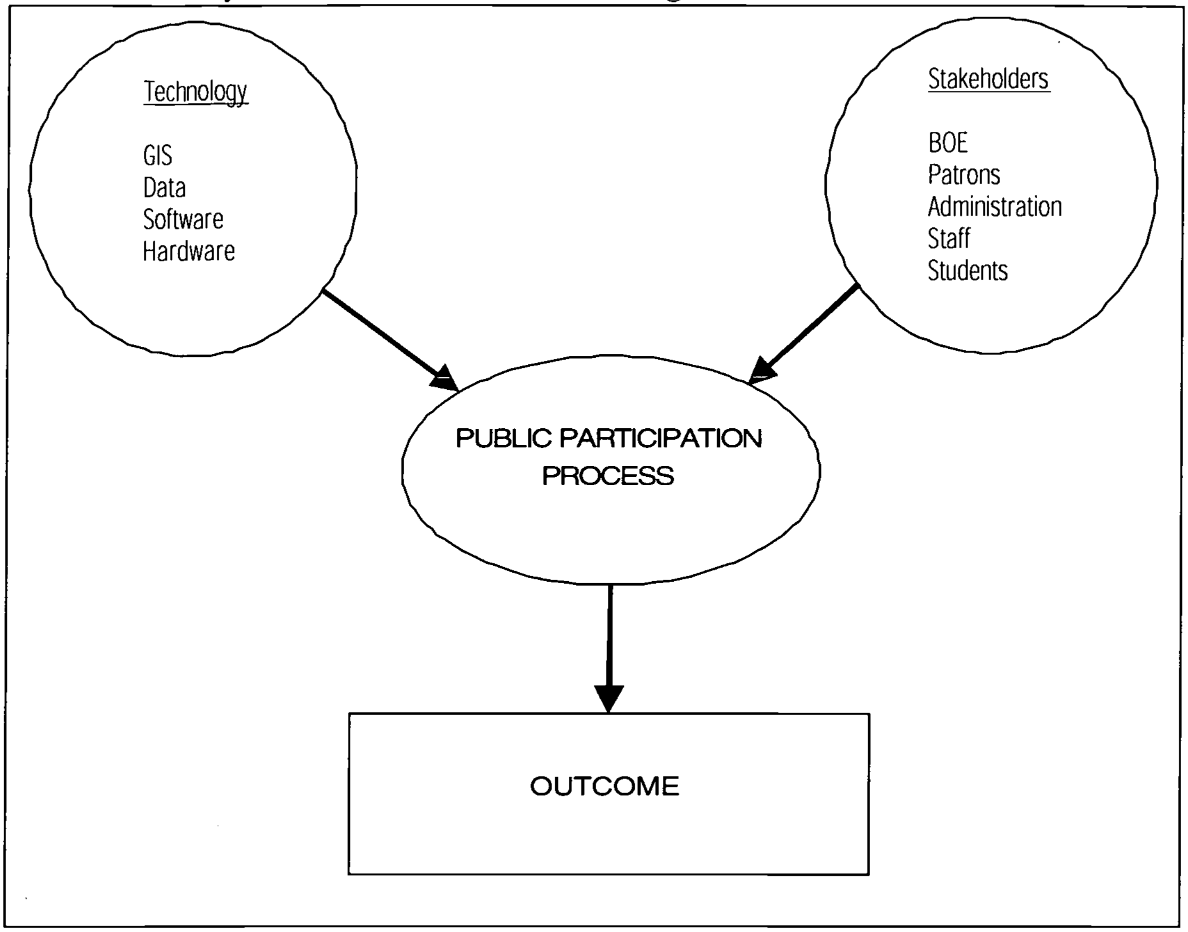
— *Better Understanding of Governmental Actions*

SEDSS and the concurrent public participation process have allowed the community and the BAC to better understand how boundary decisions are made. A very deliberate process, augmented by geospatial data, is followed. Figure 5 illustrates the planning model used in Blue Valley. In this model, the Planning and Facilities Committee members, representing the stakeholders (parents, students, Board of Education, administration, and staff), use the data provided by the technology to make the best decisions for the district as a whole. This process not only includes use of the technology, but also a public process complete with several opportunities for public comments, questions, idea formulation, and plan review. In this respect, a public participation process such as the one followed by the school district possesses many of the characteristics of a very successful public involvement program (Cogan, Sharpe, and Hertzberg 1986). These characteristics include having stated goals and objectives, empowering the public to participate in the process, encouraging participation from targeted portions of the public, and fully reporting to elected officials the outcomes of the process.

— *Increased Equal Treatment in Government Decisions*

One primary tenet of democratization that SEDSS has helped advance is equal treatment among all stakeholders in the boundary process. During the boundary process meetings, the BAC will explore several different boundary scenarios. SEDSS, by virtue of dealing with student "numbers" and because of using seven quantifiable and objective criteria in comparing boundary plans (see earlier discussion in this paper), has resulted in the equal treatment of all areas and patrons of the district.

FIGURE 5
The Blue Valley School District School Planning Model



Source: Blue Valley School District, created by Mike Slagle

— *Reduced Conflict Over Decisions*

Conflicts over boundary decisions may be inevitable. Several competing interests and strong emotions play a significant role in the public hearing process of any school boundary decision. However, SEDSS and the process have helped the community understand how decisions are made and that these decisions are made on an objective and factual basis. That, in turn, has led to a reduction in conflict over boundary decisions.

— Increased Trust in Decisions

Closely related to the above point is the belief that SEDSS has also increased the overall trust of the community in the BAC's and Board of Education's (BOE) decisions. SEDSS allows the BAC and community the opportunity to see boundary alternatives compared and contrasted in accordance with the seven boundary criteria. Using this objective criteria when reaching such decisions, and showing BAC and community members through the use of a GIS the implications of boundary changes, has enhanced overall trust in the process. The school district leadership feels that SEDSS and the planning process shown in Figure 8 is responsible for the increase in trust and credibility in boundary decisions the school district has experienced (Hill 2000).

— Increased Participation In Government Decisions

One area in which SEDSS has had no direct affect concerns the increased participation in boundary decisions. Depending on the situation and the schools involved, residents of certain geographic areas of the community will be present at decision making meetings regardless of the technology involved. If anything, SEDSS may have decreased the participation rate of some patrons because of how much information the system offers to the BAC and BOE. However, this is not to say that SEDSS has disenfranchised certain groups or has shut certain groups out of the public process. Rather, with all of the data SEDSS provides to the committee, the chance that certain groups will be forgotten in the process has been greatly diminished. Possibly the sometimes perceived lack of overall participation is because SEDSS may have increased the trust level of many Blue Valley residents; the patrons' feeling that they too need to participate in the process may be diminished.

In examining democratization as defined by Tulloch, Nieman, and Epstein (1996), it can be argued that SEDSS meets many of the tests. Five of the six democratization tests are satisfied by the technology the school district utilizes. SEDSS has gone a long way towards empowering the community and BAC to have an understanding and a voice in the boundary process.

4.4 - Current Limitations of Geospatial Technologies in School Planning

The Blue Valley School District has experienced great success in using geospatial technologies for school planning. However, some limitations do exist. Three limitations in particular — physical accessibility, modeling limitations, and conceptual access to technology — all have contributed to what Armstrong, Lolonis, and Honey (1993) have described as a limitation of spatial decision support systems to work their way into the public decision making realm and school district planning. School administrators are normally not schooled in GIS, computer support systems, and techno-political processes. It is no wonder, then, that some technologies — namely those that deal with SDSSs — have great difficulty becoming part of the school planning mainstream. Such technology, and the effort and knowledge base needed to get the most out of the technology, can strongly intimidate people not specifically trained in the field. The current limitations of geospatial technologies in school planning are characterized by the following discussion.

- Physical Accessibility — Not all residents of a school district will have access to available technology. Expense, technological confidence, and data limitations all have a part in preventing everybody in a school district from using geospatial technologies in the planning process. This is true of Blue Valley's system as well. Only those on the committee or associated with the process have the opportunity to use SEDSS.
- Modeling Limitations — The school planning process is very complex. Despite the best effort to capture all that goes into a school planning decision, not everything can be modeled.

λ Conceptual Access to Technology — Because of the software, hardware, and data involved in a planning GIS, certain sequences of steps must be followed to achieve the desired results. This can be confusing and time-consuming.

5.0 - Summary

Despite the aforementioned limitations, the utilization of geospatial technologies can improve the planning activities and enhance public decision making processes in the realm of community-based school planning. The Blue Valley School District has found that using GIS in school planning activities has increased cooperative planning activities among stakeholders in the school planning process, achieved a level of democratization, and improved the overall planning process. As a result of this success, the Blue Valley School District will undoubtedly continue to use geospatial technologies for its planning needs. GIS-based decision facilitating tools in public school districts can advance community-based school planning by enhancing the democratic process.

As for the future, much work is yet to be done in getting GIS to play a bigger role in the day-to-day operations of the BVSD. Specifically, these are two areas prime for future work. One, as GIS technology is used to generate solutions to locational problems being faced by the district, knowledge about how GIS works and how it can help solve real life locational problems is being gained by those using the system. This knowledge needs to be shared with the students in the classroom. In this respect, the district can leverage its GIS investment by using it as a learning tool in the educational setting. This task becomes even more attainable over time as GIS software becomes less expensive and easier to use. Two, as school based leadership (SBL) teams become more organized in the district, a way for these smaller leadership units to participate in the school boundary process must be explored. To that end, GIS kiosks could be set up at each school, allowing SBL teams to generate and analyze their own boundary alternatives to present to the Planning and

Facilities Committee. More potential solutions than ever before could be explored using this technique.

Appendix A

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- λ An excellent work on the how-to's of school planning. Excellent discussion on the political aspects and public participation issues of school planning.

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- λ An excellent primer on school planning, all the way from the forecasting perspective to construction process.

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