

AN INTRICATE ZONING QUILT AND ORGANIZATIONAL RELUCTANCE TO USE IT

This paper describes the inception, design, and implementation of a comprehensive desktop zoning project developed in house, at the Department of Growth Management in Alachua County, Florida. The project has transformed existing GIS zoning databases, GIS zoning procedures, GIS zoning products, and zoning applications activities by streamlining, standardizing, and integrating overall GIS and IT components along a departmental Data Management System. This paper will also share our experience with behavioral and organizational factors and processes that inhibit and hinder implementation of large scale projects that ask for organizational progress and transformation.

Keywords: Organizational GIS, Data Management System, Urban Planning, Zoning, ArcView 3, ArcGIS 8.2, MSAccess, VBA, JScript.

Introduction

An integrated Information Delivery and Data Management System (IDDMS), baptized as '*The Zoning Quilt*', was developed by the GIS Division at the Department of Growth Management, Alachua County, Florida. This project was carried out during 2002 and implemented during the first half of 2003. It materialized a departmental framework for creating, maintaining, distributing, and archiving the full collection of zoning activities in a standardized and integrated system, based on the COM standard and designed for the desktop. This framework has an MSAccess Database Management System as a central backbone, a customized ArcGIS menu for automation of various zoning notification processes, and a searchable archive of 40 years of historical maps in an intranet application. The IDDMS system, integrates zoning GIS databases with ten years of historical zoning applications information; initiates creation of zoning variances GIS database integrating it with twenty years of historical zoning variances information. The system generates dynamically HTML reports, PDF maps, MSWord label files, etc. Tools for analytic reporting and querying, technical documentation, legal zoning documentation, and a help system, are some of its components. Old legacies of GIS data in multiple formats, of deficiencies in GIS database architecture, in GIS database procedures, in GIS maps and mail out products, in format of scanned historical maps, in historical information of Zoning and Zoning variances applications, were converted to contemporary standards and were migrated to ArcGIS and MSAccess environments. Much of the procedural knowledge that was previously locked away in the heads of individual technicians and other staff, is now documented in computer code or instructional files. The many dimensions of this project have also called for streamlining of many procedures. This required not only questioning of the existing establishment but also transformation of long established rigid structures of organizational legacies in

several compartments of the Growth Management Department. Quite naturally this translated into a substantial organizational stress, that extended the technical challenges of this project into organizational ones.

Background

A fully integrated comprehensive Land Information System (LIS), does not yet exist in Alachua County, Florida. The Property Appraiser's office has traditionally been the major hub of the GIS enterprise and is currently the best potential backbone for basing the LIS on. The GIS division at the Department of Growth Management (GM), established 2 years ago, is the second biggest GIS hub in the County. For a successful implementation of an integrated county wide LIS, a dialog must occur between these two major GIS hubs. This dialog could not become effective, until the GM hub has dealt with its old GIS and non GIS legacies, and has leveraged older systems and information trapped in disparate places and databases in a variety of formats, stored in a mixture of platforms, which design had traditionally been left to casual and isolated decisions.

Everything that anyone could ever want to know about Zoning was there somewhere, tucked away in paper folders, or rooms filled with filing cabinets, in some cases stored in as remote formats as map graphics. Not only information pertaining to re-zoning and variances was recorded in paper logs, but there were no rules in place related to the entry of data in those logs. Consequently, the quality of the data accumulated over the years even when it existed was suspect. The format, location, and existence of critical values on a paper log depended mostly upon the idiosyncracies of the individual entering the data. Nor did the later use of Quattro Pro spreadsheets improve record keeping. While spreadsheets permitted networked access to the data, records still contained anomalies and inconsistencies. Analysis and decision support tools were also un-available. To generate a summary of the data, an individual had to visually scan the log books and provide a manual tally of the findings. This method was cumbersome and error-prone. Further, the absence of an automated data sorting mechanism rendered sophisticated data analysis unfeasible.

In addition to deficiencies in data quality and retrieval, the existing practices raised a larger concern: lack of department-wide data standardization, data integration, and product delivery system. Although the same fields appeared, in the existing paper logs, Fox Pro tables, and GIS shape files, they were in heterogeneous, incompatible formats and design. The systems that accessed and manipulated these data fields operated in isolation in separate divisions. A simple example is the tile number: in zoning applications paper logs, tile number was recorded as three separate numbers in three separate fields: section, township, range. In the GIS data files, tile number appeared as a concatenated single value prefaced by the string "STR" stored in one field. In the Excel tables, although tile number is stored in one field, two dashes separated the eight digit string that represented the value for section, township, range. The absence of data standardization and process integration not only indicated inefficiencies and redundancies in the existing practices, but it also comprised a major obstacle to be overcome before the start of a county wide integrated LIS.

Under this reality, without the luxury to scrape everything and start a new system from scratch, the GIS division, developed the integrated Information Delivery and Data Management System (IDDMS) and

baptized it '*The Zoning Quilt*'. As an authentic quilt, the IDDMS had to be composed of new and inherited pieces of fabric; like in a quilt, every component was a self standing work of art per se; as in a quilt it all had to fit well together, as when crafting a quilt we had to be flexible in our piecemeal approach.

Ever since its establishment, the GM GIS hub has been successful in solving issues such as data warehousing, compliance with data standards, standardization of map production, consolidation and streamlining of procedures, creation of a solid web infrastructure, renewal of network, hardware and software, etc. The results obtained in these realms have been technically challenging but relatively painless to implement, since they mostly dealt with implementation of formal knowledge applied within the boundaries of the GIS division. The implementation of the IDDMS on the other hand, turned out to be a tough challenge, charged with as many unique un-predictabilities as opportunities. The simple tasks of bringing multiple legacies up to standard and of dealing with data quality and procedures were frequently flavored with organizational resistance, since they had been historically viewed as exclusive property of individual divisions.

Goals and Objectives

Following are the primary goals this project set out to accomplish:

- provide a single, unified access point for creating, editing, and accessing of re-zoning applications
- create a centralized, networked storage facility for the data records
- offer decisional support through the generation of specialized reports
- ensure automated information sharing and interoperability across Microsoft COM-based applications

The following objectives were to be met for these goals to be realized:

Technical

- Blend formal knowledge with built up local knowledge
- Ensure info update and integrity in current zoning GIS and non GIS dbases
- Ensure comprehensive, inter-operable, integrateable dbases
- Standardize GIS and non GIS dbase maintenance procedures
- Standardize GIS products and products procedures
- Create overall documentation for databases and procedures

Organizational

- Ensure transparency of the overall process
- Streamline existing process
- Create a self running system
- Reduce effort of coordination
- Increase quality of work
- Strengthen organizational integration

- Formalize intra divisional relationships/define responsibilities/delegate power
- Prevent un-recoverable disaster damage

Architecture and Functionality

From the prospective of functionality and software environment there are three major components to the 'Zoning Quilt' which inter-operate with each other:

- a MSAccess Database Management System as a central backbone
- a customized ArcGIS menu for automation of various processes of the zoning notification
- an intranet application with a searchable archive for scanned historical zoning maps

Each of these three components consists of a series of other components that interact behind the scenes to extract data, assemble it, analyze and display it, as well as create outputs. All of them rely on COM based environments such as Access 2002, ArcView 8.3, Internet Explorer. Programming languages such as VBA and Java Script were used and file formats standards such as: MDB, PDF, MSWord, PPT, or HTML.

The **first** major component is the MSAccess Database Management System (DMS), with an entry point as shown in Figure 1 below.



Figure 1. The user interface implemented as a single point of entry.

This DMS consists of a front end and a back end. The front end provides for a collection of queries, forms and reports. It has a complete technical documentation and legal documentation, and an on line help

system. The front end is also composed of two main forms as shown in Figure 2 and Figure 3. These forms provide for regulation of data entry through use of field-level validation rules, for user access to the back end files, and for tracking down the status of the applications. Validation rules are coded in the forms, not at the table level. Some of these rules are embedded in the properties of the controls on the form, the remainder are encapsulated within the Visual Basic class module that underlies each form.

BOARD OF ADJUSTMENT

Date: 8/20/1980
Action: DEFERRED

BASIC PETITION INFORMATION

Petition No: 0001
Type: MEDICAL HARDSHIP
Agent: C.A. HALL
Owner: C.A. HALL
Location: 7722 SW 24 AVENUE

CURRENT PETITION PARCELS

Parcel No	STR No	Acres
06668-003-000	08-10-19	5

Record: 1 of 1

BOARD OF ADJUSTMENT

PATHS TO ASSOCIATED FILES

Application:
Agenda:
Maps:
Mailout Labels:
Advertisement:

NOTES

VARIANCE IN PLAT LAW TO CONSTRUCT A SECOND SFD ON 5.0 ACRES IN AN "A-1" ZONING DISTRICT

Figure 2. Zoning variances interface.

Figure 3. Zoning interface.

The back end is composed of two MDB files. One for Zoning the other for Zoning variances. The Zoning MDB is based on a single one-to-many relationship between two base tables, Applications and Parcels. A new application record is assigned a unique application number. The number is also recorded in each of the parcels record associated with the new application record and provides the logical link between the two tables. In addition to the two primary base tables, the database also contains look-up tables. These tables are linked to fields in the two main tables. They contain a predetermined set of values a user may select when filling a field. The Zoning variances MDB consists of a single table, Petitions. Each row in the table is uniquely identified by the petition number. Both of these databases were designed for full integration with the corresponding Zoning and Zoning variances geodatabases.

This DMS is installed in a shared network drive as part of a directory tree that acts as a central backbone repository for all of the files that relate to zoning activities. Image files of scanned applications and petitions, power point presentations, maps in PDF format, mail out addresses in MSWord format, and other related files are all being stored in this central location and hyperlinked to the MDB databases. All of the Growth Management Divisions have equal access to the system.

The **second** component, as shown in Figure 4 below, is a customized ArcGIS interface. It was developed

for the automation of the map production and the notification notices of the Zoning and the Zoning variances applications. This, not only provides for increased work proficiency and streamline of routine procedures, but also for standardization of product format and content. The outputs of the customized program, are in PDF and MSWord format, are stored in the appropriate directories of the central file structure backbone of the IDDMS, and are hyperlinked to the main databases. VBA was the language used for customization.

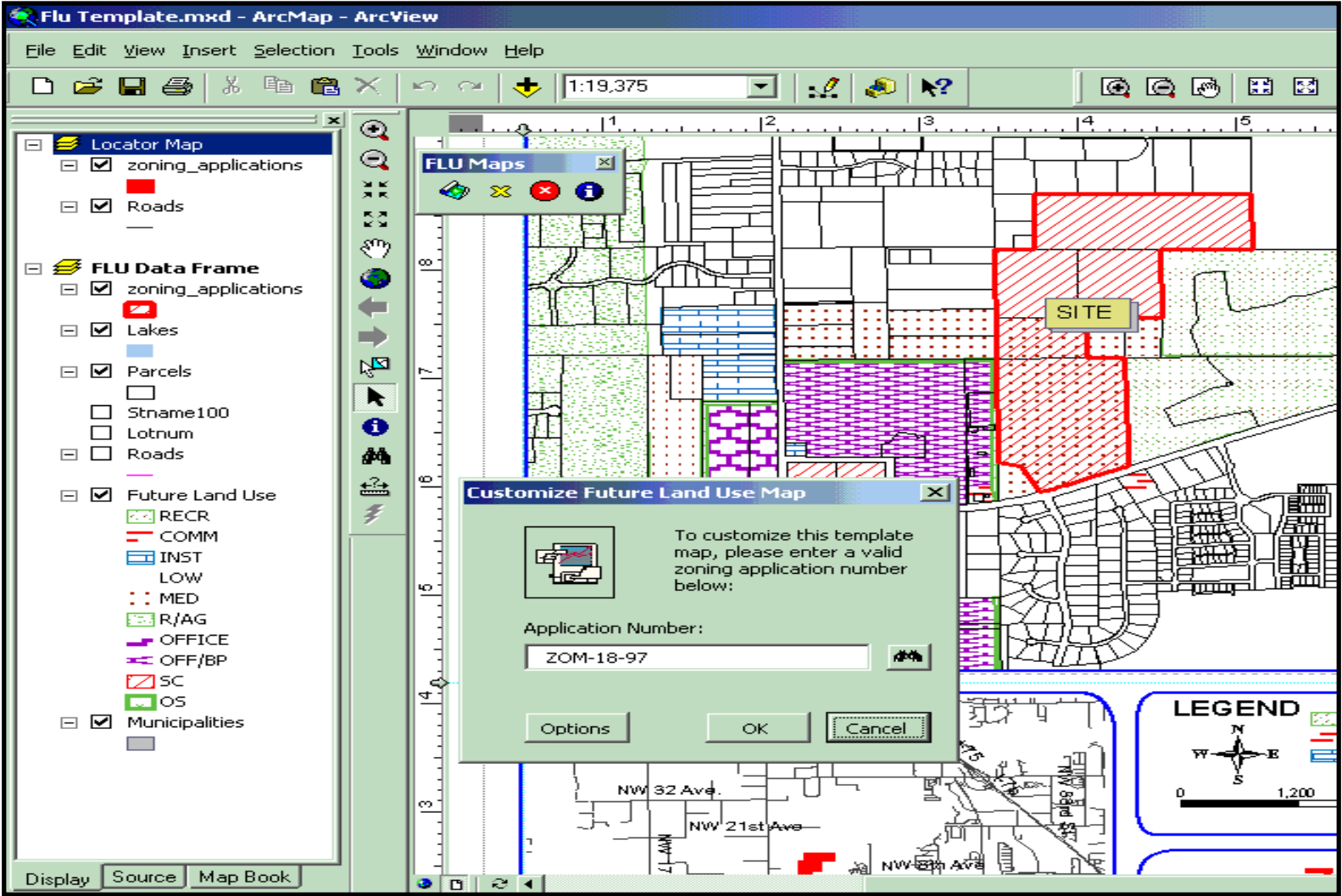


Figure 4. ArcGIS interface.

The **third** component, as shown in Figure 5 below, is an intranet application. It was developed to make accessible to all county departments an archive of more than 1000 scanned zoning maps which cover a time frame of at least 40 years. These maps represent paper maps by Section Township Range, with historical hand drawn notes on various zoning and zoning variances actions. The intranet interface allows for search by Section Township Range and for panning and zooming within Acrobat Reader. This application was written using Java Script and PHP languages. The intranet application has replaced a single use license - vendor prepared desktop application, that was based on a TIFF viewer. More than 1000 files were converted from TIFF to PDF. By introducing standard environments such as a Web Browser and the Acrobat Reader, the user community has been extended from one person at a time located strictly within

the Codes Enforcement division, to hundreds of users at a time located at any division and/or at any department within Alachua County.

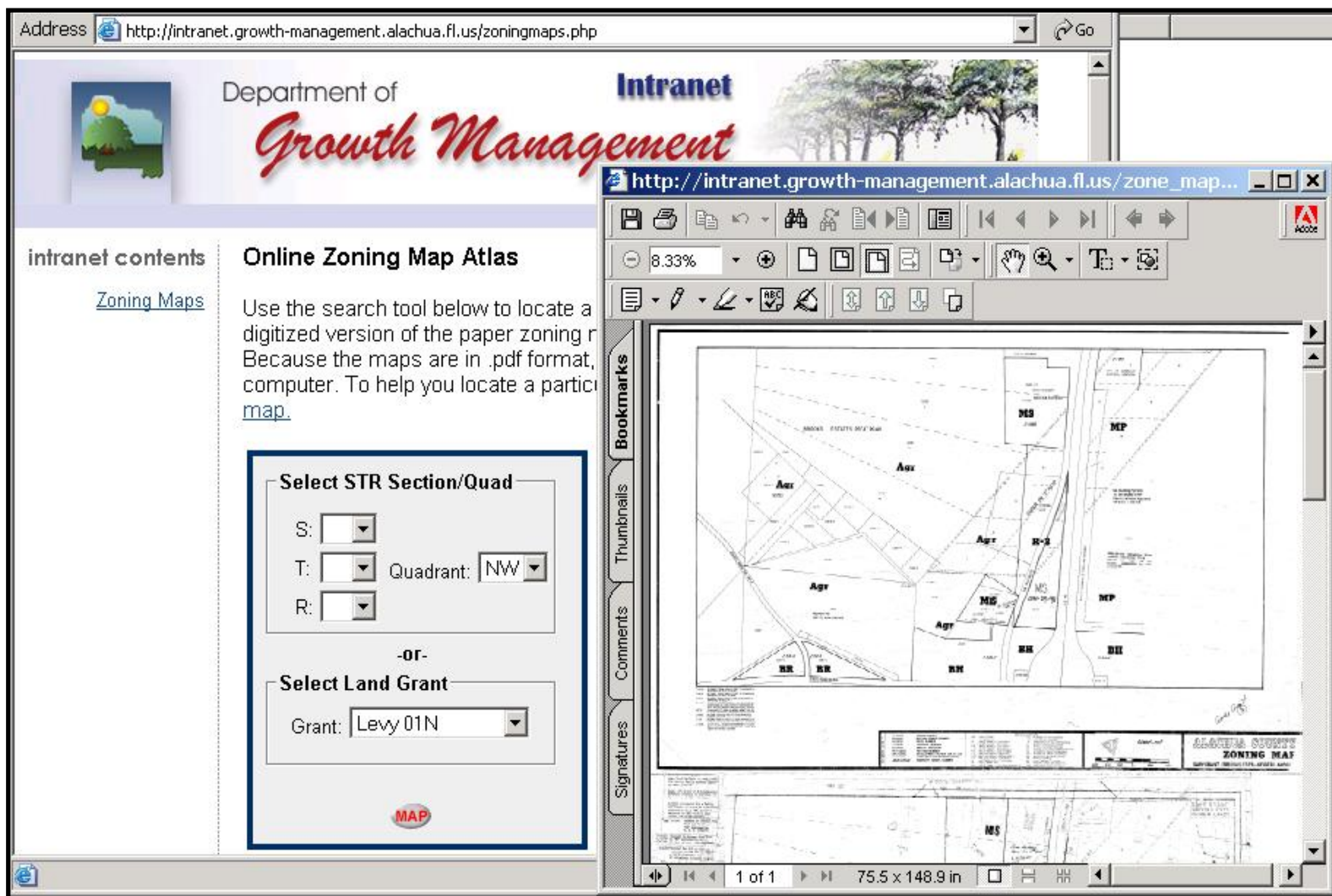


Figure 5. Intranet application for the historical maps archive of 40 years.

Conclusions and Future Plans

The 'Zoning Quilt' has now been in use for the past two months. Slowly but surely, it is becoming part of the organizational culture at the Growth Management Department. Particular individuals at the Codes Enforcement division, at the Development Services division, and at the GIS division are populating the system and are retrieving specific products from it. The rest of the staff at the Growth Management Department is taking advantage of the full transparency of the desktop system. All of the county departments have now access to the archive of thousands of scanned zoning maps from the intranet component. The *Quilt* is also proving to be a convincing showcase of the strengths of technology when used as a lead agent to organizational progress and transformation.

In evaluation, the biggest challenge has been to change the mindset of the organization in its resistance to

keep the *status quo*. We have learned that, while technology can easily facilitate collaboration, unless there is an incentive to share information and unless organizational processes support it, it won't be as easily embraced. "You must implement technology within the capability of the organization to absorb it," said Campbell. "There is an art to implementing the proper technology and the correct size of project so that people see immediate benefits and get behind it."

This experience has also convinced us that in situations such as ours, when independent islands of technology and procedural knowledge exist in an organization, historically developed with no regard for integration around a central departmental IT axis, the '*in house*' approach is the most effective model both technologically and politically. It is also our deep conviction that taking a systems approach to the Zoning issue, requiring to not just integrate multiple divisions but also the way they operate, is a task that calls for challenging the organizational establishment not only with soft skills but also with a non conformist passion. The fact that both of us were recent comers to this Department, gave us an upper hand.

In our journey towards a fully integrated LIS in Alachua County, we consider this IDDMS a transition stage. When a full establishment of this desktop system occurs, it will provide for a foundation towards an intranet based IDDMS. An intranet IDDMS will ensure an even better standardization and integration of the zoning processes and it will be the necessary gateway towards full transparency of governmental accountability.

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Note: URLs functional as of June 25, 2003 (12:34am).

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