

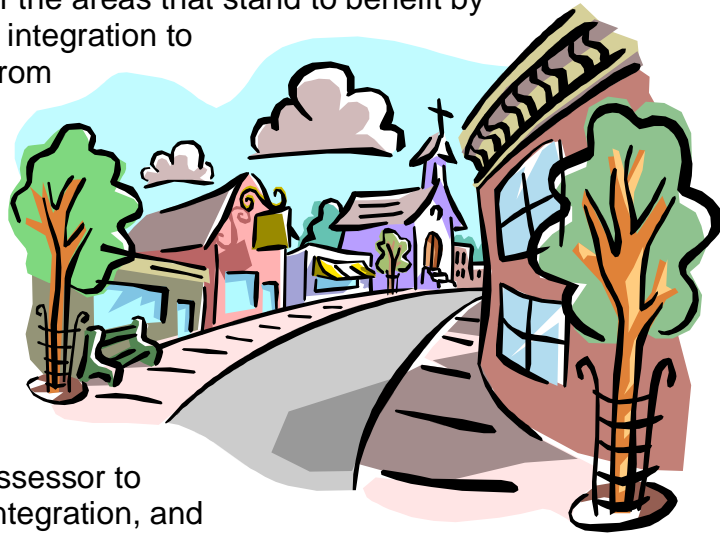
CAMA/AA Immersion in GIS

Abstract

Computer Assisted Mass Appraisal (CAMA) and Assessment Administration (AA) Systems have gone from no interaction, to simple interfaces, to complex integration over the last two decades as assessors recognize the benefits of integrating CAMA/AA and GIS. Using current CAMA/AA and GIS integration, users can see the significant potential value of GIS not just for valuation, but throughout their assessment operations including management, listing/discovery, valuation, quality control/assurance, customer service/communication, and defense of values. As a result, GIS technology ideally should be extended beyond the integrated add-on to CAMA/AA systems that it is today. CAMA/AA needs to be immersed (or embedded) in GIS to provide a truly effective total assessment solution. The ability to view, query, and analyze spatial data enhances the assessment process by making valuation patterns easier to detect inside and among different geographic regions in a community, improving work efficiency through spatial task management, and enabling assessors to provide a better picture and service to the community they serve.

This paper will describe many of the areas that stand to benefit by progressing beyond simple GIS integration to CAMA/AA immersion in GIS. From today's Integrated CAMA/AA and GIS systems we can envision the future. In order to effectively provide the most comprehensive benefits, accurate information and highest level of customer service, assessors need to advance beyond today's integration to total immersion.

Total immersion will allow the assessor to maximize GIS, workflow, data integration, and information sharing within the assessor's office, across departments, and to the public to more effectively meet his or her appraisal and assessment needs.



CAMA/AA Immersion in GIS

I. Introduction

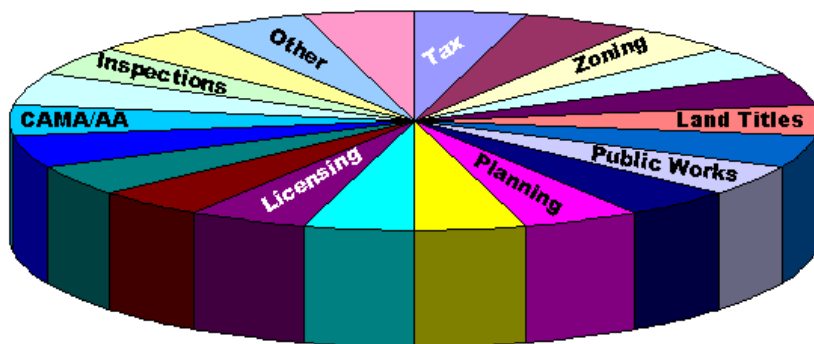
Geographic Information Systems (GIS) and Computer Assisted Mass Appraisal (CAMA) Systems grew up entirely independently. James A. Howze developed the first CAMA system back in 1961 at a time when computers were still in their infancy. It was not until the 1970's that technology advanced to the point where it was practical to develop the first basic mapping systems. Since then these systems evolved into the GIS systems we know today. Both applications followed similar paths to the extent that early implementers struggled with the major cost of developing new technologies and creating massive databases to power them. Initial databases had accuracy and completeness issues that were resolved over time. It took many years for the initial databases to mature to a point that these systems could effectively replace traditional methods. Both of these system databases represent significant investments that continue to become even more valuable assets over time. In fact, these two databases arguably represent two of the most important assets a jurisdiction owns.

As technology continues to decrease in cost and increase in efficiency these two applications are supporting many more functions, and many jurisdictions have been able to implement either or both applications. As this trend continues, it is only a matter of time before both applications become the rule rather than the exception.

As the number of jurisdictions that utilize both these applications becomes more common, the inter-relationship between them has become more apparent. The following analogy can be used to describe the relationship between CAMA/AA and GIS to my new hires:

CAMA/AA are only two of the hundreds of potential government applications that comprise a GIS:

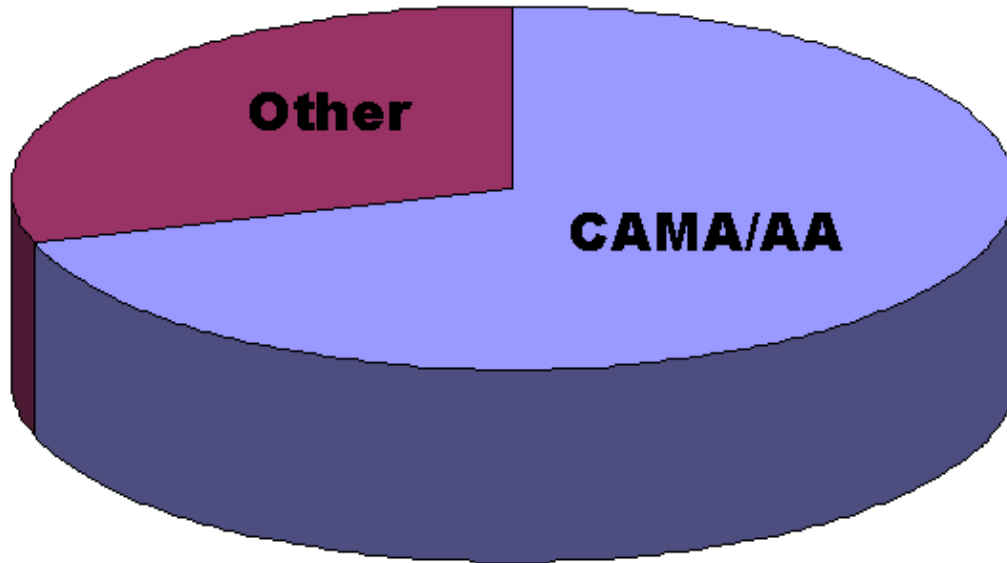
GIS Application Diagram



CAMA/AA - Two of hundreds of GIS functions

However, a CAMA/AA database comprises the largest single component of a government GIS:

GIS Database Diagram



CAMA/AA - Single largest database

Like many other things we do, the person drawing the comparison colors the result based on their interpretation or objective but the point that CAMA/AA comprises a large part of a GIS database is still valid.

II. A Look at the Present

GIS permeates every aspect of the appraisal/assessment function. The strength of their relationship is evident by the fact that the International Association of Assessing Officers (IAAO), the trade which represents assessors, and the Urban and Regional Information Systems Association (URISA) which is the Association representing government GIS technology put on a large joint annual conference (Integrating GIS & CAMA) to address these issues for many years.

The joint ESRI and IAAO, GIS and CAMA textbook committee recently separated assessment processes into six common categories:

- Management and Organization
- Discovery and Listing
- Valuation
- Quality Control/Assurance
- Customer Service
- Defense of Values

The committee then developed a list of activities within each of these major processes, which can be facilitated and improved with GIS support. This list (which I have taken a few liberties with), while by no means complete, does provide insight into how GIS runs through every aspect of what an assessor/appraiser must do to accomplish their mission:

Management and Organization

1. Policy decision making
2. Intra and inter departmental integration
3. Data management and sharing
4. Collaboration
5. Workflow
6. Resource management
 - a. Office resources
 - b. Field resources

Discovery and Listing

7. Real and personal property discovery
8. Omitted real and personal property discovery
9. Property identification
10. Property location
11. Real property transfer
12. Verification of legal descriptions
13. Ownership research
14. Parcel/multi-parcel sales identification
15. Identification of easements
16. Identification of rights of way
17. Office data collection
18. Field data collection
19. Routing field staff
20. Location of property (real and personal)
21. Location of improvements
22. Capturing improvement data and sketches
23. Parcel grouping spatial data collection
 - a. Geo boundaries
 - b. Jurisdiction and municipal boundaries
 - c. Tax districts
 - d. Zoning
 - e. Subdivision boundaries
 - f. School districts
 - g. Special assessment districts
 - h. Historical districts
 - i. Economic development districts
 - j. Value model boundaries (neighborhoods, market areas, etc.)

24. Parcel specific spatial data collection
 - a. Area
 - b. Size
 - c. Shape
 - d. Elevation
 - e. Topography
 - f. Utilities
 - g. View
 - h. Attributes
 - i. Amenities
 - j. Negative influences
 - k. Soils
 - l. Slope/aspect
25. Agricultural property specification
26. Soil specification
 - a. Slope
 - b. Contours
27. Flood plains
28. Exemption processing
29. Special assessment processing

Valuation

30. All types of real property valuation
 - a. Vacant
 - b. Residential
 - c. Condominium
 - d. Multifamily
 - e. Commercial
 - f. Industrial
 - g. Agricultural
 - h. Special purpose
 - i. Exempt
31. All valuation approaches
 - a. Cost
 - b. Sales comparison
 - c. Direct market
 - d. Income
32. Location influence
33. Value influence centers (positive and negative)
34. Abstracted/allocated land values
35. Visual representation of market behavior
36. Sales ratio analysis reports (including ratio studies)
37. Value analysis
38. Equity analysis
39. Spatial value allocation and distribution

Quality Control/Assurance

- 40. Location outliers
- 41. Spatial outliers and pattern analysis
- 42. Visual value outlier and pattern analysis
- 43. Visual sales outlier and pattern analysis
- 44. Value equity outlier and pattern analysis
- 45. Data auditing based on one or a combination of data
- 46. Spatial ratio analyses
- 47. Spatial attribute editing
 - a. Taxing authority (e.g. school, district, etc.)
 - b. Valuation attributes (e.g. neighborhood, zoning, etc.)
 - c. Jurisdictional boundaries (e.g. city, county, etc.)
- 48. Complete coverage
- 49. Eliminate double assessments

Customer Service

- 50. Communication to the public
- 51. Tax rolls
- 52. Taxpayer Notices
- 53. Public access to information
- 54. Public relations
- 55. Tracking communication from the public
 - a. Calls
 - b. Letters
 - c. Complaints
 - d. Exemptions
 - e. Requests
- 56. Communication with other agencies and customers
 - a. Government
 - b. Non-government

Defense of Values

- 57. Defense of each property's value
- 58. Fair treatment relative to neighboring properties
- 59. Appeal tracking
- 60. Level of assessment
- 61. Assessment equity
- 62. Oversight Agency Reporting and Defense

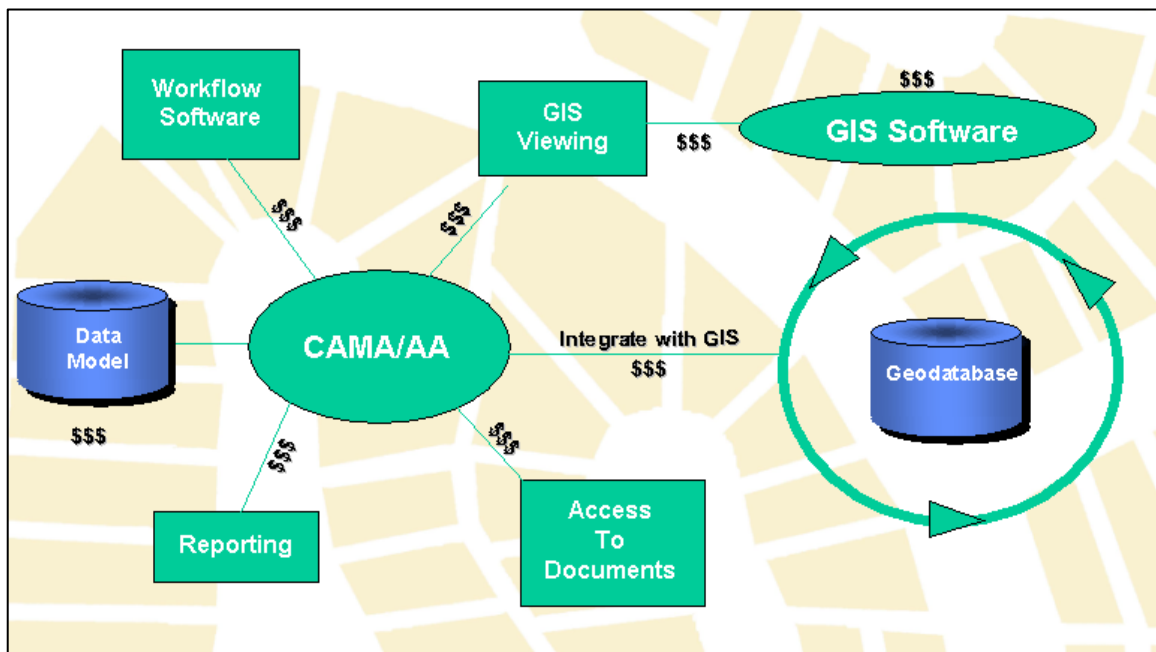
While this does not represent everything in assessment operations that can be improved by GIS support, it does make it obvious that almost every aspect of the assessment function can benefit from the application of GIS technology. It is

evident that there is a geographic component to almost every assessment activity and effective GIS requires moving from a mapping and area measurement support tool to a critical and comprehensive tool used by everyone in an assessor's office to better perform their tasks.

GIS and CAMA/AA Integration

Integration permits interaction of CAMA/AA, GIS, workflow, document imaging, and other important functions. However integration is expensive, slow, and inefficient.

Most of today's integrated systems are built between islands of technology:



The result is delays in data transfer and sharing of information. In addition, maintaining these integrated islands of technology is time consuming, resource intensive, and therefore expensive. Frequently synchronization of GIS and CAMA/AA data requires batch processing, and staff and computer resource coordination to be accomplished. Expensive appraisal, assessment, GIS, and information technology resources are often required to meet and coordinate these activities. Information technology must continuously dedicate scarce resources to maintain synchronized data for CAMA/AA activities which require or benefit from GIS support.

III. Maximize GIS Benefits Through Immersion

We are all aware that the ability to view, query, analyze, model, and maintain spatial data enhances the assessment process by:

- Improving work efficiency through spatial task management;
- Facilitating the discovery of all of the property which needs to be assessed as well as much of the information required for exemptions and other assessment activities;
- Providing location input to valuation;
- Making valuation and outlier patterns easier to detect inside and among different geographic regions in a community;
- Enabling assessors to provide a better picture and comprehensive service to the community they serve;
- Enhancing documentation of individual values as well as overall assessment and equity levels.

Immersion is more than tying existing software to a geodatabase and the latest user interface. In addition to its cartographic capabilities, today's GIS software frequently includes database management, modeling, calculation, analysis, workflow, user interfaces, reporting, parameter maintenance, and other application development support tools. As a result, it has evolved into a powerful development tool. Immersion means rethinking and re-engineering new CAMA/AA software embedded in the GIS to leverage all of this functionality for more effective appraisal and assessment operations.

Today, we are no longer constrained to using GIS to draw maps. GIS is a major supporting component of every assessment activity, providing a database and functions, user interface tools, workflow, math and statistical support, business rules, and land record function support.

In a recent article by ESRI President Jack Dangermond, he describes GIS as "an emerging language for abstracting and communicating Geography" that integrates information, organizations, and work. This broad vision of GIS has resulted in an ever-expanding technology capable of solving or assisting in the solution of complex problems far beyond mapping. This includes:

- Complex data modeling;
- Integration of information across a broad range of organizations and applications;
- Work flow management;
- Collaboration;
- Decision-making and decision support.

GIS technology has evolved in a manner that makes it well suited for use with appraisal and assessment applications. This has resulted in its widespread use by assessors for an increasingly diverse range of appraisal and assessment functions. With this broad range of support, it is now possible and practical to take the next step from integrating CAMA/AA and GIS functions to immersing CAMA/AA within GIS.

By immersing CAMA/AA in GIS we not only get the efficiencies related to minimizing or eliminating the need for resources devoted to data synchronization, but we get to leverage the other key elements of GIS. Instead of integrating a workflow tool (requiring yet more integration and expense), we can leverage existing workflow within GIS to push information to users while providing management with progress, status, and coordination information. This creates additional opportunities for more effective appraisal and assessment operations. The question is no longer how best to exchange CAMA/AA and GIS data and functions, but how best to use GIS, which is no longer just a spatial tool, to perform CAMA and AA functions.

Immersion is not Easy

As with the early years of both GIS and CAMA/AA, there is no simple solution. CAMA/AA systems appear to be simple applications to develop. However, both appraising and assessing are notoriously difficult. Appraising results in a subjective estimate of the property value. There are many appraisal methodologies based on the cost, sales comparison, direct market, and income approaches to value. In addition there are many variations on these approaches including Marshall & Swift, comparable sales selection and adjustment, regression, feedback, response surface analysis, direct capitalization, gross rent multipliers, mortgage equity, and cash flow analysis, just to name a few. And, all of these are further subject to interpretation. On top of all of this, every appraiser believes that he or she knows the best approach to appraising and yet, no two agree. Other than the sale of properties, the court of public or expert opinion is the only way to prove that the estimate is valid. Finally, the assessor has limited resources, and yet must value every parcel within his or her jurisdiction, whether it is simple or complex.



Assessment administration is not any easier. Assessment legislation, which provides the framework for getting to the taxable value, notifying taxpayers, and reporting to regulatory agencies, was developed over a period of 200+ years by countless legislators in each state or province with little or no knowledge of the cost or the amount of work required for implementation. Even today's legislators are not familiar with what is required to implement legislation they have created or how computer (or any other) technology can be used to help carry out their legislative intent. Just witness what happens when they cap values. The number of exceptions, interpretations, and unconsidered possibilities keep us from getting too complacent.

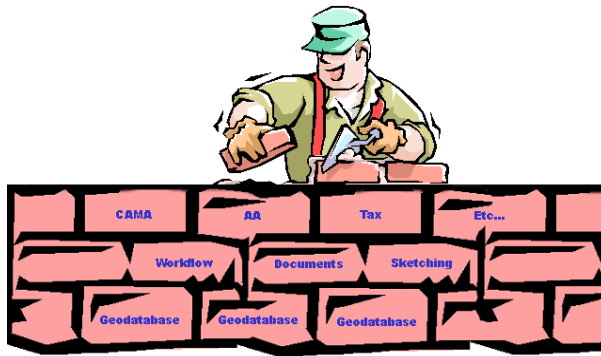
Just think of hundreds of legislators, mostly attorneys, in over 60 states, provinces and territories over hundreds of years implementing political, social, and economic policies through tax assessment. It is not surprising that not only does the legislation vary greatly from state (province and territory) to state (province and territory), but that the legislation is often interpreted and implemented differently within a state, province or territory. The moral of the story is: do not underestimate the difficulty of CAMA/AA immersed in GIS (or otherwise). New technology doesn't necessarily make things any easier; it just makes better solutions possible.

Immersion is not a modest investment. Cost is often used as an excuse to either not do something or put it off. Keep in mind that if that were always the case, everything would still be done by hand (or worse). However, immersion needs to be cost-justified just like every other significant investment. One way to do this is to build for the future. This means open, generic, interactive, and readily user modifiable. There is nothing as certain as change, and assessors want software that they or their staff, as opposed to some type of technical staff, can modify to do what they want. Choosing a user-configurable product will result in cost savings for the assessor both in time and money.

Finally, as with every other investment, there are 'hidden' costs such as training. For example, before you can use any technology to upgrade your operations, you need to ensure your staff is ready to take advantage of the new technology. If you have already invested in the appropriate GIS and computer training, you may be ready to proceed. If not, you need to be sure to include the appropriate training in your costs and budgets. Scope creep can also add substantial cost to a project. It is important to invest your own time very early in the project to make sure all of your requirements will be met. This investment in time will more than pay for itself by helping to keep the project on track, and more importantly avoiding costly modifications that were foreseeable.

IV. What Can You Do Now?

Be prepared. Start by transitioning to one of the new geodatabases where both spatial and attribute data are managed together. This is a natural progression as GIS vendors move to facilitate maintenance of attribute data with their spatial data, and database vendor's rush to include spatial data in their attribute databases. It is no longer necessary or desirable to maintain separate databases. This will put you in a position to take advantage of GIS immersion opportunities as they present themselves, and potentially spread out the cost involved in a single leap to a completely new technology base.



Look for opportunities to transition functions from CAMA/AA to GIS. Before you start to do any additional work on existing or new CAMA and/or AA functions or features, ask yourself, your staff, and your information technology support:

1. What can GIS do for me to more effectively support this function, feature, or activity?
2. How can I use my GIS to deliver this function, feature, or activity?

Let your CAMAAA information technology support and/or vendor know that GIS is integral to everything you do and that you need a simpler, easier, and more effective way to immerse it into all of your assessment operations.

Consider building sketching for example. Think about how many times you wished for building sketches with your maps. Then think about how well GIS' draw, label, and calculate polygon areas. Also, think about the ease with which these GIS sketches could be used by any future CAMA/AA software if they were immersed within your GIS. They would no longer require messy conversion and cleanup and your staff would not require retraining to maintain them.

For another example, why store spatial features as attributes? Think about neighborhoods and city/district boundaries. Wouldn't it be better if they were simple spatial attributes? Then by redrawing them all of the properties that have been added or removed as a result of the boundary change would immediately be affected by the change. No passing files from the GIS to the CAMA/AA and/or back. A spatial look at the results tells you all you need to know for a specific parcel or group of parcels. Reports needed regarding the change can be run immediately. Information technology, whether internal or external to your office, has one less process to deal with while both your staff and information technology have less to coordinate, test, and verify.

V. Summary

Few applications are as totally affected by geography and are in a position to take advantage of the broad range of GIS support that is currently available from GIS software, as government appraisal and assessment. Everyone is probably aware of many more examples of GIS support for CAMA and AA than those

described earlier. As GIS evolves, it is likely that many more appraisal and assessment functions will be supported including things we haven't even considered.

Integration brought many benefits during earlier generations of GIS. However, immersing CAMA/AA in GIS will bring many benefits over integration of these applications. Immersion will allow resources to go from synchronization and coordination to developing more and better GIS support for CAMA/AA.

The future is now. GIS technology is ready. As the need for GIS to support more and more complex and diverse functions has expanded, GIS software has steadily evolved. In addition to spatial functions, some GIS software can now support a broad range of application development functions including:

- Database management
- Parameter maintenance
- Data and valuation modeling
- Calculations and mathematics
- Business rule modeling and development
- Workflow processing
- Screen development and user interface tools
- Statistical analysis tools
- Reporting tools

GIS systems have always had one or more of these functionalities for application development. Now, some are robust enough to allow for true CAMA/AA immersion and development within the GIS. This makes immersion of CAMA/AA in GIS a real possibility.

Start now with the database and simple functions. Advance at your pace. Those jurisdictions with limited resources need to pick your opportunities and push your vendors and information technology departments.

With all of this GIS functionality and so much to gain, it is only a question of time before we see CAMA and AA applications developed entirely within a GIS. Immersing CAMA/AA in GIS will make these opportunities more obvious and at the same time make it easier and less expensive to take advantage of them.