

**Report of Findings and Recommendations
On the Computer Assisted Mass Appraisal (CAMA) Systems
Used by the Counties of Wyoming**

**Prepared for the Department of Revenue
Ad Valorem Tax Division**

By

**Almy, Gloudemans, Jacobs & Denne
December 30, 1999**

Table of Contents

Acknowledgments.....	iv
Executive Summary	v
1. Introduction.....	1
1.1 Purpose of Study.....	1
1.2 Background.....	1
1.3 What We Did.....	2
1.4 Summary of Findings and Recommendations	3
2. Critique of WYS System	5
2.1 Overview	5
2.2 Data Base Design.....	5
2.3 Cost Approach	6
2.4 Sales Comparison Approach and Comparable Sales.....	6
2.5 Income Approach.....	6
2.6 Market Analysis and Ratio Studies.....	6
2.7 Ad Hoc Reporting.....	7
2.8 Personal Property.....	7
2.9 Public Support	7
2.10 Interface with Other Systems	8
2.11 System Support	8
3. Critique of CLT System	9
3.1 Overview	9
3.2 Data Base Design.....	9
3.3 Cost Approach	9
3.4 Sales Comparison Approach and Comparable Sales.....	9
3.5 Income Approach.....	10
3.6 Market Analysis and Ratio Studies.....	10
3.7 Ad Hoc Reporting.....	10
3.8 Personal property.....	10
3.9 Public Support	11
3.10 Data Sharing and Interface with Other Systems.....	11
3.11 System Support	11
4 Assessors' Evaluations and Recommendations	12
5 Recommendations for New System	16
5.1 Summary of Inadequacies of Current Systems	16
5.2 Outline of New System Requirements	16
5.2.1 Data Base Design	16
5.2.2 Valuation.....	17
5.2.3 Query and Analysis	19
5.2.4 Personal Property	20
5.2.5 Documentation, Training, and Support.....	20
5.2.6 Ancillary Features	20

5.2.7	Parcel Numbering and Access	22
5.2.8	Assessment Administration Link	22
5.3	Conversion Issues	22
5.4	Hardware and Networking Issues	23
5.5	System Centralization or Decentralization	26
5.6	Other Cost Considerations.....	27
5.7	Policy and Strategic Issues	29
6	Implementation Steps	31
6.1	Organization	31
6.2	Requirements Definition.....	32
6.3	Contractor Selection	32
6.4	System Installation.....	33
6.5	System Implementation/Data Conversion	33

Acknowledgments

Officials in the twenty-three county assessors' offices, the State Board of Equalization, and the Department of Revenue contributed significantly to our evaluation of Wyoming's computer-assisted mass appraisal systems. The Director of the Department of Revenue, Johnnie Burton and the (then) Administrator of the Ad Valorem Tax Division, Dave McCracken, were supportive throughout. We are especially grateful to Jim Felton, Supervisor, Locally Assessed Property, for his invaluable assistance as project coordinator. We also appreciate the help of his colleagues Susann Anderson, Doug Dufva, and Harvey Klossner.

We appreciated the perspectives offered by Ed Schmidt, Chairman; Roberta Coates, Vice Chairman; and L. A. Romsa, Principal Statistician, of the State Board of Equalization.

We also benefited from the comments and recommendations made by representatives of the twenty-three Wyoming county assessors' offices through our visits to selected offices, meetings with others, and their responses to our survey questionnaire. We would like to thank Deborah Nagel-Smith of Albany County (survey respondent); Jackie Payne of Big Horn County (survey respondent); Jerry Shatzer and Linn Allen of Campbell County (survey respondent and meeting participant); Darrell Stubs and R. Pantalone of Carbon County (survey respondent); and Dixie Huxtable, Sherry Simerson, and staff of Converse County (office visit and survey respondent). Thanks also are due to Susan Redding of Crook County (survey respondent); Eileen Oakley of Fremont County (meeting participant and survey respondent); Debbi Surratt of Goshen County (survey respondent); Shelley Deromedi of Hot Springs County (survey respondent); and Dorothy Elsom of Johnson County (survey respondent). We also thank Brenda Arnold and staff of Laramie County (office visit and letter); Debbie Larson of Lincoln County (survey respondent); Susan Dewitt, Kay Music, Connie Smith, and staff of Natrona County (office visit and survey respondent); Elaine Griffith of Niobrara County (survey respondent); Doug Brandt of Park County (survey respondent and letter); and Lynda Chaffin of Platte County (office visit and survey respondent). Finally, we would like to thank Rita Schock and Rhonda Powers of Sheridan County (survey respondent); Janet Montgomery of Sublette County (survey respondent and letter); David Rauzi of Sweetwater County (survey respondent); Suzanne Olmstead of Teton County (survey respondent); Kathy Ball of Uinta County (survey respondent); Richard Bihl of Washakie County (survey respondent); and Kurt Kremke of Weston County (survey respondent).

Although we mention the Cole Layer Trumble Company in the context of the costs of new systems, the mentions do not constitute a preference for a CLT system.

The Almy, Gloudemans, Jacobs & Denne study team was composed of Robert Denne, Robert Gloudemans, and Richard Almy.

Executive Summary

This report examines the medium- and long-range viability of the two computer-assisted mass appraisal (CAMA) systems used in property tax administration in Wyoming. It finds them to be technically deficient and finds continued reliance on them to be risky. Although the systems are not now in crisis stage, one of the systems, the WYS TAS system, essentially is the child of a single contract programmer. The other, the CLT MAS system, has been superseded. Adequate support is increasingly difficult to assure, and there is a growing risk of system disruption or failure.

The systems' many notable technical deficiencies threaten to bring discredit on the property tax administration of the state, because expected functions cannot be performed adequately if at all. Analyses of the design and functionality of the systems themselves, interviews with county assessors as well as with both the Department of Revenue and the State Board of Equalization, and responses to a questionnaire seeking input from the county assessors that we were not able to visit personally all led to a similar conclusion: There are important criteria that the current systems cannot meet, and dissatisfaction with them was fairly widespread, although the motivations behind their original adoption and the ongoing efforts to keep them running were appreciated.

The report concludes that the technological basis of the current systems is so obsolete that it would be better to replace them entirely with a single uniform system than to attempt to design remedies for their worst present shortcomings. The characteristics that should be sought in any replacement system are identified. These include effective support for all three approaches to value (the sales comparison, income capitalization, and cost approaches) in accordance with professional standards, a user interface that is easier to master, and a database management system that facilitates integration with other local systems, including financial management and geographic information systems.

The report considers the relative merits of replacing the current systems with either a centrally administered system or a decentralized, although uniform system, from multiple points of view, including cost. In general, a replacement for the current system can be expected to cost on the order of \$3,000,000 to \$4,000,000 and to require as much as six years for an orderly, phased introduction, although more rapid reforms would be possible. Of course, these costs must be weighted against both the direct and indirect costs of maintaining the current system. These direct costs include \$50,000 per month that the DOR pays for computer processing time and ongoing costs of vendor support. Indirect costs include lack of functionality, excessive staff time, and increasing risk of disaster. Replacing the current systems as recommended will thus be cost-effective. The sooner the process can be completed, the better.

A decentralized, but uniform system hosted in each of the counties is recommended in the report, although we find no overwhelming cost consideration militating for either the centralized or decentralized approach. The latter affords more opportunity for the development of synergistic integrated systems addressing the needs of county tax collectors, geographic information system developers, and others, while the centralized system affords more assurance that standards can be enforced and the likelihood of disaster can be minimized.

The report concludes with recommendations for further steps in planning for the process of CAMA system reform. They are designed to build support among counties for the new system, ensure that relevant issues are identified and resolved, and provide the structure and time frame needed for a successful implementation. The new system can be expected to be neutral in terms of valuation levels, that is, values should neither generally increase nor decrease as a result. However, the new system will give the counties, Department, and State Board the tools they need to better monitor market trends and attain uniformity among properties.

1. Introduction

The Wyoming Department of Revenue selected Almy, Gloudemans, Jacobs, & Denne, Property Tax and Assessment Consultants, to make a technical review of the State's computer-assisted mass appraisal (CAMA) systems. This report contains the results of our review together with our recommendations.

1.1 Purpose of Study

The study addresses the issue of the medium- and long-range viability of the centralized systems used to provide computer assisted mass appraisal (CAMA) valuation services to the county assessors in Wyoming. Several recent developments had led officials to be concerned about the exposure of the state to potentially unacceptable risks of system disruption or failure. One major concern is the fact that only one software vendor, a sole practitioner who recently had health problems, supports one of the two systems in place. Another concern is that the two systems are over a decade old and represent technology that is several generations removed from current best practices. An additional strategic concern is that the base of the systems' cost-approach-to-value is in danger of becoming unsupportable. Significant operational concerns include the lack of standard features to provide ease-of-use and ease-of-learning for operators and power users alike. With these motivations, officials sought an independent expert opinion of the likely ability of the systems to perform reliably in the near term and guidance on the optimal strategy to address noted deficiencies, whether by additional modification to the current systems or by their replacement.

1.2 Background

Wyoming's computer-assisted mass appraisal (CAMA) systems are the result of a Supreme Court decision in 1985 mandating that assessments be in line with actual market values. Previously, assessments were based on outdated cost estimates. The original strategy was a single statewide system. Such a system is a recognized component of an effective program of state supervision and support of local assessment jurisdictions, and at least thirty states have sponsored the development of computer-assisted mass appraisal systems. Some states (including Wyoming) provide computer processing and assist with mass appraisal modeling. The services offered by the states may be free-of-charge or done on a charge-back basis. In some cases the computer system and services are mandatory (as is the case in Wyoming) and in other cases they may be adopted at local discretion. The introduction of the CAMA systems enabled Wyoming assessors to increase the accuracy and uniformity of assessments dramatically. Consequently, despite being outdated, the CAMA systems enjoy broad support.

Statewide CAMA systems provide a number of benefits. They give many assessors powerful tools that they otherwise could not afford, and well-designed systems extend the capabilities of small staffs. They impose a structured approach to mass appraisal that fosters uniform treatment of taxpayers. They facilitate sales ratio studies, making equalization more effective. The benefits

of a statewide CAMA system can be quite subtle. Standard record formats and codes indirectly promote consistency in policy and practices. They facilitate transmission of information electronically and analysis of that information.

The present practice is for counties to use either of two similar but not identical CAMA packages on the state's mainframe computer to produce value estimates for locally assessed real and personal property. Originally, the state planned to provide only one system, the MAS system developed by the Cole Layer Trumble Company (CLT). But due to historical accidents relating to the efficiency of performing data collection and data entry, a second small PC-based system was developed and was allowed to grow in directions that diverged from the uniform system until the state agreed to support both systems. The two systems, now called CLT MAS and WYS TAS, produce cost-based estimates of property value based on costs that were last calibrated to local conditions about 10 years ago. The original WYS system did not have a workable sales comparison system. However, through a programming kludge, counties using both systems can now use the multiple regression analysis (MRA) system as implemented by CLT, although the functionality of the system is severely constrained such that no other county can use it until processing has been finished for whatever county first started using it. (MRA is a statistical procedure widely used to develop sale price-based estimates of property values.) Also, the system is not a true MRA system as that term is generally used. Additionally, although both systems purport to have a module offering to implement value estimation by reference to capitalized estimates of the income stream a property can generate, neither system has been used for this purpose. The net result is that the systems are used predominantly to value properties by means of the cost approach, with a number of counties using the sales comparison approach and none having implemented the income approach.

The systems are also used, importantly, to produce assessment rolls for tax levying purposes and to manage and report the information required by the State Board of Equalization (SBE) in the discharge of its oversight duties. In this connection, however, the CLT and WYS systems are generally inadequate. In essentially all cases, counties use only the CAMA modules from the mainframe-based CLT and WYS systems and not the accompanying assessment administration (AA) systems. For AA purposes, many different systems implemented at the county level are used. Since some of the data required by the SBE are managed only by the AA system and not the CAMA system, counties must download extracts of their CAMA data, merge the extracts into their AA systems, and then summarize the data in their AA systems to satisfy the needs of the SBE.

1.3 What We Did

We approached our review of the current CAMA systems from three perspectives: (1) how the systems fit into the Wyoming property tax system, (2) how they compare with the current state of the art in CAMA and assessment systems, and (3) what should be the characteristics of a single, more modern CAMA system.

To ensure that all important viewpoints were reflected, we interviewed representatives of both of the state agencies responsible for oversight of property tax administration in the state: the Ad Valorem Division of the Department of Revenue (DOR) and the State Board of Equalization. We interviewed representatives of both CLT and WYS county assessors in their offices. We observed demonstrations of the use of each system. We administered a questionnaire seeking input from the county assessors that we were not able to visit in their offices and analyzed the results. We consulted with knowledgeable personnel in private and public office in circumstances relevant to Wyoming's. We also reviewed systems documentation and reports of system performance, including assessment ratio study reports.

We critiqued both the WYS system (section 2) and the CLT MAS system (section 3). In section 5, we lay out the features that we believe a new replacement system should possess and discuss a range of issues associated with the installation of a new system. In section 6, we lay out a possible implementation plan.

1.4 Summary of Findings and Recommendations

Although the CLT MAS and WYS systems are not currently in crisis stage, they are severely outmoded and expose the state to risks of system failure and to bringing discredit on the property tax administration of the state for failure to perform standard, expected functions in adequate ways. Among the systems' shortcomings are a cost system that may soon lose update support, a highly cumbersome sales-comparison approach, and an unused income approach. These shortcomings cloud the ability to apply effectively all three approaches (sales-comparison, cost, and income) to the valuation of the various properties for which the approaches are applicable, as required by the Uniform Standards of Professional Appraisal Practice (USPAP). Conformity with USPAP is increasingly important generally, having been embraced not only by the mortgage-lending world but also by the International Association of Assessing Officers and all major professional associations of appraisers.

The technological basis of the current systems is so obsolete that it would be better to replace them entirely than to attempt to design remedies for their worst present shortcomings. Such remedies would necessarily leave them obsolete in many respects even if somewhat improved over their current state. It is important, too, to note that the ability of the state to guarantee adequate support for at least one of the two systems is a matter of some legitimate concern, which would not be remedied by further enhancements. Also, the system as it currently operates is somewhat of a kludge, with counties that are principally on one system having to use modules of the other, with significant loss of functionality or ease of use.

The implementation of an orderly reform/replacement plan can be expected to cost on the order of \$3,000,000 to \$4,000,000 in marginal expenditures. It would require one to two years of preparations, followed by a four-year period in which the system is installed in the counties, existing data are converted, and all the necessary new data to support the new valuation methodologies have been collected. This period would roughly parallel a four-year appraisal review cycle

to not overburden county staffs, although counties would be brought on the system in groups to make installation manageable from the State's perspective. A shorter-term project with a massive one-time data collection effort would be possible, of course, but would tend to be more costly, more disruptive, and to possibly lead to less acceptance of the new data and the new system than would be obtained by the phase-in approach.

2. Critique of WYS System

2.1 Overview

The WYS system is an unplanned child that emerged from the decision in the mid-1980s to let separate CAMA software and conversion contracts. CLT won the software contract and PAC, a Texas company, won the data conversion contract. PAC shortly went broke and the Ebert Corporation, a sister company to PAC, picked up the data conversion contract. In part because of response time problems with the original mainframe system on which the CLT system was installed, Ebert convinced many counties to migrate to PCs. However, Ebert installed his own system, the WYS system, rather than the CLT system as previously agreed. Initially the WYS system even had its own costing system (referred to as the TEC system), although the State forced Ebert to substitute the nationally recognized Boeckh system, which the State previously used.

Before long Ebert also failed to honor commitments, leaving client counties in a disastrous position. Fortunately the DOR stepped in. It hired a reputable programmer to rewrite the WYS system to make it more functional and user friendly. It also negotiated with Boeckh to maintain the cost tables and wrote a bridge to provide WYS counties access to the CLT market system.

Today eleven counties use the WYS system networked to the State's mainframe. The DOR provides user help and maintains a support contract with the same contract programmer who provided the initial enhancements.

2.2 Data Base Design

The WYS system reflects a typical mid-1980s design. It was developed in COBOL and uses a series of flat files, as opposed to a central data base engine. Data entry and query are character-based with no point-and-click capabilities. There are no pop-up menus and no on-line data definitions or user help capabilities (there is a user systems manual). Building perimeter sketching is supported, but the output is in the form of alphanumeric characters, not lines and curves.

The system only maintains current inventory files with no multi-year processing capabilities, meaning that users cannot simultaneously enter, query, or compare data from multiple assessment years. The system maintains a sales file with property characteristics.

Users familiar with the system are able to input, retrieve, and edit data with reasonable efficiency, although the learning curve is likely high. Security does not appear to be a problem. Slow response times recently have been improved through communication and equipment upgrades.

2.3 Cost Approach

The WYS system uses the Boeckh cost system. Currently Boeckh provides cost trend factors by time and location (zip codes) on an annual basis. Depreciation tables are indexed by effective age and physical condition within building type. For residential property, the amount of data required to drive the Boeckh cost system is typical, except for the provision of a plethora of interior items, such as dishwashers and ceiling fans (many counties do not collect these data). The commercial system is unusually detailed, requiring data on each structural component. This detail is probably due, at least in part, to Boeckh's focus on replacement value for insurance purposes. There are concerns that Boeckh's recent changes to its cost-grading methodology may render the system unusable for CAMA purposes.

System users can apply market adjustment factors (MAFs) to Boeckh costs by property type (residential or commercial), neighborhoods, and age and value range, as well as by certain additional factors depending on property type. The system produces a number of canned cost model reports for which users can supply parameters.

2.4 Sales Comparison Approach and Comparable Sales

The WYS system contains a highly cumbersome and inflexible MRA module that does not work right. After initial attempts to use it, WYS counties gave up. Fortunately, the DOR maintains a separate CLT regression system for WYS counties. These counties generally travel to Cheyenne where they work with state personnel on model development and use the state's high-speed printers.

The comparable sales system will find sales falling within given ranges. It is overly simplistic and outmoded. Because of its limitations, it is little used.

2.5 Income Approach

Although the WYS system supports some income approach applications, they are little used. Partly due to the lack of a legislative requirement, income data are hard to get in Wyoming. Most counties only conduct income analyses on appeal.

2.6 Market Analysis and Ratio Studies

The system lacks adequate data analysis tools and graphics, making it difficult to monitor time trends and market patterns. However, a time-adjustment factor file will support monthly time-adjustment factors determined by the user. The report generator will support sales ratio analyses (see below).

2.7 Ad Hoc Reporting

The system supports two separate utilities for extracting and analyzing data; these are the Report Request System (RPTR), and Report Generator Field Definition System (RGFD). The former is used to run programmer-designed reports using user-defined parameters. There are approximately 170 of these pre-defined reports, including ones for use in connection with sales ratio analyses, market analysis, audit, worksheet printing, table maintenance, error reporting, recalculation, edits, and checks. The (RGFD) allows the user to design new reports, including the facility to select properties using Boolean logic applied to any field or group of fields in the system. The user must be familiar with the general file structure of the WYS System, or know the needed mnemonics in order to identify the desired field(s). Pertinent data are then extracted in either a digital or printed format. In defining a printed format, the user can specify a form layout including titles, headers, etc., although this is cumbersome at best due to the operator having to use positional references (i.e.: line 3, position 50) rather than the "drag and drop" positioning used by newer systems. To produce output in a digital format, DOR personnel must extract the data from the mainframe and then send the results to the county either electronically or on disk. Reports in both the RPTR and RGFD systems may be saved for later reuse.

2.8 Personal Property

The personal property system was not part of the CLT software contract. It was added in the WYS system and is now used by both CLT and WYS counties. The system has been enhanced over the years, has the required functionality, and is reasonably user-friendly. Users can add or view up to five line items for an account at one time, but then must page up or down (versus scrolling as in a Window's-based system).

The system is generally well liked, at least by the WYS counties. CLT users find the system harder to use than WYS counties, since the user interface and design principles were patterned after WYS and are foreign to CLT users.

2.9 Public Support

Both the CLT and WYS system offer little exciting in terms of public support. Although the public can peruse assessment books and documents, data coding and formats are often difficult to understand. There is no Internet access to assessment data. Assessment personnel who service the phones and counters are the mainstay of public assistance in both systems.

As mentioned, the WYS system has no comparable sales module or facility for efficiently retrieving the most comparable properties for a given subject parcel. WYS counties who use the CLT regression system can produce reports showing the most comparable sales used to determine val-

ue for residential properties valued with MRA (although the reports are cryptic and difficult to explain).

2.10 Interface with Other Systems

Appraisal systems in Wyoming must interface with both the State and other county departments. Because of its standard file formats, the State can access data in both the WYS and CLT systems with little difficulty. Counties have established workable links between their assessment systems and other affected departments, particularly the Treasurer. Several counties, most notably Laramie County (which uses the WYS system), have established or are developing the ability to access assessment data through GIS, although none of these applications currently go both ways (the assessment systems cannot call GIS data). Standard import and export features (e.g., using ASCII formats) appear workable.

Of longer-run concern is the willingness of the State and counties to support an increasingly outmoded assessment database when considering upgrades to their other systems.

2.11 System Support

Support for the WYS systems is precarious. As mentioned, the system is several generations behind the current state-of-the-art and, in fact, stands unique as a CAMA system. The State maintains an in-house expert user, who troubleshoots problems and provides user support. It also contracts with an outside programmer who provides periodic fixes and upgrades. While these individuals are well skilled in the system, their loss would be nearly catastrophic. Since the programming language is outmoded and since the system is not used elsewhere, finding or developing similar skills would likely entail sizable costs and a long learning curve.

3. Critique of CLT System

3.1 Overview

The CLT MAS system is of the same programming generation as the WYS system. It, too, is written in COBOL. It also was designed as a single-user system, not a centralized system with multiple county users. CLT itself has since released two major rewrites to its system. Interestingly, Natrona County is in the process of converting to the latest of these systems, IAS (Integrated Assessment System), which uses an Oracle database. (The Natrona system should be compatible with the State CLT system in that it should return the same cost approach values and feature a functionally comparable although much streamlined regression system).

3.2 Data Base Design

Like the WYS system, data entry screens are character-based and make liberal use of mnemonics. Although a trained clerk can work with reasonable speed, users regard the systems as generally cumbersome and not user-friendly. Specific functional shortcomings include the inability to enter multiple-class parcels (part commercial and part residential), difficulties in retrieving the most recent sales for purposes of generating sale verification letters, inconsistent reset features (sometimes must enter asterisks and sometimes not), and difficulties in retrieving legal descriptions. As in the WYS system, the audit trail is very limited. There is no appeals-tracking system. Value recalculations effectively require overnight processing.

On the positive side, unlike the WYS system, the system supports multi-year processing in the form of previous, current, and future year files.

3.3 Cost Approach

CLT has its own cost system, although it is actually a hybrid system with cost tables calibrated through a building-residual analysis. Data required to support cost calculations are somewhat less detailed than in the WYS system. Depreciation is based on CDU (condition, desirability, and utility) and year built (or renovation year if a renovation has occurred).

3.4 Sales Comparison Approach and Comparable Sales

For residential properties, the CLT system emphasizes an MRA/Comparable sales module in which values are based on the several statistically most comparable sales with adjustments based on regression coefficients. The system can produce very accurate values if the selected comparable sales provide good market value proxies, but can suffer somewhat in terms of consistency in comparison to values generated directly by MRA. In all, the system is functionally strong but

user-unfriendly. Users are also limited to 199 variables, including intermediate and final transformations, which can be a significant problem in large counties.

Interestingly, since WYS did not have a workable MRA system, WYS counties that want to use MRA must use a version of the CLT system. In part because of the complexity of the system and in part because of the sophisticated nature of MRA itself, the DOR does the MRA modeling for many counties (both CLT and WYS). Others usually come to Cheyenne to run MRA, since they don't have complete access from home. A related problem is that only one user can use the MRA module at a time. Response times are slow compared to PC systems. In all, the system provides powerful analytical capabilities, but lags badly compared to the current state-of-the-art.

3.5 Income Approach

Although the CLT system provides basic income approach capabilities, they are seldom used due to the de-emphasis of the income approach in Wyoming (see 2.5).

3.6 Market Analysis and Ratio Studies

The CLT system provides basic descriptive statistics, character-based plots, and sales ratio capabilities. Although somewhat superior to the WYS system, they are limited and cumbersome versus more modern software (including CLT's current release).

3.7 Ad Hoc Reporting

The CLT system has two report generators (including "selectability") with which the user can build and save custom-designed forms and reports, although they are notably lacking in comparison to modern tools found in desktop database systems. Users familiar with more modern software find it relatively tedious and cumbersome. Two specific shortcomings are an inability to pull multiple parcels for the same owner and the inability to query by subdivision.

3.8 Personal property

The Wyoming personal property system was developed by the programmer who maintains the WYS system and was written to be compatible with that system. Although the CLT version generates the same values as the WYS system, it is less functional and user-friendly. CLT users must rely on the state to update personal property tables or roll values to the assessment administration system.

3.9 Public Support

In terms of public support, the CLT system is similar to the WYS system. Printouts are not easily understood and there is no Internet access possibility. Comparable sales reports (used by MRA counties on both systems) are difficult to explain.

3.10 Data Sharing and Interface with Other Systems

Like the WYS system, the CLT system is easily accessed by the State and has been effectively integrated with other county departments, although some duplicate data entry is involved. Downloading data to a geographic information system (GIS) is possible, but there is no true interface.

3.11 System Support

The State is able to obtain maintenance service and support from CLT on a pay-as-you-go basis, although a regular maintenance contract would also have been a possibility. However, because of the datedness of the system, CLT would likely be reluctant to provide any meaningful upgrades without considerable cost. Clearly, the company would prefer the State to purchase its new IAS system being implemented in Natrona County.

As with the WYS system, the DOR provides in-house user-support for the CLT system. As fewer CLT clients stay with this much older version of its software, however, expertise and support can be expected to become increasingly problematic.

4 Assessors' Evaluations and Recommendations

We wanted our review of Wyoming's CAMA systems to reflect the views of their primary users: Wyoming's twenty-three county assessors and their staffs. To this end, we interviewed selected users of the CLT and WYS systems, and we sent a survey questionnaire to all county assessors. We were pleased that we were able to hear from all twenty-three counties. This section summarizes how assessors' offices evaluate their systems and their recommendations for the future.

Virtually all assessors expressed dissatisfactions with their systems. However, WYS counties are markedly more satisfied with their current system than CLT counties. To shed light on this pattern, we examined satisfaction with, and the importance attached to several features of current systems and features that might be asked for in a new system. We conclude that part of CLT counties' dissatisfaction can be attributed to their having higher expectations than the WYS counties overall. For example, they are more likely to use multiple regression analysis to value residential properties. We note also that some responses reflected unfamiliarity with the features of their current systems or with the jargon in our survey questionnaire.

What follows are highlights from our investigation of how important selected CAMA system features and characteristics are to Wyoming assessors and how well satisfied they are with their current systems.

- Maintainability unsurprisingly emerges as an important CAMA system characteristic. The view that the WYS system is more maintainable is somewhat surprising, given the fact that its maintenance essentially depends on a single contract programmer.
- Security also emerges as an important characteristic, although less important than maintainability. WYS counties attached less importance to security than CLT counties. Both groups were generally satisfied with the security features of their current systems.
- Survey respondents generally considered interoperability with other systems to be important. There was considerable dissatisfaction with their current systems in this regard.
- Ease of training new system users emerged as important. CLT users were less satisfied than WYS users.
- Ability to customize the system also emerged as important. As would be expected, WYS users were more satisfied because their systems *are* more customized.
- Users of both systems considered statewide uniformity in systems important. Although no users were very satisfied with the current situation, opinion generally was mixed. When responses to the ability to customize are compared to those on statewide uniformity, the preference would seem to be for a statewide system that can be customized somewhat.

- Ease of exchanging data with other counties emerges as a less important feature, and aside from some apparently reflexive dissatisfaction, more respondents expressed no opinion than respondents in the satisfied range.
- Public data access: Survey respondents considered the ease of making data publicly available a comparatively unimportant feature, although it was more important to CLT users. It is generally agreed, however, that public understanding of assessments is crucial to acceptance of the property tax. We note that CAMA system vendors now stress public access via the Internet.
- Although more important to CLT users, the ability to use the income approach was viewed as being of only marginal importance.
- Most survey respondents considered the ability to apply the sales comparison approach important, with CLT users attaching greater importance. With respect to satisfaction with their current system, CLT users were divided between being satisfied and dissatisfied. WYS users were more likely to be satisfied.
- There was a strong consensus that the ability to monitor market trends in selected areas or for selected property types was important. As is typical, WYS users were more likely to be satisfied with their current system in this regard than CLT users.
- USPAP: Most respondents considered ability to demonstrate compliance with the requirements of the Uniform Standards of Professional Appraisal Practice (USPAP) important. WYS users were more likely to be dissatisfied with their current system than CLT users.
- Data transfer: The ability to transfer data easily from the CAMA system to and from personal computers (PCs) emerged as important, with CLT users attaching greater importance to this characteristic. They also were more likely to be dissatisfied with their current system than WYS users.
- Although some survey respondents clearly recognized that their current systems did not have a graphical user interface (GUI), the unusually large number of respondents who did not respond to or express opinions about the question suggested that they might not have understood the question. In any event, CLT users attached greater importance to this feature than WYS users. Not surprisingly, they were more likely to be dissatisfied with their current system.
- Survey respondents strongly agreed that it was important to be able to move or navigate from one screen to another easily. CLT users tended to be dissatisfied with the navigational ease of their current system, whereas WYS users tended to be satisfied. The personal property system was a particular source of frustration.

- Data management and ad hoc reporting: Most survey respondents agreed that it is very important to be able to enter, retrieve, and query data and to develop ad hoc reports easily. Most CLT users were dissatisfied with the performance of their current system in this regard, whereas most WYS users were satisfied.
- Help: Most survey respondents agreed that having field-level (context-sensitive) help was important. Although there was a wide range of opinions, CLT users were more likely to be dissatisfied than WYS users.
- Most survey respondents agreed that building perimeter sketching capabilities were important. There was general satisfaction with existing capabilities. Contrary to the general pattern, CLT users were somewhat more satisfied with current capabilities than WYS users.
- Most respondents believed the ability to store data in a relational database was important. Although neither of the current systems has a relational database management system, most WYS respondents were satisfied with their current system.
- System integration: Most survey respondents considered local integrated systems important. Satisfaction with current systems was low.
- State support is considered important. Both CLT and WYS users were satisfied with current levels of state support.
- Local support: When assessors were questioned about local—as opposed to state—support, they logically continued to believe that support was important, but not as strongly. Satisfaction was not as strong. It should be noted that the raw tabulations mask the fact that some respondents clearly favored continuing to rely on the state while others clearly wanted to take responsibility for their CAMA system. The availability of computer system expertise in the county influenced their preferences.

Survey respondents were asked to make recommendations on ways to improve the accuracy of their value estimates. Responses ranged from the type of CAMA system they would like to their desires concerning specific valuation functions (for example, a better MRA module, more accurate cost tables, particularly for high-value dwellings and outbuildings, and better depreciation routines). Several expressed preference for a PC-based system running under Windows. Some also recognized the lack of sales and other market data as a source of problems.

Finally, survey respondents were asked to note other matters or concerns. Some respondents also made helpful comments next to their check-off responses. Some made specific functional recommendations (Crook, Fremont, Laramie, Park, Sublette, and Uinta counties, for example) that should be reviewed during the refinement of user requirements phase of new system implementation. There was widespread concern that documentation be good, as poor documentation is a problem with the current systems. Other comments ranged widely. Some wanted greater control over their data. One area of concern was whether past instability in the DOR would continue in

the future. In a similar vein, some observed that having to use an obsolete state system with limited functionality imposed costs in terms of the systems they had to acquire to have a fully integrated local assessment and taxation system (greater integration and interoperability with GIS, personal property, tax administration, and other systems were often mentioned). Some respondents saw maintaining the current systems as inherently wasteful; they wanted the money spent on a system that would adequately meet their needs. Some hoped that sufficient time would be allotted for the conversion so that available staff would not be over-burdened.

5 Recommendations for New System

5.1 Summary of Inadequacies of Current Systems

The CLT and WYS systems fail to provide usable support for all the expected valuation approaches. Users of the WYS system must use the CLT comparative sales module, lacking an acceptable one of their own, and the CLT MAS system does not include a clean implementation of MRA, as described above. Neither system's income approach is usable, in part because of a lack of readily available income data in the state (something that legislative changes would be required to address) and in part because neither system can adequately model missing data on the basis of available data. The two systems contain incompatible cost systems with attendant differences in the way common building attributes (such as construction quality) are encoded. This shortcoming, coupled with the state's inability to enforce consistent coding of such attributes, means that it is essentially impossible to compensate for small numbers of sales in a county by sharing sales data among counties, by analyzing market trends on a multi-county basis, or by combining data from several counties to build regional valuation models. In a state where markets are as limited as they are in Wyoming, the ability to maximize the use of available market data is crucial. With standardization come not only more effective use of the systems but also a host of operating efficiencies that cannot be achieved in the present systems. In large part because of data complexities and inconsistencies, the present systems also suffer in their ability to support performance measurement and analysis. Finally, the systems are cumbersome, obscure, and unlikely to enhance the credibility of the property tax system they support. At present they appear unlikely to be worth the \$50,000 per month that DOR must spend for computer usage alone.

5.2 Outline of New System Requirements

5.2.1 Data Base Design

There must be no requirement to re-keyboard any of the data presently available in either system. Moreover, the vast majority of the data presently used in the systems should be brought forward to support the maintenance of valuation work during the phase-in period if, as we recommend, new data are captured through the 4-year review cycle. If, to the contrary, a big-bang approach is to be taken, only the old data needed by the new system need to be brought forward to it.

The new system must support multi-year processing or versioning. In particular, work necessary to record new parcels, and changes to existing ones should be able to be performed at any time of the year, irrespective of whether or not the prior year's tax roll has been frozen. The system should, additionally, enable a user to review the status of the parcel (on screen) as of the prior several tax years.

The system must maintain a sales file with property characteristics as of the time of the sale of the property. It is not sufficient to know only the characteristics of the property at some later time of the inquiry. There should be no limit to the number of sales that can be managed this way. Ideally, it should be possible to include in this file information on sales occurring outside the jurisdiction (there should be no required link to a current or former taxable parcel). The system must also accommodate a variety of codes to indicate the validity of certain sales for some purposes, such as valuation modeling, while not for other purposes, such as ratio study analyses. The system should further support a variety of adjustments to sales ratio data to reflect such possibilities as atypical financing, time since the sale, personal property and the like. It should also be possible to create an aggregate ratio for a property when multiple parcels sell as a single transaction and multiple assessments must be aggregated for comparison to a single sale price.

There must be adequate on-line help available for every field and action that an operator is expected to deal with. Ideally, a modern graphical user interface should be employed, with operators able either to key in fields rapidly if they know the necessary codes or to click on down arrows or other contextual help devices to see sorted lists of acceptable codes, values or other help.

The system must support a good audit trail subject to human analysis, ideally including support for ad-hoc queries. This capability would reveal who made what changes to the database and when. This is in addition to the ability to support a rollback to a prior state in the event of a system disaster.

The data in the system should be stored in normalized tables so that multi-valued fields, such as most recent sale information and property inspection information, do not constitute the problems that they presently do when users attempt to generate sales verification letters and other form letters based on data that may appear in any of several possible fields. Ideally the system should permit the development of triggers that could be configured to generate such processes automatically rather than requiring the operator to run batch processes.

The system should also present a consistent user interface, including consistent field exit procedures and consistent justification of fields.

5.2.2 Valuation

The system must support, at industry standard levels or above, all three approaches to value and be able to produce accurate market-based value estimates. The SBE has strict requirements in this regard, although their enforcement may have been somewhat lacking in recent years. Certainly the system should be capable of meeting the SBE's requirements without recourse to selective screening or adjustments to sale properties.

The system must support a cost-based approach to value in which the tables and formulas for the development of the "replacement cost new" are from a reputable source and are updated annually. The system must support the ability to make obsolescence adjustments and support market

adjustment factors. One of the present systems (WYS) supports the ability to apply market adjustment factors not only by neighborhood (as the system was originally designed), but also by class, age group, ranges of square feet, and the like. Several interview respondents described the superior accuracy and persuasiveness of the Marshall & Swift cost-based estimates, especially for commercial and industrial property, and especially in an appeals setting, and we would concur that Marshall & Swift enjoys high credibility and warrants strong consideration along with other reputable suppliers of cost data, such as Boeckh. The cost system for residential properties should probably be from the same vendor as the system for non-residential properties for the sake of consistency of approach and the few buildings in which mixed-use issues arise. In general, of course, a true component-based cost analysis is far superior to one based largely on a building-residual analysis, as is the case with the tables underlying the CLT system.

The cost tables underlying the WYS system are derived from the Boeckh Company, which has a good reputation, but is more involved in the insurance market than in supporting CAMA systems. There have been reports that the Boeckh Advantek system, due to replace the current Boeckh system next year, will not allow buildings to be manually graded, but instead will infer the grade from such other characteristics as age and number of corners. If true, this change will severely limit the utility of the system for CAMA purposes. It is also possible, however, that the system will be designed such that a default grade will be inferred from other characteristics, but a manual override of grade will be possible. In any event, the chosen system must contain a facility for the user to enter observed grade and have it determine the costing factors applied. Ideally DOR should ensure that the cost schedules are kept current and have been appropriately calibrated to Wyoming costs.

The sales comparison approach must be supported in at least two different ways. The system must support the development of predictive equations by means of multiple regression analysis (MRA). It must also support the development and printing of reports showing the value estimated for a subject property relative to the values of several comparable recently sold properties (comps). The MRA facility should allow the values generated by this approach to be considered for enrollment on the assessment roll in their own right, not merely affecting the value estimate by determining the adjustment coefficients used in the comps routine. Both facilities should be user-friendly and support both point-and-click and batch processing. The comps reporting and analysis capability must include both the facility to select comparables on the basis of a dissimilarity algorithm and a facility to retrieve only properties whose characteristics fall within specified ranges. In addition to MRA and comps, the new system might also implement an adaptive estimation procedure, although this would not be required.

The system must support the application of the income approach for properties where it is relevant. Although the approach is little used in Wyoming, due to the difficulty in getting the necessary data apart from an appeals setting (a problem requiring a legislative solution), the new system must support its application and DOR and the local assessors should do what they can to get the legislature to remedy this problem. Although the development of the necessary capitalization rates and formulas could be spreadsheet-based, it would be preferable to have their development incorporated in the system routinely, and the system must minimally support their application.

The system must support a variety of approaches to land valuation. It must support the ability to segment a single taxable parcel into multiple land types with various valuation considerations. It must also be possible for the user to develop and apply size-adjustment curves and site-characteristic adjustments.

Throughout the valuation modules of the system it must be possible for the analyst to undertake simulation studies, that is, to test new formulas and parameters without updating live assessments. It should also be possible for the system to maintain simultaneously several candidate value predictions so that the characteristics of each candidate valuation model may be explored in detail.

5.2.3 Query and Analysis

The system must include a user-friendly report generator, which must encompass the ability to save and rerun queries and customized reports. The system must provide the ability to produce all statutorily required reports and conveniently manage all data necessary so that the report feature will be capable of generating the abstract required by SBE.

[System specifications developed for the purpose of soliciting information from potential vendors will need to enumerate the reports required by law and provide samples of each, but this report does not attempt to do that.]

The system must include good graphic capabilities, with emphasis on scientific data displays, including scatter plots (preferably with the ability to label selected points) as well as the usual box plots, bar charts, and histograms. It must also support calculations, which are currently being used in the reports developed by many counties.

The system must be capable of producing all of the sales ratio analyses specified in the IAAO *Standard on Ratio Studies*, notably including the ability to produce such statistics for selected user-defined strata. The requirements of the SBE must also be accommodated. Furthermore, the ratio study facility must be capable of detecting instances in which counties appear to have engaged in sales chasing. When sales chasing is detected, the system must make it possible to adjust the ratio study results to reflect the reality of the assessments of the unsold parcels, not merely the assessments on the parcels whose assessments have been changed (disproportionately) as a result of their having been sold. Our review of some of the current ratio study results suggest that there is reason to believe that at least some counties are reporting ratio study results too good to have been obtained in any way other than by sales chasing or by selectively purging valid sales from the analysis by flagging them as invalid.

5.2.4 Personal Property

The system must provide an effective, user-friendly personal property system. The current system is generally well liked, but may not include desirable features such as the ability to audit the reasonableness of data relative to norms established for firms of comparable size and Standard Industrial Classification (SIC) or North American Industrial Classification (NAIC) code.

5.2.5 Documentation, Training, and Support

The system must be accompanied by a complete set of documentation, particularly including a complete and readable user's manual. It should also be accompanied by a programmer's (system administrator's) manual. The source code for the CAMA system should also be provided.

Ideally the vendor of the system should also provide training materials addressed to at least the issues of data collection and valuation methods, suitable to the state, in addition to the reference manual orientation usually adopted in the preparation of a user's manual.

Help must be made available on-line for users unsure what code(s) are appropriate in a data entry context and what actions would be performed by various options in a program-initiation context.

Ideally the system should be based on a graphical user interface, and should incorporate as much state-of-the-art help as possible, including context-sensitive help, toolbars (including tool tips) where appropriate, on-line how-to in addition to reference information, and optimally on-line tutorials.

Training is essential, and costs can be well repaid in flattened learning curves and higher productivity in shorter time periods. Natrona County contracted for \$25,000 worth of training. A reasonable budget for vendor-provided training would be on the order of \$150,000.

Given the current county levels of preparedness and funding, DOR should plan to fund substantially all of the initial training, both in mass appraisal theory and practice and in system use.

In-house systems support is also necessary. DOR personnel should be the first line of support for counties, and as such DOR personnel should receive thorough training in all aspects of system support, use, and administration.

5.2.6 Ancillary Features

The system must include a user-friendly download feature. Downloading data to a *local* PC for further analysis should be possible, even if the CAMA system chosen has an architecture based on Windows Based Terminals. The system must also make it easy for data to be extracted for sharing with other government agencies.

The system should have good sketching features, and the system conversion (if any) should entail any necessary reformatting of existing sketch vectors to make them compatible with the new system. The new system should support sketch entry by clicking a mouse on a grid, and not require the entry of unappealing vector codes.

The system should support the storage and retrieval of digital images, the display of which should be possible by clicking on an option button (or pressing a function key) so that the image is automatically synchronized with the data displayed for the property on the data-coding screen.

The system should be designed such that it can be easily interfaced with any of the leading geographic information systems (GIS) such that the exchange of data can, if desired, go both ways. Similarly the system should be architected so that it can be interfaced smoothly with a document management system, if desired.

The system should provide a facility to enter, track, and manage hearing and appeals data.

The system must support good public service. In particular, the reports that justify the value conclusions must be easily and quickly generated locally on demand, and be free from excessive cryptic codes unsuitable for use at the public counter. Ideally the system should provide an option for Internet access, including providing a user with the ability to search and download records. It would also be desirable for the system to provide users with the ability to view maps and request comparables.

5.2.7 Parcel Numbering and Access

The system must be able to maintain two unique parcel identification numbers (PINs), one based on a scheme involving parcels and subdivisions and another based on townships, sections, and ranges, inasmuch as both are used, simultaneously, in some counties of the state. The system must also provide a means by which any given set of parcels may be associated with a certain other (“tieback”) parcel along with a code indicating a reason for the relationship. The tieback facility should make use of a least one of the aforementioned PINs.

The system must be able to provide indexed browse access by other multiple fields as well as either PIN. Such fields should include situs address, subdivision, and owner name.

5.2.8 Assessment Administration Link

The new system should address assessment administration issues such as special districts and veteran’s exemptions in a flexible way. In general, the system must provide for the management of several user-defined fields. Such fields should be available for use by counties that want to continue to rely on their own assessment administration (AA) system rather than some standard one ideally provided in conjunction with the revised CAMA system. Users of a different AA could then store in the user-defined fields in the CAMA file the necessary information on SIC codes, special taxing districts, exemptions and the like that would permit them to comply with the reporting requirements of the SBE in a more expeditious fashion than they do now. Ideally, of course, the accompanying AA system should be so modern and fully featured that all counties will want to abandon their current AA systems and adopt the new one integrated with the new CAMA system. However, for those who do not, the facility noted above should be provided. Accommodating notes and legal descriptions of effectively unlimited length should also be provided, which should also present no difficulty to any modern database management system.

5.3 Conversion Issues

The installation of the new system should be quick and smooth because of the annual market value requirement. Ideally, the system should be able to manage, perhaps by means of user-defined fields, the temporary continuation of the current valuation system until the data necessary to implement the new appraisal methodologies are collected for all properties. Depending on policy decisions not presently known, it may take an entire four-year review cycle for such data to be collected. Alternatively, the new computer system, new valuation methodology, and newly collected data could all be implemented simultaneously with a big bang, but this is more prone to political difficulties.

5.4 Hardware and Networking Issues

Hardware and other architectural issues depend in some measure on the ancillary uses made of some of the resources that are presently shared and what will be the fate of those systems once the CAMA system is re-engineered. At present the CAMA system is hosted on a state mainframe, and communications between the client counties and the state mainframe are conducted over a state network for which the counties typically pay very little. The state pays an internal charge of \$10 per month on behalf of the counties for each network identification, and also pays about \$32 per month for each networked PC, up to the number of networked IDs mentioned above, with any additional PC connection charges payable by the county. In general, the CAMA traffic over the state network is reported to be a relatively small fraction of the total.

Conceptually, some of the same network that is in place now could be retained for the re-engineered system, although it is likely that all the peripherals such as the county terminals and printers should be replaced. The current equipment, dumb terminals or at best personal computers with 3270 emulation, will probably not be optimal for the new system, except for some recent personal computers (PCs). Graphical user interfaces, of course, are not fully possible on 3270 family machines, leading to their likely replacement, and protocol changes necessitated by the new system will almost certainly also render most of the local printers obsolete. Note, however, that some CAMA vendors advocate a so-called Windows Based Terminal architecture, in which *all* processing is done on the server, possibly a state mainframe-replacement, and the local PCs are used only for their graphical displays, keyboards, and mice. For concreteness, we will summarize below some of the choices made and costs incurred by a statewide property tax agency whose circumstances matched Wyoming's more closely than any other.

When the state of West Virginia decided to upgrade its old CLT MAS system to a new statewide IAS system, it found that the total capital cost for the counties to replace their old dumb terminals and printers with new equipment, including network switches and new wiring, was on the order of \$1,800,000, or about \$33,000 per county or \$2500 per user. With 55 counties and 700 users, their system is significantly larger and costlier than would be required in Wyoming however. Furthermore, West Virginia bore a cost burden in its networking choice that Wyoming could choose to avoid. In anticipation of a "courtroom of the future" application, West Virginia developed a wide area network (WAN) based on ATM (asynchronous transfer mode) communications. This provides for broadband capabilities sufficient to support remote video, with transmission speeds between 25 and 2,488 Mbps, and will cost approximately \$650 dollars per county per month. By way of comparison, a T1 telephone line provides only 1.5 Mbps (and would cost \$500 per county per month in West Virginia). By contrast, general-purpose modems transmit data over standard switched public telephone lines at rates of only about 3% of T1 capabilities. By avoiding expensive ATM technology, the capital hardware and networking cost in Wyoming can be anticipated to be about half what West Virginia paid on a per county basis, and the ongoing costs an even lower fraction, but this is not our area of expertise and independent confirmation should be obtained before reliance is placed on these estimates. (See also below for comments on different architectural approaches.)

Whether a WAN is the ideal approach for Wyoming is a question that will turn on a judgment of whether the least technologically sophisticated county is judged capable of performing its own system administration, including backups and LAN administration. Although the assessor's office may not be capable of it, if some central county office can be responsible for administering the LAN that will serve the county assessor's office, then statewide uniformity of assessment systems can be achieved without a state-run system simply by installing identical systems in each county. The state can still provide effective assistance to the counties by means of dial-in access to the county system, if necessary, and can provide monitoring of the counties by requiring them to send a copy of their databases to the state for loading onto the state system on a weekly basis. Recordable CD-ROMs and various digital tapes are both economical means of transmitting data; the one-time hardware cost is on the order of \$300 per county and the weekly media and shipment cost is on the order of \$2. Since each disk can hold 650 Mb and each tape can hold several times that much, either would be sufficient for essentially any county and either could be prepared in under an hour. There should be no particular problem in implementing this approach, provided responsibility for system administration can be safely lodged with the counties.

A different approach was taken in West Virginia. There, the state will provide a centralized system for use by all the counties, except that two of them (Kanawha and Wood) will host the system on their own servers instead of accessing the state's server, although the software will be identical in all counties. The two self-hosting counties will send weekly copies of their databases to the state for monitoring purposes. Although the state will continue to host the system for the other 53 counties, those counties are not being insulated from the need for a higher level of sophistication than was required before. Each county assessor's office will effectively have its own LAN (local area network). Although the database server is in the state capital, each local county will have a so-called forms server that will handle the graphical user interface and minimize network traffic. Conceptually each local PC could provide its own forms services, but the server arrangement simplifies printer sharing and the process of updating the software as necessary. Thus, although the state of West Virginia insulates each county from the need for a database administrator, and will bear the burden of WAN administration, the counties will probably have to bear responsibility for their own LANs.

This is an essentially inevitable consequence of the trend in computer systems toward software that is easier for users to interface with (including graphical user interfaces and more abundant help) but more likely to require greater system administration skills for systems where users are collaborating. Probably the AS/400, with which many in the state are familiar, is the only alternative system noted for its ease of administration. Its user interface, while acceptable, is not state of the art, and its built-in database management system, while very good, is proprietary and incompatible with most CAMA systems, including Oracle based systems in particular. Thus there is a marked tradeoff between ease of administration and breadth of alternative choices.

A variety of telecommunications alternatives are available to support a re-engineered system, including a distributive network or WAN if the state desires. Virtual private networks, in addition to leased lines and ISDN services, are possibilities, but this is in general an area in which we do

not specialize, and for which possibilities and prices show enormous local variation. We would suggest that local expertise be brought to bear in this regard. Advocates of the aforementioned Windows-based-terminals also can bring to bear technology inherent in Windows NT and augmented by partners such as Citrix that claim to be able to adequately support WAN traffic over connections as slow as 14.4 kbs., but, again, this is not our area of expertise. If Wyoming chooses, as West Virginia did, to support the installation of a high-speed ATM network with enough excess capacity that assessment administration uses could essentially be considered free riders, then the cost impediments to a WAN-based centralized system disappear, and we understand that an ATM network in Wyoming may be inevitable. If so, the presumptive case for a centralized system is strengthened, but the cost allocations are unlikely to favor tax administration as a free rider (possibly instead it would pay a disproportionate share), and there still remains the issue of the loss of the potential for local synergistic system integration with collector, GIS, and similar functions.

At least one database server is needed at the state and as many as one per county may be needed depending on the architecture ultimately selected. If the state is to host all counties over a WAN, as West Virginia does, either the state will need to install the system on its current mainframe or the state will have to obtain and dedicate a server for this purpose. West Virginia chose the latter course, and spent about \$200,000 for a Hewlett Packard data base server with all the disk space necessary for anticipated growth. Their only latent hardware concern is that they do not presently have a backup server. It may be possible for Wyoming to host the new system on the state's current mainframe, in which case hardware costs would be minimal, probably connected mostly with the need for additional disk space to accommodate the software and database(s). If, in the alternative, each county can be relied upon to host its own system, then the state's system can be much smaller while the counties' would remain about the same size although be configured differently. The state's system, although it would be accommodating all of the county data as before, would be servicing far fewer users since it would be used for support, research, and monitoring rather than production purposes. The county systems would be the production systems. If, as anticipated, a requirement for weekly transfer of database copies were instituted, the exposure of the counties to disaster would probably be tolerable. Each county should make a daily backup of all of its data for recovery purposes in the case of disaster, and if an off-site copy is provided to the state weekly then even if the system and the daily backups were lost the most that would have to be recovered is one week of work, an unpleasant but not insurmountable prospect. Under this scenario the local server/system costs could be projected to be on the order of \$25,000 to \$35,000 each, with as much as \$80,000 budgeted for the state's, or a total on the order of \$750,000. Communication costs, however, would be minimal. Although a WAN would be avoided, the system should still provide for remote, on-line support provided from a help desk run by DOR (preferably) or the vendor (in the alternative).

All things considered, we recommend that Wyoming pursue the local area network (LAN) approach with a separate server installed in each county and the DOR. Although the single server (mainframe) solution offers more standardization and control, we do not anticipate that counties will develop separate "mini-systems". Further, we recommend that the counties be required to provide weekly copies of their databases to the State, so that, among other things, it can monitor

and audit each county for compliance with the statewide standards (as well as provide routine help). Equally important, as explained above, we believe that the LAN approach offers substantial cost savings in the form of reduced telecommunications costs and enhanced abilities to integrate with other local county systems, including GIS and tax billing. This approach entails some costs. Average salaries for LAN managers are typically in the low \$40,000 range, and the software tools they will need can range from \$2,000 to \$10,000, but the latter are one time costs that have been included in the estimated cost of system procurement. As the tools involved continue to improve, the salary increment necessary to attract and retain competent LAN managers can also be expected to diminish. A moderate amount of training and an absolute sense of responsibility are the real essentials. In some small assessor's offices in Ohio, the LAN-manager role is performed by the assessor ("auditor") himself, requiring a time commitment of only several hours per week. Of course telephone access to help, such as the state might provide, is also essential.

5.5 System Centralization or Decentralization

There is no overwhelming case to be made for either side of the issue of whether the system should be a centralized system, as is currently the case in Wyoming (and as will be the case for 53 out of 55 counties in West Virginia), or whether the system should be decentralized, although uniform. As noted in the previous section, technology and cost considerations can be marshaled in support of either alternative. We believe that the model of a decentralized, but uniform system is preferable, based largely on the grounds that it provides much greater potential for the development of synergistic locally integrated systems. The major downsides of this arrangement are (1) the requirement for more sophisticated local system administration expertise than is known to currently be available, and (2) the potential for the systems to diverge from uniformity. In truth, both alternatives entail the first requirement; decentralized systems are not unique in this regard, but merely require a somewhat higher *degree* of sophistication. It is our judgment that suitable personnel could be found or trained to operate the system, with state assistance as appropriate, in all of the counties with which we are familiar. The questionnaire responses do not evince any great pent up demand for locally integrated systems, although one is already being implemented to a limited extent in Laramie County. We attribute the current lack of demand for this capability to a limited familiarity with what is feasible and currently implemented in other jurisdictions. The advantages of a centralized system are greater certainty that uniformity can be enforced and greater likelihood that system collapses can be averted. Also, if it is really the case that assessment administration can be a free rider on an ATM infrastructure put in place for another purpose, then the centralized system may be more cost effective. The level of charge backs for information technology services now payable by the DOR for the current system, however suggests that such assumptions are untenable. The drawbacks of a centralized system lie chiefly in the limited ability of the counties to develop synergistic integrated systems and secondarily in the probable lack of "buy in" that may arise from having a new system mandated over which the counties would have little effective control. The first drawback may be ameliorated over time by allowing counties to become self hosting as they develop plans for integrated systems that warrant their doing so. The second drawback will be partially ameliorated by the dramatically improved functionality and user interface of the modern system in comparison to the current ones.

It is possible that we have given inadequate weight to the argument that only with a centralized system will DOR be able to discharge its appropriate oversight responsibilities. In some measure this depends on a political judgment of how likely it is that the quality of assessment administration will regress to pre market-value-standard levels in the absence of active state involvement. Certainly it is true that when sales are less than plentiful it is especially difficult to monitor and enforce performance standards on the basis of assessment-ratio studies alone, and recent experience offers no additional comfort in this regard. Although we have recommended a decentralized system, it is likely that the decision whether the system should be centralized or not will require a political decision in the best sense of that term.

5.6 Other Cost Considerations

In addition to the costs noted above in connection with hardware and networking issues, the following cost should be considered. As usual with CAMA systems, and as borne out by the experience of Natrona County, the biggest cost element of a new or re-engineered system is associated with preserving the enormous previous investment in data. Various customizations are required to transform the data to new storage formats and ensure its integrity during the conversion process. Given that this will have been performed successfully once already for Natrona, if the re-engineering decision is in favor of migrating to the CLT IAS system that Natrona adopted, virtually all of that investment can be applied to the other CLT MAS-system counties in the state, resulting in a significant cost saving for them. The remaining counties now on the WYS system, of course, will incur these costs on their own, and in general, since they are somewhat different from Natrona and also marginally different from one another, will incur them at a higher aggregate rate. A reasonable estimate of the cost for doing all of them would be three or four times the cost of doing Natrona alone, assuming that the commonality among the systems is very substantial. Since conversion costs for Natrona were on the order of \$225,000, the total of such costs for the whole state can be expected to be on the order of \$1,000,000 if the system to which the state ultimately migrates is CLT's IAS. Since the WYS system is open to much greater customization and flexibility than the more uniform CLT system, however, this estimate should be confirmed before reliance is placed upon it. If a different vendor and system is chosen no long term benefits will accrue from the Natrona conversion, and costs for redoing both the CLT counties and the more diverse WYS counties can be expected to be higher, since data requirements will differ.

Licensing costs for CAMA software per se are relatively trivial, whether for the CLT system or a competitor's. Those for the IAS system in Natrona are fairly typical: they were \$18,000 for the CAMA module and \$18,000 for the assessment administration module. An additional \$11,000 expense would be incurred if the tax billing and collection module were also to be obtained. Maintenance, if desired, would be an additional \$52,000 per year. A purchase by the state of a uniform system to be installed in all counties might occasion some kind of quantity-discount pricing, as noted below.

Licensing for additional software will also likely be necessary. Again Natrona's experience is instructive. Ancillary licenses there were required for the network operating system (already included in the costs projected above), the Oracle database management system, and a COBOL

compiler for use in conjunction with the statistical analyses in the CAMA system. Roughly speaking, a budget of \$5,000 to \$10,000 per county should be adequate, although a system with full developer and tuning tools could cost as much as \$20,000. Myriad pricing schemes are offered, and Oracle is notorious for being open to negotiated pricing. All told, such licenses could require a total budget of \$200,000 to \$300,000 if each county hosted its own Oracle-based system and almost the same amount if the system were to be architected as a single, centrally hosted Oracle-based system.

Some vendors, including CLT, offer discounted pricing for quantity purchases and/or for purchases made under an arrangement whereby someone other than the vendor, typically the state Department of Revenue, assumes responsibility for frontline help-desk support. Such an arrangement would be preferable in Wyoming, in our opinion, not only for the cost savings that would inure, but also for the enhanced ability of the state to help monitor counties' performance and uniformity. Our understanding of likely license costs for a statewide implementation of CLT's IAS system, under two models, separate systems in each county and one centralized system, have been provided confidentially, with a breakdown by module.

An additional significant cost to consider is for customization or modification. Natrona contracted for \$150,000 for this purpose, an amount comparable to charges made by other vendors for typical CAMA packages. Like the conversion costs, this might be considered an investment from which other jurisdictions in the state could benefit.

It should be borne in mind, however, that one of the conditions for allowing Natrona to take the course of action that it did was that the new system be configured to work (under the covers) substantially the same as the old MAS system and produce highly comparable value estimates. This, however, is not the best that can be done.

First of all, it would be generally preferable, even if the CLT IAS system were ultimately chosen as the new statewide system, to plan to take advantage of its enhanced capabilities. In particular, the system can be configured to use the Marshall & Swift cost system for commercial and industrial property, rather than the CLT or the Boeckh systems now used in Wyoming. Several assessors commended the higher credibility of the M&S based estimates for commercial and industrial properties and recommended that they be adopted if possible. For this modification the customization cost should be small, since the facility is built in. Reconfiguring the system to take advantage of it, however, may impose some moderate costs.

Second, the CLT IAS system, and most modern CAMA systems generally, provide much better market modeling possibilities and income-approach valuation modules than are currently available. Again, since the capability is built-in, reconfiguration costs should be trivial, although as noted above CLT's market modeling module by default uses MRA only to generate coefficients used in adjusting a small number of comparable properties to the subject in the market comparison approach. It would be better, if CLT were the chosen vendor, to have MRA modeling capabilities that could be applied on their own without recourse to the comparables routines. Costs for this may be less trivial. If CLT is not the chosen vendor the issue is moot, since most other

vendors do not commingle their MRA and comparables routines.

In both these cases, however, there are requirements for the collection of more and different data than are being managed by the current system(s) for the new/enhanced modules to be used optimally. While modification charges may be minimal, depending on the vendor and system chosen, data collection costs can be very significant if the new capabilities are to be implemented immediately. Alternatively, newly required data could be gathered as part of the cyclical review process and full implementation of the new systems capabilities deferred until one complete cycle had passed, thereby affording significant savings in data collection costs. In any event, in essentially all CAMA system procurements the charges for system customization constitute the biggest cost element. In general they are second only to the costs of collecting the data necessary to administer the system.

Mention was made during several on-site interviews of the presumed superiority of the Marshall & Swift cost system relative to the current alternatives, both in terms of its reputation and the credibility of its component-based methodology in comparison to the current residual basis. If the credibility of M&S based cost systems is truly judged to be superior to the building-residual method that is routinely available for residential properties, discussions could be undertaken about modifying the system, if necessary, to incorporate M&S residential as well as commercial and industrial tables, although this would likely require very substantial extra costs that could only be estimated by the relevant vendor. Note that CLT does not currently offer M&S based costs as an alternative for residential property, but other vendors offer M&S routinely for both residential and commercial/industrial properties. (Ideally residential properties should be estimated by the sales comparison approach, so a major investment in enhancing the cost approach for such properties may not be warranted.) Our understanding of licensing fees for Marshall and Swift cost services, provided elsewhere, suggest that the amounts involved are not likely to constitute a serious impediment to reforms of this sort if the state is interested in making them.

5.7 Policy and Strategic Issues

Given the benefits afforded by a modern CAMA system tightly integrated with an assessment administration system, coupled with the magnitude of the project and the risks involved, attention to a number of policy and strategic issues is warranted.

For example, we recommend that legislation be adopted mandating the disclosure of rental property income and expense information on a state-prescribed standard form when requested to do so by county assessors. This would enable assessors to use the income approach systematically, in conformity with professional standards. The legislation should provide that such information be treated confidentially. (Some states restrict appeal rights to property owners who have disclosed the requested income and expense data.)

The DOR should initiate a public relations program underscoring the benefits of assessments based on market values and annual reassessments. The program should describe how the new

computer system would contribute to these goals. The program should provide other necessary background information.

6 Implementation Steps

We recommend a multi-phase system implementation project. The phases are:

- Organization
- Requirements definition (CAMA, AA, and, possibly, tax billing and collection)
- Contractor selection
- System installation (in DOR and in pilot counties)
- System implementation/data conversion in two pilot counties (one CLT county and one WYS county).
- System installation in remaining counties in three groups over three years.

The aim of our recommended timetable is to maximize acceptance of the new system and to minimize costs and risks of failure.

6.1 Organization

The organization phase includes appointment of a project coordinator for the DOR, appointment of an advisory committee and necessary working groups, and the development of an implementation plan. We envisage that project organization would begin about 1 January 2000 and be completed by 31 March 2000.

Regarding organizational responsibilities, the DOR should assign a project coordinator, who can devote a significant amount of time to the project and who has the authority to make routine decisions. We also recommend that the DOR form an advisory committee chaired by the DOR's project coordinator and composed of representatives of assessors' offices, the SBE, the data processing department, and other interested parties. The committee would serve as a sounding board for our recommendations, options for implementing them, and other matters affecting the eventual acceptance and success of the new system. Conceivably, each county could be represented on the committee, although this would tend to make the committee unwieldy. Alternatively, the representatives of assessors' offices could reflect a cross-section of counties.

The implementation plan should identify specific objectives, assign responsibilities and resources, and establish deadlines. In developing the plan, it is not necessary to resolve all issues before beginning to implement the plan. Decisions can be prioritized just as activities will be. Some decisions will be contingent on the results of earlier stages of the project.

Obviously, funding must be secured before a new CAMA system can be implemented. The DOR should develop a financing strategy and begin budgeting discussions with appropriate government officials with the expectation that a sum on the order of \$3,000,000 to \$4,000,000 will be required over the implementation period (which we estimate to be six years). An element of the financing strategy is a decision as to how costs are to be shared between the State and the counties.

6.2 Requirements Definition

The requirements definition phase of the CAMA system implementation project includes necessary further research and finalizing system requirements, which would be translated into the specifications included in a request for proposals. Work on this phase should begin as soon as organizational matters are completed. It should be completed by 30 September 2000.

Matters warranting further research include:

- Review migration experience in Natrona County
- Pilot test the Marshall & Swift cost system (or other cost service) to assess magnitude of likely system disruption (revisions to data collection/management requirements needed to support it) and magnitude of benefits likely to accrue. Judge value of benefits relative to soft and hard costs. Consider changes in values of typical properties.
- Research telecom infrastructure and costs.
- Research local LAN administration capabilities.

Regarding system functional requirements (5.2), there often are alternative ways of satisfying a system requirement. The DOR with input from the advisory committee should consider the alternatives and select the preferred one. Alternatively, this could be left up to the proposer.

It also will be necessary to finalize hardware and facility requirements (at the state level and for each county).

6.3 Contractor Selection

The third phase of the implementation process would be to select a contractor to supply the required system. This objective can be approached in several ways, and the approach chosen would depend in part on Wyoming purchasing procedures.

A conservative approach would be to identify potentially qualified vendors and compile information about the features of their current systems, customer satisfaction, financial strength, and so forth. It would be highly desirable to obtain demonstrations of promising systems that are not controlled by the vendors. This approach would allow the state to “pre-qualify” firms, which would simplify the evaluation of proposals.

In any event, it will be necessary to issue a request for proposals (RFP) to either the short list or to all known CAMA system vendors. We believe the RFP should be issued by 31 December 2000. Before proposals are due (say, by 28 February 2001), potential proposers should be afforded an opportunity to ask questions about the project and the RFP. Answers should be provided to all recipients of the RFP. A pre-bidders conference can be a useful way of giving all potential proposers an equal understanding of the project and giving the DOR an understanding

of any concerns about the project. We believe the evaluation of proposals, negotiations with the successful proposer, and the execution of an agreement should be completed by 31 May 2001.

6.4 System Installation

The fourth phase would be the installation of the new system. This would include necessary customization of software. Obviously, necessary new hardware will need to be in place. We believe that this phase should be completed by 31 December 2001.

The DOR will need to monitor system installation activities to ensure that the contract is adhered to. Acceptance testing will be needed to ensure that the system performs in accordance with specifications.

As noted in section 5.2.5, training is essential, and most training should be completed during the installation phase. Since the new CAMA system should enable counties to use improved valuation and other procedures, education on the underlying valuation and administrative concepts should begin before vendor-supplied operational training to provide users with a better context for the system-specific training they will receive. Ideally, each county would have at least one person with the skills needed to develop valuation models. The training strategy should be integrated with other efforts to ensure that each county and that key users in each county accept the new system and are committed to its successful introduction. In addition to providing training, the DOR likely will need to supply ongoing system support and related technical assistance.

6.5 System Implementation/Data Conversion

We recommend that the new CAMA system be implemented in stages with ample time allowed to deal with data conversion issues. Initially, one CLT county and one WYS county should be selected for a pilot implementation/data conversion project. This project should be completed by 31 December 2002. The remaining counties could be brought on stream in three batches, beginning with counties most dissatisfied with the current systems, and the last batch would include the counties least enthusiastic about the change. The first batch should be completed by 31 December 2003, and each successive batch would be completed one year later, so that the project would be completed by 31 December 2005. Lessons learned during the pilot implementation and successive projects could then be applied to counties brought under the new system later.