

CASE STUDY: INDEPENDENT SOFTWARE AUDITS USING  
IEEE Q. A. STANDARDS BY THE  
AMERICAN BAR ASSOCIATION

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ABSTRACT

The American Bar Association has been performing functional and physical configuration audits, with some independent verification and validation testing, on some 40+ software applications over the last three years. The purpose of this effort is to provide to the legal profession a degree of reliance on product quality similar to the Underwriter Laboratory seal of approval. Approved systems are reported on in an in-depth manner to assist a purchaser's decision-making. This article describes the methodology of applying the IEEE standards for software quality assurance and the practical issues of planning, controlling and staffing such an operation. The participating vendors in the ABA software review program have found that the cost of software audits to be reasonable and that their products have been significantly improved in terms of quality and maintainability as a result. The ABA's program can serve as a model for other industry-wide efforts to insure quality for packaged software products.

Background

At the end of 1984, the American Bar Association implemented a software review program designed primarily to improve the quality of product and information available to purchasers. The initial premise was that packages designed for small computers would be the major source of reviewable product. The ABA established the Legal Technology Advisory Council (LTAC), staffed with a director (who is both an engineer and a lawyer), R. L. Robbins, a staff tester and an administrative assistant. The author was engaged as a consultant to refine the first efforts to establish testable product standards in conformance with IEEE and AICPA (accounting) standards. The latter standards were applicable because the first application area, time and billing, had to adhere to proper accounting practices. The applications areas for which applications have been audited include:

Time and Billing

Word Processing

Litigation Support (full and partial text retrieval applications)

Probate Accounting

Docketing (managing critical schedule dates, the missing of which constitutes negligence - i.e., malpractice)

Estate Planning

Real Estate Conveyancing.

Others are planned for financial reporting, databases and tax preparation programs.

The software application Guidelines that are promulgated by LTAC for each of these areas incorporates three levels of parameters that are to be audited. They are:

Mandatory Guidelines  
Preferred Guidelines  
General Guidelines.

The mandatory guidelines define the minimum functional requirements to constitute a program being considered as an application in the area. They also define the minimum software reliability requirements (now known as universal guidelines), which state that:

1. All changes in database can be tracked and verified.
2. All documentation is complete, correct, understandable and well cross-referenced. Advertising materials are not misleading.
3. All logically possible verification of data is performed.
4. All processing of data is correct.
5. All presentation of results and database are correct, distinguishable and understandable.
6. All command sequences are verified, no program bugs or lockups.

7. All messages are appropriate and understandable, sufficient to correct errors and continue processing.
8. Security systems, if provided, cannot be easily breached and provide control by operator/task.
9. Purged data can be listed or archived prior to purging, summary totals can be traced to detail of items purged.
10. Key minimum features are present.

The next set of guidelines define the preferred functional characteristics in as generalized a fashion as possible so as not to prejudice design alternatives. Some preferred features are deemed to be applicable to a "basic" or "standard" version of a product and others are deemed to be appropriate for products seeking approval as "advanced". To be approved as a standard system, 2/3 of the basic guidelines must be met. Advanced systems must meet all basic requirements plus a majority of the advanced criteria.

Finally the general guidelines are used to develop benchmark tests and other operating information for use in the report to the potential purchaser. A user survey is performed as part of this effort to confirm findings of the the audit and provide application-oriented examples of the product's use in the field.

With these guidelines, plus the product's own documentation providing detailed functional specifications, the LTAC group can perform its physical and functional audits of the product.

#### Auditing Methodology

The LTAC process constitutes an audit environment because, in accordance with section 3.2 of the draft version of IEEE 1028 we have:

Objective criteria to evaluate the software elements.

Supportive organization whose product is being audited (the process is voluntary).

Audit personnel totally independent of product development organization with complete authority to determine approval or disapproval of the product.

Furthermore, all audits are performed using standardized templates which indicate responsible personnel, required input, entry criteria, procedures to be applied by the auditor, exit criteria, output reporting and auditable work products that will allow any other auditor to verify audit results through inspection of work performed. The audit is performed in accordance with a standard schedule of events, which for convenience has been printed on the heavy duty folder we use to store test results,

correspondence, etc. The audit steps are defined by the report template used to report our findings. Each section of the report is fully specified by questions to be answered and provides detailed breakdowns of each generalized guideline into specific test scenarios. The report thus acts as an audit trail of testing performed as well as a vehicle for communicating the results to interested parties.

The software vendors are solicited by the vendor relations staff, whose basic role is to market the program to the vendors and handle nontechnical correspondence (for ordering report copies, participating at exhibition areas, etc.) The software vendor fills out an application form which describes the name of the product, the version to be tested, the choice of test system configuration (non PC-based software vendors must provide their own on loan until report is complete), description of pricing for package and support and other related products. The vendor also must prepay all "testing fees" and provide a test data set in accordance with detailed instructions provided. The purpose of the test data set is to provide a standardized benchmark for operating statistics, such as response and processing times.

The audit staff, as of December 1987, consists of two full-time ABA employees and four "consultants". The latter, the author and his organization, primarily handle larger systems and newer application areas. Our organization, ColdFrame, Inc., has performed over 60% of the actual reviews issued under the rubric of the ABA.

The process of software auditing begins when the auditor receives a copy of the application, a copy of documentation and software, the test data set and where applicable, training from the vendor based on their standard program. The auditor then proceeds to perform the physical and functional audits as follows:

- Installation
- Training and documentation, system structure
- Initialization and Customization options
- Data Base Set-up and validation testing
- Transactional validation testing
- Processing testing
- Presentation testing
- Backup/recovery testing

The first two steps verify that all pieces of the software and supporting materials are complete. The last six verify compliance to ABA's guidelines and vendor's specifications (per user documentation). These steps have corresponding detailed sections in the audit (review) report template.

The actual initial audit and reporting effort takes about 100 manhours for a single-user product and 160 for a multi-user product. Both the ABA's and ColdFrame's software audit staff has been trained by the author in the theory of verification and validation of software in a simulated environment [1] as well as the procedural steps of auditing per IEEE/ANSI 730-1983, 983-1986 and 1028-1988 (in ballot stage). The formal training takes about two days and most testers become proficient by their third package (after five to six months).

The relevant sections of the IEEE 730 and 983 standards are 3.6.2.5 and 3.2.2.6 modified to the circumstances. For instance the SRS is considered to be the ABA's guidelines plus the vendors user documentation. The Software Verification and Validation Plan is that of the ABA's. It is a checklist, again modified to the functional specifications of the product under review, based on the generic qualities of a system that could meet ABA's guidelines in principle. The auditor in fact performs the detailed tests to create the formal tests.

The test results are "saved" by utilizing "snapshots" of screens as various test steps are performed and having hardcopy output from processing steps. The auditor documents the results as part of the reporting process, creating the draft audit report. Exceptions, due to program errors, nonconformance to guidelines or discrepancies in documentation are listed in a separate report, called an Exception Report, whose entries list the exception condition, proximate cause, the guideline violated and includes a reference to any sample screens or reports provided.

The physical audit called for in 3.6.2.6 is performed using the vendor's documentation package and executable software modules and files. The auditor verifies that all claimed functions are physically present in software and that the documentation is complete. The ABA guidelines have some specifications in this regard, such as complete index, glossary, error message directory. In this fashion as a byproduct of the functional review, the physical review is performed.

Clearly the intent of the IEEE standards is to have the vendor perform these steps prior to the release of product to the market. The fact that we have found so many significant errors in the products that have already been released to market does not speak well for relying on vendors to have good SQA. The need for industry-wide support for independent third party "Underwriter Laboratory" type SQA organizations - having application specific expertise is evident. The exceptions found by LTAC must be resolved prior to approval being granted by the LTAC group.

Furthermore, the draft report and exhibits are provided to the vendor for comment. Under contract, they bear liability for errors in the report. Retesting of amended software is performed to verify compliance and regression testing is performed to verify that no additional exceptions have occurred. Once testing is completed, all exceptions resolved and the report finalized, the tester makes a backup copy of the final test data base and program configuration and puts all materials together into the audit files. The worksteps on the cover of the folder are filled in and initialled as completed. All correspondence with the vendor, report corrections, etc. are included for future reference.

The approval granted by LTAC is limited to the product and version tested. New versions must be retested, generally at a lower fee since prior test data base and reporting can be utilized.

Exhibit I is a copy of a summary software review written by the the author. Exhibit II is a copy of excerpts of a detailed review report. Exhibit III is a copy of the audit work plan for time and billing applications. Exhibit IV is a copy of the guidelines developed for probate and trust accounting as required by the legal community.



The Legal Technology Advisory Council (LTAC) of the American Bar Association helps lawyers use new technology to computerize their practices by testing software suitable for law offices and publishing the results. Manufacturers apply for review and LTAC examines software in a sixteen-week audit process on vendor or ABA equipment. Guidelines developed after extensive lawyer and manufacturer comment control the review process and set minimum performance standards. An LTAC approval signifies that these standards have been met.

The Software Summary Review (SSR) is a highly abbreviated version of a complete Software Review, which describes software features in detail and the American Bar Association's software testing results completely. Because the SSR is a summary, it cannot fully describe all functions or all testing results. Lawyers who intend to purchase this software should read the complete Software Review. This summary represents the opinion of the Legal Technology Advisory Council of the American Bar Association. Copies of the full Software Review and other LTAC publications may be ordered through the ABA, LTAC, 750 North Lake Shore Drive, Chicago, IL 60611. Or by calling 312/988-LTAC for further information.

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EXHIBIT I - Summary