A Database Management System for Medical Technology Educators

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Although medical technology educational programs seem to handle a relatively small volume of data in the form of admissions and academic records, a database management system can greatly improve day-to-day efficiency and can facilitate data manipulation and statistical analyses. Our educators asked for such a package, one that could streamline student recordkeeping and simultaneously meet the operational needs of both the academic and admissions offices. A custom application of a widely distributed commercial database, Knowledgeman (a trademark of MDBS), was developed using the software's own programming capabilities.

The primary demands on the database management system were automatic report generation, routine data analysis, and simplicity of operation for users not trained in database software. These criteria were the basis of the custom programming task. Knowledgeman is amenable to functions we wished to emphasize in our database management system: data storage, retrieval, and analysis. In addition, Knowledgeman permits database operations to be carried out both interactively and under program control, which lends flexibility to this application.

Our educators desired data handling capacity for two types of student data—academic progress data and admissions records. The medical technology office uses two totally independent programs to manipulate two Knowledgeman databases, but the data each system generates are stored in similar (ie, compatible) structures. Student name and identification number are fields in both structures, but the remainder of the data stored are unique to each office. The academic data structure holds a grade in each course of instruction for each record, ie, student (Figure). The admissions data structure accommodates biographical data, previous educational experience, and other admissions data for each record (applicant).

In both the admissions and the academic systems, the database is organized into tables according to year of graduation, with each graduating class “residing” in its own file. Creating a multitude of small tables offers two advantages. Data integrity and security are preserved, since access to only a small part of the overall database is necessary for daily operations. In addition, statistical analyses and data retrieval require less time since Knowledgeman consults a smaller table.

The grade reporting system is largely intended for an inexperienced user. The instructors enter the final grades for their own courses, which eliminates much administrative overhead at the end of each academic term but demands clarity and simplicity from the data entry routines of the program. The primary user for this half of the database is an academic coordinator for the medical technology program, who retains sole security clearance for report generation. The following two reports are generated by the academic database program: (1) student progress reports and (2) a summary of student grades for each course. The database itself is on a floppy diskette (with backup copies), which may be locked away by the primary user and checked out to other authorized users, the instructional staff.

Whereas the academic system is oriented toward the storage, maintenance, and output of simple grade data, the admissions segment of the database management system is dedicated to statistical analyses and sorting operations on the applicant data. One user, the director of admissions, performs data entry and generates the standard reports of that office. The reports include a wide variety of demographic studies as well as a standard statistical evaluation of numerical data. Since many of these
queries involve comparisons between graduating classes, multi-table access is routine. These data again are kept on a floppy diskette in the possession of the primary user.

We chose Knowledgeman as the database software for several reasons, one being the extensive network of Knowledgeman users distributed throughout the hospital laboratories. Since several of the potential medical technology record system users were already somewhat conversant in the interactive functions of Knowledgeman, and programming using this database follows the same rationale as interactive operations, system troubleshooting and maintenance could be performed by the educational personnel themselves.

Second, Knowledgeman's built-in programming environment simplifies the creation of a custom database management system, eliminating the need to write the routines in a standard high-level language such as C. Knowledgeman's modular programming system allows separate subroutines to control, for example, data entry, data editing, statistical analysis, and report generation. This also encourages future program modifications to suit the changing needs of the administration. It is reasonable to expect that new course names or numbers will be introduced. New fields, data analyses, or report formats will be needed in the future. None of the anticipated changes, even modification of the table structure itself, would destroy existing data or result in incompatibility between the subroutines. Program maintenance and improvements can be accomplished by advanced Knowledgeman users themselves, with no damage to the existing database.

The third feature Knowledgeman offers is a series of attractive technical options. The hospital laboratories use a medley of networked and stand-alone PCs and PC compatibles. Knowledgeman is available for both stand-alone and network operation, which means that our database management programs can be used immediately (at any work station) and will not need to be rewritten after the transition to a fully networked PC population. Knowledgeman also features built-in security options for read and write protection of each field. Since in the academic database each course is represented by its own field, the instructor of a course alone can be granted access to his or her course only. Such a system strongly protects against accidental erasure of data for other courses by data entry into the wrong field. This is attractive to multiple-user stand-alone operations for reasons of privacy and safety from erasure, but such security measures are mandatory for network operation.

In addition to routine procedures, the software users wanted the ability to perform ad hoc or interactive queries. For example, it is necessary to track the academic progress of students based on various admissions criteria, or to compare admissions and academic data from several graduating classes. The ability to perform complex analyses depends upon the interactive capabilities of the commercial software. On the basis of the student name field or, more efficiently, the identification number field, “academic” and “admissions” tables for the same class of students can be joined to perform queries or generate reports involving both families of data. Such complex analyses are not “hard-wired” into the custom program since they are not ordinary tasks, but are accomplished by Knowledgeman interactively. A combination of this joint operation and the multi-table access granted by Knowledgeman allows the user to correlate the admissions data and academic progress of several graduating classes.

Database applications such as this can ease the work load of a medical technology education program by providing data storage and automatic report generation. In addition, such a system is not intimidating to the inexperienced user and can serve as an introduction to personal computers and the database management procedures that are ubiquitous in laboratory applications.