The role of computer assisted instruction (CAI) in management information systems

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In recent months there has been much discussion of the “Fourth Generation” in computer technology. Defined as a total system, not a new series of computer hardware, the Fourth Generation has the following characteristics:

- An interactive communications system
- A data base system
- A transaction processing system

At Kraftco Corporation a new dimension, Computer Assisted Instruction (CAI), has been added to this Fourth Generation total system concept—a dimension which provides management with a new body of information on which to base its decisions. The objective of this paper is to describe how Kraftco, faced with the challenge of implementing a Fourth Generation Order Entry System, utilized a sophisticated CAI system in the management decision-making process.

BACKGROUND

In 1970, the Corporation approved a recommendation to implement a Fourth Generation Order Entry System (OES). This new system would replace the existing paper tape system and provide management with a comprehensive data base with which to plan, evaluate and forecast the directions best suited to the corporate objectives. OES affected every aspect of the business; sales districts, plants and distribution centers, division as well as corporate headquarters, would participate in the system. The specifications called for the utilization of the IBM 3270 Information Display terminals for the entry of order data and IBM 3286 printers for the output of hard copy messages.

In addition, locations with high volume printing requirements (such as distribution centers) would utilize high speed IBM 3780 Card Reader/Printer terminals. Kraftco would be the first company in the food industry to utilize these cathode ray tube (CRT) terminals in an on-line order entry system environment—an environment which included users spread across the United States from Maine to Hawaii and from Alaska to Miami, in Canada from Vancouver to Montreal, and even in Puerto Rico. There would be approximately 140 CRT terminals installed in over 65 locations.

Truly, this multi-million dollar system represented a major challenge both to the management of the corporate Systems Services who must develop the computer system and to the management of the company divisions who must implement and smoothly integrate this new system into the
everyday life of the business. Both management teams agreed that prior experience dictated that the system would only be as good as the education and training of its users.

USER TRAINING CONSIDERATIONS

The audience for the education program consisted of two categories of people. First, there were the local management personnel who would be responsible for the implementation of the new Order Entry System at their respective Sales Districts and Distribution Centers. They must understand the new system and be in a position to administer the required training to the administrative personnel who would actually be doing the work. Secondly, there were two groups of administrative personnel:

1. Sales District, and
2. Distribution Center.

Each group must be taught how to perform their day-to-day order entry and order dispatching functions utilizing the new CRT terminals and printers. By far, the largest audience was in the second group. Over four hundred administrative personnel must be trained to input the pre-coded transactions on to the appropriately formatted CRT screen and achieve an acceptable level of speed and accuracy while performing this data entry function. An analysis of the problems associated with the training of the OES users came to the following conclusions:

1. The smooth conversion and implementation of OES are highly dependent on the successful completion of training. Since OES affects many vital areas of the business, all personnel must execute their functions properly.
2. Errors are especially costly when dealing with real-time systems. Each error compounds file requirements, communication line utilization, error report generation and system control balancing as well as the time of the individuals involved in correcting the error. Thus, a definite economic value could be attached to the benefits realized by a sound, performance-tested education program. The education program had to be designed so that each trainee had to progress beyond intellectual understanding of the system to develop his performance capabilities.
3. Centralized training would be extremely difficult because of the diverse geographical distribution of the users. In addition to the cost aspects of travel and living expenses for literally hundreds of users, the interruption of business due to the unavailability of employees who would be attending classes was not desirable.
4. Since OES would be continually in a state of revision as development and testing progressed simultaneously with user training, students who had been trained early in the cycle must be advised of the latest procedural changes.
5. If local management were given total responsibility for training, the everyday pressures of running the business could have a negative impact on the quantity and quality of the resulting training program. Local management needed support at a local level to get the job done effectively.
6. Finally, management must have facts to make the following decisions: Is a particular location ready to convert to the new system? Is each location aware of the latest revisions to OES? Will new employees be provided with adequate training after a location has been converted to the new system?

To make these decisions, management had to focus its attention on the most basic question of all: What kind of user training should be employed to meet the above challenges?

After a thorough investigation of the most recent developments in industrial training programs, management chose Computer Assisted Instruction as the principal training tool, supplemented in hard copy by comprehensive procedure manuals. The selection of CAI enabled the corporation to insist on a central prerequisite for the education program: that the Order Entry System training effort run in the same environment as OES daily processing. Although the implications of such a decision are far-reaching, at least two challenges were obvious from the outset: (1) In order to utilize the same environment for training and OES daily operations, CAI would have to run successfully on the new IBM 3270 Cathode Ray Tube terminals which had been chosen for the Order Entry System, and (2) CAI courses would have to simulate the graphic control features which are used so extensively in the Order Entry System formatting techniques.

SYSTEM ENVIRONMENT

Adapting CAI software for use with the IBM 3270 terminals was a challenge welcomed by management; many of the outstanding features of the new Cathode Ray Tube would, management reasoned, enhance the train-
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The large screen of the CRT provided 1920 character positions, sufficient to accommodate a full behavioral unit of instruction. Furthermore, the highlighting feature of the IBM 3270 terminals was as potentially useful for CAI course writing as it was for OES transactions. Several of the advanced features of the CRT terminal (extra program function keys, data entry keyboard design, free movement of the cursor) promised to add significant sophisticated dimensions to traditional CAI course development. The graphic control capabilities of the terminal itself could be adapted for use in CAI, just as they had been incorporated into the Order Entry System formatting techniques.

Following a rather extensive exploration of the existing CAI software systems, a CAI program was selected that seemed adaptable to the IBM 3270 terminals under CICS. Essentially, the program consists of the TIME (Terminal Instruction Managed Education) software package developed by McDonnell Douglas Automation Corporation, with major enhancements provided by Kraftco personnel. The features of the CAI system evolved, through improvements and software adaptations, into a program of attractive and varied capabilities. Among the most advantageous aspects of the new CAI software were:

1. Frugal use of 370 core (under 15K)
2. Easy portability
3. Convenient author language and simplified coding
4. Ready adaptability to the 3270 CRT terminals under CICS
5. Incorporation of the student's name in the text, response, and question lines of each course frame
6. A "Mailbox" feature which permits on-line communication between course authors and individual trainees, as well as all-point bulletins from course authors to all students
7. A "Calculator" capability allowing the trainee to interrupt his course at any time and tap the computer's mathematical resources to perform a wide variety of complicated calculations
8. An "Index" feature which can serve as an on-line dictionary, cross-indexing terms and concepts for quick reference by trainees at any time during a course
9. A Computer Managed Instruction System (CMI) with sound information processing, readily adaptable to the corporation's own needs

ORGANIZATION OF TRAINING PERSONNEL

Once the initial software for the Computer Assisted Instruction had been acquired, a specialized CAI training team was formulated, consisting of one person with a solid technical background and another with considerable teaching experience in the humanities, but without technical background. The training team composition, while somewhat unusual, was very instrumental in the effectiveness of the CAI effort. Maintaining a staff technical expert on the CAI software development provided management with control of the CAI design modifications—both in liaison with, and independent of, the efforts of McDonnell Douglas Automation Corporation. Entrusting the CAI curriculum development to a trained non-technical educator resulted in courses with a readable "humanized" writing style and a sound educational psychology. In a sincere attempt to avoid duplicating some other companies' mistakes, where programmers as course authors produced CAI courses that were logically sound but tediously boring, Kraftco courses were designed under the supervision of educators and were written to appeal to user trainees who possessed no technical background.

INITIAL PREPARATIONS

In order to provide a valuable tool for effective course writing, a "CAI Standards Manual" was created for use by the course authors. This manual sets high standards for learning theory, grammatical style, and educational structure.
of each course. Emphasis is placed on the importance of sound behavioral objectives as the foundation for each course; in actual practice at Kraftco, behavioral objectives composed by course authors must be approved by the CAI curriculum coordinator before actual course writing may begin. Much of the "CAI Standards Manual" is devoted to exercises and instructions on how to incorporate the modern concepts of totally individualized instruction in CAI course writing: courses are structured according to decision points and branching techniques, permitting experienced and bright students to proceed swiftly through the lesson while trainees requiring more detailed information are also accommodated. "Leap frog learning," or the ability of a student to skip lesson units that do not pertain to him, is one of the outstanding benefits of CAI branching technique, when it is utilized skillfully.

To aid course authors in the creation of interesting and valid instructional units, the "CAI Standards Manual" addresses such topics as: advantageous use of the trainee's name, effective incorporation of student interaction, appropriate audience analysis, the need for a defined "computer teacher" personality, the necessity for clearly stated achievement expectations, the ability to reword the same concept again as an effective remedial measure, the advantages of positive reinforcement and the impact of good negative reinforcement (complete with sample responses, arranged by degree of intensity), and an explanation of the various answer types. While the existence of such a guide to CAI course writing may not be unusual with other companies working in the same field, Kraftco's strong insistence on high educational standards as evidenced by the comprehensive nature of the "CAI Standards Manual" is one of the factors surely contributing to the corporation's outstanding success with Computer Assisted Instruction. Furthermore, the "CAI Standards Manual" becomes especially helpful when course authors are programmers or system designers who have expertise in one phase of the Order Entry System, but who lack teaching and writing experience. Although most course writing is done by the full-time CAI training staff, management is able to enlist expert programmers' efforts as temporary course authors by providing them with the manual outlining sound pedagogical practice.

While the educational thrust of the CAI course development was well under way, the technical advancements of the CAI software were increasing rapidly. The technical expert on the training staff worked in close conjunction with the McDonnell Douglas designers to create a CAI program with the most outstanding capabilities possible. Of particular
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Figure 6(e)

Figure 6(f)

Figure 6(g)

Figure 6(h)

(a) After entering a security code for the Order Entry System, the student clears the CRT screen; she then types "START" and hits the "Enter" key on her keyboard; (b) The system responds with heading information for the CAI program, and asks for the student's name; (c) The student types her name, beginning where the cursor is pointing, and then depresses "Enter"; (d) The system requests the student's official identification number; (e) The student records her ID on the screen and presses "Enter"; (f) The system now asks the student to name the course she wishes to take; (g) The student chooses a course from the "Course Catalog" in her CAI Workbook, and types the official course title on the screen. She then presses "Enter"; (h) The first frame of the selected course appears on the screen. If the student had begun this course earlier, the system would have placed her in the last frame she had completed, rather than at the beginning of the course.

value was the addition of the following programming features to the existing CAI software:

1. Macro-type expansion pre-compiler utility
2. Standardized course flow control
3. Diagnostic editor
4. Course flowchart which diagnoses logic flow errors and provides a course flowchart for documentation purposes
5. Report generator module
6. Copy library capability for course authors, utilizing Panvalet

COURSE DEVELOPMENT PROCEDURE

Once the technical and educational preparations for CAI course development were made, a logical procedure for all course construction was devised. Each course author initially prepares a series of behavioral objectives for his course; once the objectives are approved by the CAI curriculum coordinator, the course author composes his course. Each completed course is referred to the designer of the specific application in question for content verification, and is then passed to the curriculum coordinator for a review of the style and psychology. Finally, the CAI technical expert verifies that the course makes use of the latest CAI technical capabilities. Where additional programming needs are recognized, the technical man formulates proposals for further software development by McDonnell Douglas Automation Corporation, or he creates programs himself to meet special requirements. The organized course writing procedure worked smoothly; in less than two months, eight full-length CAI courses were developed.

While seven of the eight courses centered on the major
SAMPLE PAGES FROM C.A.I. WORKBOOK

Kraftco Corporation
COMPUTER ASSISTED INSTRUCTION
DATA ENTRY COURSE WORKBOOK

TABLE OF CONTENTS

HOW TO START A CAI COURSE ........................................... 1
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"INTRODUCTION TO THE 3270" ....................................... 1
"INTRODUCTION TO CAI" .............................................. 2
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"ORDER STATUS REQUESTS" .......................................... 6
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Figure 7—Sample pages from CAI workbook
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AUTHOR CODING
This portion of the frame simulates a typical Order Entry System format. The student is able to enter the answer in the body of the format itself, thereby utilizing CAI graphic controls. Panvalet Copy Library statements are used to simplify author coding.

This portion of the frame consists of the various answers, responses, and destinations programmed for this frame. Panvalet Copy Library statements are also utilized here.

RESULTING STUDENT TEXT
The student is able to practice working with an actual Order Entry System format as part of the CAI lesson. The answer is to be entered where the cursor indicates. Depending on the accuracy of the answer, the student will be given an appropriate response and destination, as coded by the author.

TRANSACTIONS OF THE ORDER ENTRY SYSTEM, ONE COURSE SERVED AS AN INTRODUCTION TO THE OPERATION OF THE IBM 3270 TERMINAL. INITIALLY, THE DECISION WAS MADE TO TREAT THE SUBJECT OF DATA ENTRY PROCEDURES FOR EACH OF THE SEVEN TRANSACTIONS, SINCE DATA ENTRY SKILL WAS REQUIRED BY HUNDREDS OF OPERATORS THROUGHOUT THE COUNTRY. OTHER TOPICS REQUIRING TRAINING—SUCH AS HOW TO CODE ORDERS FOR THE VARIOUS ORDER ENTRY SYSTEM TRANSACTIONS—PERTAIN TO FAR FEWER "STUDENTS" ACROSS THE NATION; THE DECISION WAS MADE, THEREFORE, TO TEACH THOSE SUBJECTS BY ALTERNATE METHODS, SUCH AS WEEK-LONG CLASSES AT HEADQUARTERS OR SPECIAL SECTIONS IN THE PROCEDURE MANUALS. CAI COURSES WERE TO FOCUS ON THE DATA ENTRY TECHNIQUES ONLY.*

THE CORPORATION CONDUCTED SIX USER CLASSES AT A CENTRAL LOCATION TO TRAIN OFFICE MANAGERS IN THE CODING OF ORDER FORMS FOR THE ORDER ENTRY SYSTEM. THE CAI TRAINING TEAM MEMBERS WERE FULLY PREPARED TO SERVE AS CLASS INSTRUCTORS, SINCE THEIR COURSE AUTHORING EXPERIENCE HAD MADE THEM THOROUGHLY FAMILIAR WITH THE DETAILS OF THE ORDER ENTRY SYSTEM. DURING THE WEEK-LONG CLASSES ON ORDER CODING FOR OES, THE LOCAL OFFICE MANAGERS WERE GIVEN TEN HOURS OR MORE OF ON-LINE EXPOSURE TO THE CAI COURSES ON DATA ENTRY. IN THIS WAY, THE OFFICE MANAGERS WERE ABLE TO PARTICIPATE BRIEFLY IN THE CAI TRAINING PROGRAM WHICH HAD BEEN PREPARED FOR THEIR LOCAL EMPLOYEES.

THE AVERAGE LENGTH OF A CAI COURSE IN OES DATA ENTRY IS 100 FRAMES. EACH COURSE WENT THROUGH APPROXIMATELY FOUR REVISIONS IN THE FIRST TWO MONTHS OF DEVELOPMENT, WHILE CAI SOFTWARE WAS SIMULTANEOUSLY ADAPTED TO BRING ALL THE COURSES TO THE IBM 3270 SCREENS. ALTHOUGH THERE WERE STILL TECHNICAL AND CONTEXTUAL REVISIONS TO MAKE, THE TRAINING STAFF MET A VERY TIGHT DEADLINE SUCCESSFULLY.

NOW—SIX MONTHS LATER—EACH OF THOSE ORIGINAL EIGHT COURSES HAS BEEN UPDATED AT LEAST FOURTEEN TIMES TO INCORPORATE THE LATEST SYSTEM CHANGES, TECHNICAL CAPABILITIES, AND EDUCATIONAL APPROACHES. IN ADDITION, SIX MORE COURSES HAVE BEEN ADDED TO THE CATALOG, A DICTIONARY OF TERMS FOR THE CAI INDEX IS BEING COMPILED, AND THE "CAI STANDARDS MANUAL" IS BEING EXPANDED.

TRAINEEs FOLLOWED A SPECIFIED SIGN-ON PROCEDURE WHICH RECORDS PERTINENT DATA FOR SUBSEQUENT COMPUTER MANAGED INSTRUCTION (CMI) REPORTING.

MEANWHILE, EMPLOYEES ACROSS THE NATION ARE ENJOYING CONSIDERABLE EXPOSURE TO CAI TRAINING. OVER TWO HUNDRED SEVENTY-FIVE TRAINEES HAVE ALREADY REGISTERED THEIR NAMES AND IDENTIFICATION NUMBERS WITH THE COMPUTER SO THAT THEY
THAT'S EXACTLY CORRECT, JANE. YOU HAVE UNDOUBTEDLY HAD EXPERIENCE IN CALLING UP DIFFERENT KINDS OF FORMATS, ESPECIALLY THE BEFORE-THE-FACT ORDER FORMAT.

NOW, LET'S PRACTICE DOING IT.

IF THERE WERE A DIFFERENT FORMAT ON MY SCREEN, AND YOU WANTED TO CALL UP A BEFORE-THE-FACT ORDER FORMAT NEXT, WHAT CODE WOULD YOU TYPE AFTER "NEXT FORMAT?" FEEL FREE TO LOOK AT THE CODE ON A BEFORE-THE-FACT ORDER FORMAT IF YOU NEED TO. AS SOON AS YOU TYPE IN THE CODE THAT YOU WOULD USE, TYPE IT IN WHERE MY CURSOR IS PLACED BELOW, AND THEN PRESS "ENTER."
can be recognized as students. Then, when CAI is extended to them daily through a system of remote message switching, trainees in distant locations sign on to the terminal indicating that they wish to begin taking a CAI course.

Graphic control features have been added to the CAI software so that regular Order Entry System formats can be used in CAI courses; students are able to enter data in the appropriate fields, just as they will when their location is converted to the Order Entry System.

The interactive mode of CAI training allows the student to participate freely in the learning process. Each course frame consists of five basic parts: the text material, the question which is posed to the student, the student’s answer, the appropriate response by the course, and the destination to the next frame of instruction. Since the response and destination are both dependent on the accuracy of the student’s answer, each course is individually structured for the student’s capabilities.

The trainee can choose to take a course all the way through, or he can “STOP” at any time. Once he types “STOP,” the computer remembers where the student left off, and will always return him to the frame he last finished—regardless of how much time goes by before the student resumes the course.

EVALUATION

Even at this early stage in the corporation’s experience with Computer Assisted Instruction, there has been significant feedback from employees across the country regarding CAI as a major training tool. The most gratifying response has been, unanimously, that learning is enjoyable. Office managers report that their employees look forward to training time each day because the subject itself is made pleasurable and interesting, and the terminal-as-medium is “fascinating.” Furthermore, early intrigue with the terminals does not seem to diminish as training progresses. Another benefit of CAI, from the employees’ perspectives, is that the “computer teacher” has been given a distinct and pleasant personality by the CAI authors. The positive attitude of the “teacher” increases the trainees’ desires to excel in their learning.

Employees report further that they respond highly favorably to the personalization of the text and question lines of each frame. In addition, the use of the trainee’s first name in the positive responses creates an educational atmosphere of interest and trust. On the other hand, employees identified a significant error course authors had made. The incorporation of the student’s first name in the negative responses seems to be too personal to maintain a healthy learning atmosphere. The psychological impact of “Charlie, I am afraid your answer is wrong again” is too strong, according to the CAI students, because the trainee is usually too embarrassed to try again. Instead, a non-personalized negative response, such as “I am afraid your answer is wrong,” permits the student to try again and again without personal guilt over his mistakes. As a result of this feedback from students, the course authors revised all the courses to eliminate names in the negative responses.

One benefit of the CAI training program is that much of the potential apprehension associated with changing from an old system to an entirely new one was removed as a result of the pleasurable exposure to CAI education. From management’s perspective, the attitude-shaping capabilities of CAI are a most welcome bonus. Experience to date has shown that employee “fear” of the new equipment is virtually removed by CAI. The early management decision to train students in the same environment used for daily processing—i.e., utilizing the identical equipment in the same physical surroundings—has proved to be a wise choice. Employees can become familiar with the techniques and equipment of the Order Entry System before the system is live for their location.

As each office converts from the old system to the new Order Entry System, the most significant benefits of CAI training become obvious. To date, twenty-one locations across the country have been smoothly and efficiently converted to the new Order Entry System without any substantial training problems. The interactive mode of Computer Assisted Instruction has increased student comprehension and concentration to the extent that CAI-trained employees are able to remember and put into effect the precise details of OES data entry. Since OES error correction takes place on-line, no statistics on error rates are available. However, the actual number of errors has not been, to date, sufficient enough to interfere in any way with the smooth conversion to the Order Entry System. CAI has, therefore, proved to be highly successful in teaching discipline and precision by providing practice on sample formats without consequences to the production system. Many of the CAI trainees volunteer that their comprehension seems much greater as a result of taking CAI courses compared to their learning comprehension after reading a procedure manual only. Employees at one location, for example, once noticed a minute change (the nonsignificant addition of a minus sign) that had been made to one frame of a CAI course. They recognized instantly that the frame in question had been updated overnight. When questioned, the trainees readily admitted that they would probably never notice a similar change to the procedure manual they are reading, but that they find it quite easy to concentrate on the small details of CAI courses.

One of the reasons cited for the high degree of comprehension by CAI trainees is that the CAI “computer teacher” is much more helpful in providing detailed remedial information than a traditional teacher can afford to be in the classroom situation—or than a procedure manual can afford to be in its print structure. CAI students can move at their own speed without guilt at proceeding too slowly, and without undue pressure to finish quickly. Whenever additional information is required, it is readily provided before the student can move on to a new lesson unit. Unlike one of the dangers of traditional programmed instruction, however, CAI trainees never get “stuck” in one frame if they are having difficulty with an answer. A programmed
routine was designed to accommodate those students who may repeatedly commit the identical error (in spite of three levels of remedial help). The students are always permitted to leave the course without penalty and to seek the answer from the procedure manual or their supervisor. Once the trainee has the answer, he is allowed to re-enter the course at the beginning of the lesson unit he was taking. There is no need for him to start at the beginning of the entire course, because he would then be repeating what he already knows.

As a result of the high degree of success of the Computer
The Role of Computer Assisted Instruction (CAI) in Management Information Systems

Kraftco Corporation

REPORT A*

COMPUTER ASSISTED INSTRUCTION

STUDENT ID # | STUDENT NAME |
-------------|--------------|
0029         | JOHN ABRAMS  |
0153         | MARLYCE D. ADAMSON |
0010         | BONNIE AIELLO |
0023         | CHRISTOPHER W. APPLETON |
0247         | BARBARA ARENSON |
0066         | JOE ARBONSMITH |
0016         | JAN ASHLEY   |

STUDENT LOCATION IDENTIFICATION
7693
6305
2189
5405
2239
6305
3146

* ALPHABETICAL CLASS LIST

REPORT B*

COMPUTER ASSISTED INSTRUCTION

STUDENT ID # | STUDENT NAME | PASSWORD | COURSE ID # | START DATE | LAST ACT. DATE | # FRAMES COMPLETED | # FRAMES IN COURSE | ACTIVE/COMPLETE** |
-------------|--------------|----------|-------------|------------|----------------|-------------------|-------------------|-------------------|
0068         | JOE MASTERS  | 003      | 02/09/73    | 03/26/73   | 66             | 66                | 02 C              |
0068         |              | 011      | 02/21/73    | 04/01/73   | 87             | 102               | A 01 C            |
0068         |              | 008      | 02/22/73    | 03/05/73   | 75             | 75                | 01 C              |
0069         | META SULLIVAN| 001      | 05/05/73    | 05/11/73   | 103            | 103               | 01 C              |

COURSE PROGRESS BY STUDENT ID #

** AN "A" ("ACTIVE") CODE INDICATES THAT THE STUDENT IS STILL TAKING THE COURSE.
A "C" ("COMPLETE") CODE INDICATES THAT THE STUDENT HAS COMPLETED THE COURSE.
THE TWO-DIGIT FIGURE REFLECTS THE NUMBER OF TIMES THE STUDENT HAS COMPLETED THE SAME COURSE.

THE TWO-DIGIT FIGURE REFLECTS THE NUMBER OF TIMES THE STUDENT HAS COMPLETED THE SAME COURSE.

Figure II—Two computer managed instruction reports

From the collection of the Computer History Museum (www.computerhistory.org)
Assisted Instruction training effort, management is now better able to make the crucial decision: When is each location ready to convert to the new Order Entry System?

MANAGEMENT INFORMATION PROCESSING THROUGH CAI

A major piece of evidence influencing that decision is the information processing gained through Computer Managed Instruction (CMI) reports. At regular intervals, management is provided with the following information:

1. The number of students (in general) who have completed, or are taking, each course.
2. The number of students (by location) who have completed, or are taking, each course.
3. The effectiveness of each course frame—i.e., statistical data on the number of students (and their locations) who err on certain key points within each course. (This is valuable information for the course authors who are continually re-evaluating the clarity of their courses. Information of this kind may indicate a training weakness that is either inherent in the course, or unique to a particular location.)

Since management can monitor the individual training progress of every remote location through CMI, educated decisions can be made regarding each location’s readiness for conversion. Continual checking of an Office’s progress avoids last minute decisions; management can choose to send special field representatives to help achieve total readiness at a particular location, as soon as a potential training problem appears evident. In this way, management is assured of meeting the planned conversion date for each office.

Although the Computer Managed Instruction reports are most valuable tools, Computer Assisted Instruction itself permits management decisions to be based on much more than just information processing. The crucial decision to convert a location can be made with full confidence in the quality behind the information processing data. For example, management can always rely on the following characteristics of Computer Assisted Instruction:

1. Learning has taken place. CAI continually tests and reinforces the material it teaches by asking for practical, interactive responses. Conversely, a procedure manual is incapable of providing individualized instruction, a manager cannot really determine that his employee has fully read and comprehended a procedure manual, despite the excellence of the manual itself, until the learning is put into actual practice at the risk of costly errors.
2. Education has been sound, both psychologically and contextually. Each course was constructed—and reconstructed—by trained experts. The CAI course author, moreover, is continually accountable for his course content and style because his lessons are subjected to scrutiny by those who actually use the system he’s teaching. User feedback is both encouraged and sincerely incorporated in all CAI course revisions, as a way of further management accountability to users.
3. Training has consistently adhered to high standards of style. Although each “computer teacher” has been purposely endowed with a lively and distinct personality, the CAI courses all seem to be part of a larger and more comprehensive training plan. The course consistency eliminates one initial obstacle to sound learning; the adjustment to different styles of teaching and variable standards of expectation.
4. Training has been customized to the corporation’s special needs. Since courses are written by Kraftco CAI educators for Kraftco employees, there is no danger of the characteristic loss of specificity that often occurs when an outside training package is adapted to one’s own needs.
5. Education is current. Editing of CAI courses can be done on-line or overnight in batch. Late-breaking important changes can be called to everyone’s attention through the use of the Mailbox feature of CAI.
6. Training has shaped attitude very positively. Management recognizes the vital importance of attitude-shaping in any endeavor; since CAI has proven to be one of the best means of creating an outstanding morale among employees, the training program is valued even more highly by management.

FINANCIAL CONSIDERATIONS

Naturally, one of the prime considerations was the cost of implementing the selected training system. An extensive financial analysis took the following factors into account:

1. Cost of developing an in-house software program versus renting (or rent with option to buy) a CAI system such as the McDonnell Douglas TIME system. The corporation chose to rent the TIME system for a three year period at a monthly rental of $1500. Total cost of the program is approximately $50,000.
2. Cost of writing the actual curriculum associated with each CAI course. Since one of the major costs in the development of a CAI system is the writing of the course material, the system which is selected must be relatively simple for the course authors to code.
3. Cost of the extra hardware (if any) which must be allocated to the CAI system. Usually, the extra hardware consists of additional CPU core required over and above the normal transaction processing requirements and additional disk storage space required for the CAI data base.

When these CAI costs were compared to the costs of doing a comparable job of training (measured by the results achieved) using another educational approach—such as
field classes or training at headquarters—it was obvious to management that Computer Assisted Instruction is considerably more economical than other training modes. Furthermore, in the opinion of management, cost considerations dictated that obtaining an outside CAI package, and enhancing it, was a better plan than attempting to design a full CAI software system.

CONCLUSION

Although managers of data processing installations have long felt that sound information processing would assure informed decision-making, Kraftco's experience with CAI has convinced its corporate management that good decision-making is more than information processing. By its very nature, Computer Assisted Instruction allows the manager to have control of the quality behind the data gathered through information processing, and permits the corporation to place confidence in the role of CAI in the "Fourth Generation" of computer systems. Kraftco's initial experience with CAI has been so successful that Computer Assisted Instruction will be used as part of the company's in-house technical training, as well as for nationwide user education. Once a manager can have confidence in the proficiency level of his employees—a confidence achieved by the skillful incorporation of Computer Assisted Instruction—he can make his decisions with the characteristically sound judgment of the successful executive.