Virtual Schools & Universities

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Introduction

By now, everyone and their brother has heard of virtual reality (VR). Some have even experienced it in the form of new video games or experimental computer interfaces. You've seen it. The player puts on this headgear looking thing that has built in headphones and miniature screens for their eyes, and then the player proceeds to interact with the VR scenario by using a VR glove or other manipulative device.

So basically, VR is a way to interact with things or people that are not really there. Through the wonders of technology, VR gives you the illusion of "really being there".

This concept of virtual reality **IS** the future of distance education. Imagine the possibility of attending a K-12 school or University located thousands of miles away which offers coursework equivalent to if not superior to "traditional" coursework. Just as in a "traditional" classroom, you could interact with the instructor in "real-time" as well as interacting with the other students enrolled in the course. Imagine taking a class from a University in New York while sitting in your home in Dell City, Texas.

"But Virginia, we can do this now!"

On the contrary. Distance education paradigms of today still require you to travel to a site that is capable of sending and receiving the transmissions to and from the distant instructor. These sites frequently are specially designed rooms outfitted with thousands of dollars of equipment including expensive video cameras, monitors, microphones, compression/ decompression devices, and control stations. This does not include the ongoing cost of leasing special transmission lines (or satellite uplink/ downlinks) and contractual agreements with equipment companies. For the average education provider, it is a costly and risky investment.

Enter Virtual Schools and Universities.

When TCET accepted the challenge of exploring virtual schools as a reasonable avenue for mainstream education, we were astonished at the numbers of currently available on-line programs and courses. Some programs and courses are in their infancy; others have a successful track record. This publication examines the paradigm of distance education and its evolution into virtual schools and universities. It describes established on-line resources and includes documentation from several schools, universities and businesses that are taking that "next step" into virtual or "telepresence" delivery of information.

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and the fine folks at Yahoo

- J. Ashton

Distance Education: Yesterday, Today, Tomorrow

Distance education is beset with a remarkable paradox—it has asserted its existence, but it cannot define itself (Shale, 1990). But the variety of proposed definitions seem to have as a common element the physical separation of students from the teacher. This separation may be merely a wall, or it may be miles of distance. The basic idea is that the teacher and the learners are not in the same room together.

Grenville Rumble (1989) defined distance learning as a process in which there must be a teacher, one or more students, a course or curriculum that the teacher is capable of teaching and the student is trying to learn, and a contract, implicit or explicit, between the student and the teacher or the institution employing the teacher, which acknowledges their respective teaching-learning roles.

The U.S. Department of Education's Office of Educational Research and Improvement (Bruder, 1989) defines distance education as "the application of telecommunications and electronic devices which enable students and learners to receive instruction that originates from some distant location."

Rudolf Manfred Delling (Keegan, 1986) speaks of distance education as a teaching process "which is achieved by bridging the physical distance between student and teacher by means of at least one appropriate technical medium."

Some definitions specifically mention lack of eye contact, but as two-way video approaches maturity, eye contact and observation of body language can be maintained even over distances. A time element is included in some definitions which consider prerecorded presentations as a form of distance education.

History of Distance Education

A Brief History of Distance Education

Although some definitions, as observed above, specify electronic transmission between teacher and student, the roots of pure distance education go back at least 150 years to the beginning of correspondence study. An advertisement in an 1833 Swedish newspaper touted the opportunity to study "Composition through the medium of the Post" (Holmberg, 1986). In 1840, Isaac Pittman used England's newly established penny post to offer shorthand instruction via correspondence. Pittman went on to establish the Phonographic Correspondence Society, precursor of the Sir Isaac Pittman Correspondence Colleges (Holmberg, 1986). In this same time period, Toussaint and Langenscheidt introduced correspondence study in Germany by teaching languages by correspondence from Berlin.

Correspondence study crossed the Atlantic in 1873 with Eliot

Ticknor's founding of the Society to Encourage Studies at Home. In its 24 year existence, this Boston-based society attracted more than 10,000 students who corresponded monthly with teachers offering guided readings and frequent tests. The popularity of correspondence study in America grew rapidly. New York's Chautauqua College of Liberal Arts and Illinois Wesleyan offered academic degrees via correspondence in the late 1800s. Yale's William Rainey Harper, who headed Chautauqua's program is quoted as saying:

> The student who has prepared a certain number of lessons in the correspondence school knows more of the subject treated in those lessons, and knows it better, than the student who has covered the same ground in the classroom.

The University of Chicago opened its doors in 1892 with a correspondence division as one of its five divisions, and the University of Wisconsin developed the "short course" along with farmers' institutes in 1885. These two programs, however, were eventually dropped.

The Europeans remained leaders in correspondence courses as they pioneered such innovations as audio tapes for the blind and laboratory kits for subjects such as electronics and radio engineering.

The modern age of distance education began in the 1930s with experimental television programs produced at the University of Iowa, Purdue University, and Kansas State College. Television broadcasts of college credit courses were first offered in 1951 by Western Reserve University, and New York University ran its Sunrise Semester from 1957 to 1982.

TODAY

Satellite technology, which became cost effective in the 1980s, now enable the rapid spread of instructional television. Federally funded experiments, such as the Appalachian Education Satellite Project (1974-1975), while criticized by some, demonstrated the feasibility of satellite-delivered instruction. More recent attempts are the Learn/Alaska system created in 1980 and the privately operated TI-IN Network that has delivered a wide variety of courses via satellite to high schools across the United States since 1985.

In the United Kingdom, the Open University is a leading example of a degree granting distance education program. Germany, with its FernUniversitat, offers degree granting programs. Japan, Canada and even Sri Lanka and Pakistan, have established similar institutions.

Many K-12 schools are reaping the benefits of a distance education program by tapping into existing wiring schemes such as the local cable

company and telephone service. Many have sought after grant monies offered through businesses and other entities that support innovative efforts of public and private schools.

FUTURE

To claim to know what the future holds is as much an exercise in futility as trying to predict the weather a year in advance. Other than general trends such as the heating and cooling cycles of seasons, one cannot say exactly how the realm of distance education will evolve. More institutions of learning are coming on-line every day and offering continuing and fundamental education opportunities for the remote learner. There are many issues to resolve such as tuition rates, accreditation, and equal access. The concept is solid and has a proven track record. The technology is to the point that distance education is becoming more mainstream and accepted as a viable alternative to what most think of as a "traditional" education.

The rest of this publication is devoted to illustrating just a few of these institutions that have taken that "next step" into the history of distance education.

THE VIRTUAL COLLEGE MODEL

TELELEARNING IN THE HOME

Currently, 6 million Americans are enrolled part-time in colleges and universities. Over 80 percent of these part-time students are adults aged 25 and over, and 58 percent are women. These large numbers mask an even larger adult population that would like to attend college but cannot. Some of the major obstacles faced by adults trying to obtain postsecondary education include:

- Inconvenient class hours
- Home and job responsibilities
- Business travel
- Campus inaccessibility
- Child or elderly care
- Physical handicaps
- Commuting costs

Communications technologies have been used to deliver higher education to distant learners since the 1920s when university-owned radio stations first began operation. Successive technologies such as television, time-share computing and videoconferencing have been utilized to extend the reach of on-campus instruction. Following New York University's introduction of *Sunrise Semester* in the 1950s, televised courses have been the primary means of delivering college instruction into the home. But broadcast television is a largely passive medium, and student interactions with faculty and other students are limited to the occasional phone call or letter. Videoconferencing systems have made televised instruction interactive, but only those students who work at or can get to a business or university videoconferencing site can participate in these courses.

The introduction of computer-mediated communications (CMC) systems such as computer conferencing and e-mail in the 1980s finally permitted the delivery of interactive instruction directly into the home. Colleges such as New Jersey Institute of Technology, New School for Social Research, and University of Phoenix have used CMC packages like EIES, Unison and Caucus to offer online courses and some degrees over the public telephone network to students with home PCs and modems.

LIMITATIONS OF CURRENT CMC SOFTWARE PACKAGES

While the current generation of computer-mediated communications packages support a wide range of student-faculty interactions, they have the following important limitations as distance education delivery systems:

Limited Capabilities - Current CMC packages are essentially text-based communications systems with limited graphics and database capabilities. Most of today's innovative on-campus computer-based training programs utilize multimedia and hypertext systems to enhance learning.

Hybrid Delivery - Current CMC packages cannot provide the myriad educational support services (e.g., student recordkeeping, curriculum development, textbook delivery) characteristic of all college operations, and therefore require mail, express or fax delivery of instructional and administrative print materials to and from students and faculty.

Discussion Focus - Current CMC packages allow students and faculty to discuss class projects such as information systems, engineering designs and marketing presentations, but don't allow them subsequently to develop these projects. The electronic equivalents of such on-campus facilities as laboratories, workshops and studios are missing.

INTERACTIVE VIDEO TELEPROGRAMS

THE VALUE OF INSTRUCTIONAL VIDEO

Video's effectiveness as a tool for training has been demonstrated at every level of education from preschool through adult education. Video shifts time, space and content into viewer-adjusted, viewer-accepted segments, making information available whenever, wherever and in whatever amounts needed. It uses color, motion and sound in one universally acceptable medium to convey technical skills, concepts and attitudes equally well. Whether broadcast, cablecast or taped, video brings the advantages of compression, consistency and visualization to the learning process.

Instructional video offers the advantage of compression, eliminating unnecessary material and delivering only as much information as is directly related to course objectives. With compression, students can learn in one-third to one-fourth the time it would usually take in a classroom setting. Another advantage of instructional video is its ability to deliver information consistently—all students receive the same content in the same style of delivery. Individual instructor differences in the interpretation, style or emphasis of course content is eliminated.

Video is a visual medium and has the ability to hold student interest through color, motion and sound. Visual images can add to student retention and recall of information. Color visuals help illustrate difficult concepts and clarify information and can accelerate learning, improve comprehension, increase recognition, and reduce errors. The motion element of video facilitates presentation of subject demonstrations, process flows and role simulations. Finally, audio can reproduce various voice and sound conditions, and can enhance student recognition and discrimination.

HOME-BASED LEARNERS

Video telecourses have been broadcast to home-based learners for over forty years. The widespread availability of home videocassette recorders and personal computers has introduced various degrees of student control of and interaction with video courseware. Current consumer technologies support three models of video instruction in the home—Video and Print Telecourse, Video and Conferencing Telecourse, and Interactive Video Telecourse.

A. Video and Print Telecourse. This is the most common model of home-based video instruction. Characterized by the dozens of telecourses funded through the Annenberg/CPB Project, Video and Print courses consist of eight to twelve hours of presentation video, one or more textbooks and a course study guide. Many students use home VCRs to watch the telecourse sessions, giving them the ability to stop and replay sections of the tapes they don't fully understand. Where concepts are still not understood, however, students must rely on course textbooks which are often only loosely linked to specific examples or problems shown in the tapes. Phone calls made to other students or the instructor for help may require them in turn to locate specific sections of videotape before providing any assistance. Unlike live classrooms that can provide immediate feedback, video and print telecourses may raise questions that take days to resolve.

B. Video and Conferencing Telecourse. This model, characterized by The New School's Distance Instruction for Adult Learners (DIAL) program, adds a personal computer and modem to the home instructional technology mix. Presentation or taped classroom lecture videos are used in conjunction with printed textbooks and study guides. Unlike the video and print model, however, instruction is supplemented by computer conferencing-based collaboration with other students and faculty. Questions about course concepts are likely to be answered online in a more timely fashion than through telephone tag, but still require reference to disparate video, electronic text and print materials.

C. Interactive Video Telecourse. This model, as developed by NYU's Virtual College program, would integrate digital video into a highly collaborative Lotus Notes groupware environment on a single platform—the home PC. All instructional materials—video, lectures, laboratory projects, and readings—are electronic and interactively accessible through one common user interface. In this system, a student having a problem could go beyond the video segment to access directly a hypermedia store of additional information about the topic. If this additional material still did not resolve the problem, the student could capture the appropriate digital video frames, annotate them as necessary, and add them to an electronic message for the instructor and/or other students. Respondents could add and highlight their own digital visual images in trying to clarify the student's problem. The overall process would be entirely seamless and highly responsive.

Each interactive video telecourse database would organize information in a nonlinear hypermedia format that supports active cross-references and permits the user to "jump" to various parts of the database as desired. Interacting with the database through associative links, users can follow their individual trains of thought and nonsequentially access video, audio, software, data, graphics, and text materials at varying levels of detail.

Interactive Video in the Home

The nation's telephone and cable companies are committing billions of dollars to build interactive television systems. Bell Atlantic, for example, plans to provide interactive TV to over one million homes by 1995, and more than eight million by 2000. In designing these interactive systems to lure consumers from the Mall and the Bijou, however, the telecommunications giants are overlooking a market that is a potential goldmine—the home-based college student.

Unlike TV shopping or movie reruns—often considered by consumers to be free services—college has never been considered free. Average 1992-93 college tuition costs were $2,300 for public and $10,500 for private institutions, and totalled $37 billion in direct tuition payments by students. This $37 billion would put higher education in second place (after catalog shopping) among interactive TV's greatest potential sources of annual business revenue. The same consumer who would balk at an additional $10 a month for the electronic equivalent of going to Macy's might not hesitate to pay a far larger monthly fee for gaining access to interactive college telecourses—especially those offered at lower tuition rates.

As they did with such older media as radio, television, and videoconferencing, hundreds of colleges and universities will want to offer courses and degrees via interactive television systems. This new medium will provide homes with communications and computational capabilities that exceed those available in most business offices. If the rich instructional promise of this new medium—far richer than that first offered by broadcast television in the l950s—is to be realized, work needs to begin on interactive video telecourse design and evaluation.

Interactive Video Telecourse Development

To evaluate the instructional potential of interactive video for home-based learners, the Alfred P. Sloan Foundation awarded NYU a $380,660 grant in March, 1994, for the development of four interactive video telecourses as part of The Virtual College graduate teleprogram in information technology. The Sloan-funded Interactive Video Telecourse Project will use the Lotus Notes delivery platform, but incorporate many of the capabilities of future interactive television systems.

The project will utilize two new applications developed for the Lotus Notes groupware package—ScreenCam and VideoNotes. ScreenCam is a recording utility that produces full-screen, audiographic "movies" of PC display activity. ScreenCam file sizes depend on what is being recorded, but a typical minute of screen activity and accompanying audio occupies only 700 KB of disk space. VideoNotes is a video-storage and delivery system that allows users to capture and embed video clips in Notes applications and databases. With VideoNotes, students can activate icons located in various telecourse lessons, case study or text documents and have instructional video clips sent from the Virtual College server to their PCs.

The teleprogram will employ 128 Kbps Integrated Services Digital Network (ISDN) lines that are capable of delivering digital video into home PCs over ordinary copper phone wires. The teleprogram will be delivered initially over NYNEX ISDN lines in the New York Metropolitan Local Access Transport Area (LATA). The New York LATA includes New York City and Nassau, Suffolk, Westchester, Rockland, and Putnam counties. The region has a population of 11.2 million with 4.5 million residential phone lines. NYNEX has initiated "Metro Showcase" program to accelerate ISDN availability within the New York LATA. By January, 1995, ISDN will be available to all of the region's residents.

Interactive Video Telecourse project students and faculty will be loaned the necessary ISDN hardware for their PCs during their participation in the two-semester teleprogram. In addition, each faculty PC will be equipped with a desktop videoconferencing system and camera for synchronous curriculum discussion and development.

Interactive Video Telecourse Evaluation

The Interactive Video Telecourse project will be designed to provide accurate cost and effectiveness outcome measures given a varied range of course session skill levels—Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation —and telecourse activity/technology processes. The four main telecourse technologies—digital video (full-motion and audiographic, hypertext, computer conferencing, and online laboratory—are described below:

Digital Video will provide for audiographic and full motion video of faculty discussions, animated demonstrations and case study simulations. The visual linkages created by the video sessions will increase student mastery and retention of telecourse concepts, methodologies and tools.

Hypertext will provide students with dynamic cross-references to all telecourse materials and will permit them to "jump" to various information sets as desired. Interacting with the telecourse databases through associative links, students will access video, graphics, software, data, and text at varying levels of detail.

Computer Conferencing will support asynchronous discussions among students and faculty in the study of telecourse topics, case studies, projects, and assignments. The conferences will generate a considerable and permanent record of student-faculty interaction and analysis.

Online Laboratory will permit collaborative work groups of students and faculty to go beyond discussion to creating tangible information systems products with the tools of the trade. Applications software or computer-aided software engineering, project management, database management and quantitative analysis will be supported in the online labs.

The project evaluation will analyze and identify the most appropriate mix (and corresponding costs) of course activities and interactive video telecourse technologies for meeting the student knowledge and skill objectives shown in Table 4. With over 150 individual topics representing the six student skill levels in the APC program, the project will provide a sufficient number of cases to reliably calculate the relative effectiveness (i.e., impact on student skill acquisition) of the various technologies—video audiographic, hypertext, conferencing, and software. Accurate production and delivery cost data will be collected for all telecourse modules to insure that valid cost-effectiveness analyses of each technology can be conducted.

EDUCATION -ON- DEMAND

The current Virtual College teleprogram uses the seminar model as its basic instructional paradigm. This approach provides for significant student-faculty (and student-student) collaborations, at the expense of increased faculty costs and reduced scheduling flexibilities. While teleprogram students can work on their telecourses at any time of the day and from anywhere on Earth, they must still adhere to the fixed telecourse session schedule and may only take courses as they are offered on a semester basis (with three start times per year).

The Virtual College now offers instruction the way a school does—on a fixed schedule established by the institution. But there are other educational delivery models. Why not also offer instruction the way a museum does—on a fluid schedule established by the individual? Such a delivery method, coupled with emerging knowledge agent technologies, might effectively use the independent study model as its basic instructional paradigm. For certain distant learners and for certain courses, this might be an equally effective means of instructional delivery.

The Virtual College will develop an education-on-demand system for delivering quasi-independent study telecourses to home PCs whenever individual students want to begin a course. Each interactive telecourse would have built-in workflow automation capabilities to track, prompt, record and

evaluate student progress through the course. While each student would work independently on these courses, computer conferencing, electronic mail and voice mail access to a faculty and advisor "pool" would be available to answer questions, evaluate assignments and provide advisement. Electronic meeting and activity spaces would provide for some degree of student and faculty socialization.

LOTUS NOTES

In an effort to meet the needs of a broad range of distant learners and to deliver high-quality, interactive instruction directly into the student's home, New York University's School of Continuing Education began work in 1991 on The Virtual College teleprogram. The Virtual College was intended to be a comprehensive instructional management system for the efficient production and delivery of a potentially wide range of college, business and technical courses and programs. Through The Virtual College, students would receive instruction, ask questions, conduct analyses, resolve problems, and complete projects—all largely at their own convenience and from practically anywhere in the world.

In addition to being a higher education delivery system, The Virtual College was intended to be a model for corporate training. Corporate training, and professional education is a $100 billion a year business in the United States. Upwards of 35 million individuals receive formal, employer-sponsored education each year. The facilities, staff and travel costs of traditional training programs are considerable. To meet the continuing demand for training, education has to be constantly available to employees through convenient and economical means. The cost-effectiveness of online versus on-site training is of increasing interest to thousands of business and public organizations.

Given the limitations of existing CMC software packages, the Lotus Notes groupware package was selected to be The Virtual College's software platform. First introduced in 1989, Notes is a powerful group information manager that gives people who work together an electronic environment within which to collect, organize and share information, using networked PCs. For The Virtual Collcge, Notes provided the following advantages over current CMC packages:

The Virtual College opened its electronic doors in the spring 1992 semester. The teleprogram utilized an IBM PS/2 model 95 PC as a server and provided student access over a 3-line, national 800-number communications network. The initial noncredit telecourse enrolled ten students and was an introduction to information systems analysis and design. During the eight-week telecourse, the students and instructor formed a virtual workgroup and collaborated on the development of a data collection system in Notes.

Beginning with the fall 1992 semester, a new 4-credit graduate course was offered to provide eight students with a working knowledge of the techniques and technologies used to develop virtual workplaces that connect people as well as computers. Students and the instructor collaborated online to analyze, design and build "corporate cyberspaces" for both their own and case study organizations. Six students enrolled in this graduate course during the spring 1993 semester.

The initial group of 24 Virtual College students were primarily mid-career professionals and managers from such large organizations as NBC, ITT, Con Edison, United Nations, ChemBank, and British Airways. Most were generalists and had limited experience with networked computing. Their primary reason for enrolling was a professional curiosity about the process and potential of virtual workgroups.

Developing the Curriculum

In 1990, New York University's School of Continuing Education began offering a 4-course, 16-credit Advanced Professional Certificate (APC) in Information Systems Auditing. This new graduate program was designed to prepare auditors and analysts for information systems audit and control responsibilities. In the initial design of the program, little emphasis had been placed on familiarizing students with broader management information systems concepts and methodologies.

In recent years, auditors of all levels and functional areas increasingly have had to work with and on complex computer and communications systems. This changing responsibility is reflected in the certification requirements of the Institute of Internal Auditors (IIA). The IIA is the key professional association in the audit field, and it administers the Certified Internal Auditor (CIA) examination to certify the professional competence of auditors in the following disciplines:

- Internal auditing administration
- EDP auditing and statistical sampling
- Organizational behavior and management
- Management information systems
- Economics and finance
- Accounting

The CIA exam consists of four equal parts covering the above disciplines. EDP Auditing topics have constituted 10% to 20% of the Part II questions in recent CIA exams. Management Information Systems topics have constituted 40% to 50% of the Part III questions in recent CIA exams. The general topic areas for EDP Auditing and Management Information Systems are indicated below.

EDP Auditing
(10% - 20% of CIA Part II Questions)

A. Effect of EDP on Controls and Audit

B. Nature and Audit of Computer-related Controls
    1. General Controls
        a. Organization and Operation Controls
        b. System Development, Changes and Documentation Controls
        c. Hardware and Systems Software Controls
        d. Security and Access Controls to Computer Facilities, Programs and Data
        e. Data and Procedural Controls
    2. Application Controls
        a. Input Controls
        b. Processing Controls
        c. Output Controls
        d. File and File Management Controls

C. Audit of Computer Processing
    1. Auditing Computer Programs
    2. Auditing Computer Files
    3. Auditing Computer Processing Systems

D. Control and Audit of Advanced Systems

E. Control and Audit of Third-party Systems

F. Control and Audit of Mini- and Micro-computers

G. Feasibility Studies and System Conversion

H. Evaluating System Efficiency and Effectiveness

I. Computer Abuse and Crime

J. Establishing and Maintaining an EDP Audit Function

Management Information Systems
(40% - 50% of CIA Part III Questions)

A. System Fundamentals

1. Information Systems Concepts and Techniques
2. The Systems Concept and Systems Theory
3. Management Decisions and Information
4. Information Systems Environment and Changes Therein
5. Elements and Operations of Management Information Systems
6. Behavioral Considerations

B. Business Computer Systems and Their Components
1. Forms and Operations of Computer Hardware
2. Computer Languages and Programs
3. Forms of Input, Processing and Output
4. Storage Concepts and Data Files
5. Computer Operations and Procedures
6. Operating Systems

C. File Management and Data Base/Data Communication Systems
1. File Organization and Data Management Systems
2. Major Supporting Software Systems
3. Data Base/Data Communication Systems
4. Systems Analysis and Design
    a. Systems Development Life Cycle
    b. Systems Analysis and Selection
    c. Systems Implementation and Evaluation

D. Various Information Systems in Use

The faculty found the original APC course sequence provided graduate audit students with insufficient study of the management information systems area, and offered excessive and redundant study of the EDP auditing area. During the fall 1993 semester, the four teleprogram faculty used The Virtual College's Faculty Database to review and revise the APC course scope and sequence online. In addition to the CIA examination requirements outlined above, the faculty analyzed the following three model systems curricula developed by professional associations:

• Model Curriculum for Information Systems Auditing (developed by The Institute of Internal Auditors)

• Graduate Curriculum in Information Systems (developed by the Association for Computing Machinery)

• Model Curriculum for Graduate Computer lnformation Systems (developed by the Data Processing Management Association)

Print copies of these documents were distributed to all faculty in September 1993. During a three-month curriculum development period, the Notes Faculty Database was used by all four instructors in an online collaboration that identified, analyzed and selected the appropriate course

topics, assignments, readings, and case studies for the new APC teleprogram. During this period, the faculty used the ongoing fall 1993 Systems Analysis telecourse as a real-time laboratory to develop a uniform telecourse curriculum structure and delivery model. Each new APC telecourse would incorporate a course outline, six course session guides and a detailed case study.

APC Telecourses

During their curriculum development effort, the four instructors made extensive revisions to the APC program. The revised APC course sequence was designed to provide audit students with a balanced study (as identified by IIA certification requirements) of both the management information systems and EDP auditing areas. The four new APC telecourses are described below:

Systems Analysis Y52.1100/4 credits This course provides an introduction to the role of information technology in organizations and an overview of the systems development life cycle. Topics include: planning and managing the information resource; project management within networked organizations; identification of user information requirements; evaluating the costs and benefits of systems alternatives; application of structured systems analysis tools and processes; input and output design considerations; and building and testing prototype systems.

Database Management Y52.1110/4 credits This course provides a working knowledge of the logical structure and physical implementation of database management systems. Topics include: information as an organizational resource; concepts of data file processing systems; the application of data models and dictionaries in data file design; strategic data and systems planning process; database models (hierarchical, network, and relational); data normalization steps; data structure, access and storage methods; distributed database design and operation; and data administration, security and integrity fundamentals.

Advanced Technologies Y52.1120/4 credits This course provides an introduction to the technologies, concepts and design strategies for business telecommunications networks. The course surveys key technology trends and the creative use of information technology as an enabler for business process reengineering. Topics include: Network technologies and topologies; Open System Interconnection model; basic principles of network planning, analysis and design; and key business information technologies—workstations, client/server, wireless communications, imaging and multimedia systems.

Systems Auditing Y52.1130/4 credits This course focuses on the standards and techniques employed in the audit and control of information systems. Topics include: nature and audit of computer-related controls; general controls—hardware, software, security, and access; application controls—input, database, processing, and output; control and audit of advanced networked and client-server systems; computer abuse and crime issues; and evaluating overall system efficiency and effectiveness.

The instructors believed the revised APC program provided a balanced curriculum of both management information systems and EDP auditing courses. The original APC subject title of Information Systems Auditing was felt to be too narrowly focused on the EDP auditing field, and did not properly reflect the inclusion of more generic information systems courses. To more accurately reflect the proposed information systems/EDP auditing curriculum, the subject title for the revised APC was changed from "Information Systems Auditing" to "Information Technology". Information technology is a widely-accepted designation in the audit profession that encompasses both the management information systems and the EDP auditing areas.

Anatomy of a Telecourse

During the fall 1993 semester, the prototype APC telecourse was offered to 21 students. This graduate course in Systems Analysis served as both a faculty training and curriculum development platform for the new faculty's design of the APC teleprogram. In terms of course structure, full enrollment, participant collaboration, communications costs, and student evaluations, this Systems Analysis course embodied and tested all of the operational attributes of the new APC teleprogram in Information Technology.

All students were employed full-time and all had at least a bachelor's degree (about 20 percent had a masters degree—typically an MBA). Five of the students were "sponsored" by having the $1900 telecourse tuition paid by their companies up-front (at registration). Most of the rest had their tuition paid by their companies' tuition reimbursement programs after final grades were submitted to their personnel departments. All of the students were PC literate (i.e., word processing and spreadsheets), but only six of them had some professional systems experience—the rest were nontechnical managers or professionals.

During the six-week core of the telecourse, students, instructor and "client" collaborated online to analyze, design and build a working information system in Lotus Notes. Due to the relatively large class size, the students were divided into four subgroups to work concurrently on various phases of the case study systems project. During a two-week period when the subgroups were conducting the preliminary and alternative analyses phases of the project, 750 Notes documents were created! This was an average of 35 questions, proposals, analyses, resolutions, etc. per student—a level of participation that would be rare even in the most active on-campus seminars over a similar time period.

Functioning as members of their virtual project teams, the students established discussion gluidelines, critiqued and edited each other's work, managed virtual workplace responsibilities, and at times ran an asynchronous groupware package as if it was an online chat service. This level of interaction

was maintained even when many students were "away" on business trips—one as far as Tokyo!

During the overall nine-week duration of the telecourse (October 11-December 12), 2,604 calls totalling 159 hours were made to the Notes server. Of this total, l,858 calls (71 percent) were made from the New York Metropolitan Region and the remaining 746 calls were made from 18 states, Puerto Rico, Canada, and Japan. Using the AT&T 800 service, the total telecommunications cost was $1,820 or $87 per student. The average call duration was 3.7 minutes and each student made an average of 100 calls during the course.

FOR MORE INFORMATION

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