

Soft News

Edcompcon sees bright future in educational software

Torrey Byles, Contributing Editor

Educational software publishing promises to be a billion dollar industry in less than three years, but today the market is saturated with too many suppliers, and the negligible profit margins are restricting investment in further development, according to speakers at Edcompcon in San Jose, November 8-10.

Educational packages "are multiplying like mice in a barn," said Jeff Locke, vice president of Bell and Howell's Interactive Communications Division, a publisher of software. The development opportunities in educational software are much greater than in utility or game software, Locke pointed out, because the subject matter is more diverse and after sales customer service is less. But the proliferation of software writers, along with the difficulty of informing the consumer what the product does, have made the business of selling software a hard one.

Selling educational software is not as easy as selling textbooks. For a given courseware product, a school district is likely to buy only one per school. With textbooks they will buy one per student. Also, courseware is a "hidden" product: the buyer finds it difficult to know what he is buying. The buyer must rely on outside magazine reviews, word of mouth, demo diskettes or product trial periods. For the software publisher, the first two are hard to control and the second two are costly.

As an example of one way to approach the problem, Locke outlined his company's Professional Authoring Software System, an Apple-based authoring language that enables non-programmers to write interactive computer-aided-instruction courseware. Normally licensed to industrial trainers for \$15,000, Bell and Howell is offering it free to authors in the academic community to write courseware in their content areas. The company provides editing and additional programming assistance, and ultimately will pay the author a 15 percent royalty on net sales of the final package.

Another speaker, Debbie Dennis, marketing director for MacGraw-Hill's college division, supported Locke's remarks by estimating that today's market for college courseware alone is \$150 million. Having recently purchased EMS of

Minnesota and another software house in Arizona, MacGraw-Hill is positioning itself to be a major player in electronic publishing, she said.

In an unusual venture, MacGraw-Hill has joined with the nineteen-campus California State University system to develop and distribute courseware. In this Personal Adventures in Learning program, campus coordinators contact and help faculty members to develop curriculum designs. MacGraw-Hill helps distribute and market the final product, usually in conjunction with its own selection of textbooks. Under this arrangement, authors receive a 25 percent royalty on net sales as well as professional recognition.

Courseware authors involved with the Pal program usually will not do any programming. Instead, they work with a university-supplied design team. Teams typically consist of a programmer, who does the majority of the coding, and an instructional technologist, who acts as a bridge between the professor and the programmer. The instructional technologist is trained in both computer science and principles of educational psychology. He offers assistance in determining the format of the package, in how to make it interesting (with, for example, intriguing graphics), in what degree of reinforcement should be given the student, and in the extent of remediation the program automatically requires of the student when he misses the problem.

One of the program's university coordinators, Mike Barden, based on the Fresno campus, said much of the computer-education theory behind their packages relied on the work of Thomas Malone of Xerox PARC. Courseware typically falls into three main categories: drill and practice, tutorial, and simulation. The first two kinds, according to Barden, are easier to build than simulation, but their pedagogical use is limited to the remedial and review type of instruction. Barden estimated the development of a typical CAI package required approximately 750 man-hours.

The design and utilization of educational software is far from being understood. According to Alfred Bork, a professor of computer and information science at the University of California,

Irvine, and a well known exponent of computers in education, most educational software on the market today is "trivia." The twenty to thirty minutes of interactive instruction these packages offer the student is hardly enough to provide an integrated or comprehensive course, he said. Bork has in mind courses of upwards of 20 hours of continuous computer instruction. The inherent limitation on producing this kind of in-depth courseware is the development costs of \$10,000 to \$20,000 per hour.

These high development costs, according to Bork, help explain why publishers have been reluctant to take the initiative in educational software publishing. "Textbook publishers are scared to death [by educational software], and will probably never make the transition [to it]," he said. Probably, the large computer companies, not the traditional textbook publishers, will take on the job of publishing educational software, he predicted. Bork hailed IBM's *Writing to Read* which teaches reading and writing to five and six year olds, as "the most significant thing to happen in computers and education in the past year." He estimated the program cost IBM \$5 million to develop.

Bork emphasized the important role computers can play in revitalizing our "rapidly deteriorating" national educational system. Specifically, our substandard instruction of math and physical sciences in high school, the continually falling number of qualified high school teachers in these fields, and the uneven distribution of educational resources among urban and rural schools can be rectified, he said, by the bold application of computers and computer materials. A revitalization of this magnitude, he estimated, would cost on the order of \$1.5 billion per year over a period of ten years. To those for whom the figure sounded high, Bork quickly pointed out that the total government expenditure for education already amounted to \$140 billion per year. The proposed figure, therefore, would amount to only a one percent increment. Furthermore, he said, the military is presently spending \$1.5 billion every two days, and in that context his figure for education seemed small.

Software essential to aeronautics advances, report says

Richard Landry, Assistant Editor

High performance design centers, total flight management, and real-time imaging systems made possible by a combination of advanced hardware and software are all part of the future of the aeronautics industry by the year 2000. But these advances will be realized only through a joint effort on the part of the computing and aeronautics communities in the face of huge technological and practical difficulties.

These projections were among those included in the report of a panel discussion on the potential state of computer and information technology by the year 2000. Chaired by Stephen F. Lundstrom of Stanford University, the panel met as part of the Workshop on Aeronautical Technology: A Projection to the Year 2000, sponsored last year by the Aeronautics and Space Engineering Board of the National Academy of Science. The discussion touched upon possibilities held out by parallel computing, distributed computing, and artificial intelligence to aircraft systems of the future, with emphasis on the role that software will play in tailoring these technologies for use in aeronautics. In turn however, the panel expressed concern that some of the needs of the aeronautics industry are sufficiently unique and limited that government and industry together may have to promote the required research.

Progress in advanced computer and information technology is expected ultimately to influence the aeronautics industry on all fronts, the panel reported, from the early phases of design to actual manufacture and use. By the year 2000, integrated design systems, featuring "local processing power...comparable to the highest performance supercomputers of today," and linked to larger distributed systems with access to advanced supercomputers, should be able to reduce the current 15-year development period for major aeronautical products to 12 years or less. "Such an improvement in productivity...would allow these aircraft to use electronic technology which is the state of the art a few years before the aircraft is shipped, rather than technology which is close to obsolete by the time the product is in production," the report says.

Although a large part of this improvement will come as a result of hardware advances that will produce components 100-1000 times more cost- and size-effective than those available today, workstations with 50-Mword RAM and rotating storage of 10-1000 Gwords, and supercomputers with a total processing

power of up to 1000 Gflops and 10 Gwords RAM, the report predicts that software will also play a central role, especially in the areas of system architecture, high integrity, human interface, and expert systems.

The aeronautics industry will most heavily depend upon the software industry in the construction of algorithms to support extremely sophisticated parallel and distributed architectures however, the report predicts. On a general level, parallel processing is requisite to any advance in processing speed beyond the limits of von Neumann architecture; but today's parallel architectures are not sufficient for high-speed solution of linear algebra, image processing, computational fluid dynamics, and other challenging problems. Once new highly parallel algorithms are understood and developed to support very-high-performance, highly concurrent, tightly coupled multiprocessors, the report continues, "supercomputers are expected to be capable of studying physical effects which currently cannot be studied either experimentally or computationally." Further, the report predicts that by the year 2000, "effective parallel architectures employing thousands of processors will be available" for airborne applications.

Software support for the airborne environment will extend to various forms of artificial intelligence as well, the report continues. "Expert systems" are likely to be widely used, though restricted to those portions of systems where well defined, codifiable "expertise" is available. Some expert systems may even be applied to real-time problems, but only in instances that require relatively small knowledge domains. Here the report says that the software profession must address the major present limitation on the use of expert systems: "the manual process of acquisition, organization, and structuring of the knowledge base." The tedious problem of translating a complex discipline into a knowledge base now restricts expert systems to applications that are not time-critical; and the report pessimistically notes that "the divergence in the rate of improvement in the ability of equipment to support complexity compared to the growth of application complexity will prevent indefinite scaling of these systems."

In other areas of artificial intelligence however, including robotics, goal seeking and reasoning systems, vision,

speech recognition, and natural language understanding, the report expects significant improvement in user capabilities. "The anticipated computation-rich airborne environment will support a new kind of man/machine interface designed to facilitate situation comprehension by pilots," the report says. "Information delivery tools...will be designed with emphasis on information presentation and comprehension, not just data delivery."

Finally, the report notes that software will play a key role in ensuring the level of integrity required by aeronautics systems. Although such integrity will in part derive from redundant hardware, new hierarchical techniques that include software will be needed to deal with possible faults in highly parallel systems. Furthermore, the report says that "theorem checking must be developed to support the validation and verification of computer systems. This will involve specification languages and formal development procedures." Because aeronautics integrity requirements throughout the entire process of design and implementation are far more rigorous than those demanded by commercial systems however, the report stresses that leadership on this front must come from interested sources: in particular, from government and from the aeronautics industry itself.

"The appetite for high performance computing in aeronautical research and system design appears boundless," the report concludes, although it will be limited in the future by the availability of new architectural concepts, conceptual models, and algorithms, especially where they relate to the design and implementation of high-integrity systems. Nevertheless, the report urges that "substantial economic benefit and improved international competitiveness can accrue from the development and use of advanced, integrated tools supporting the life cycle of aeronautics products."

The findings of the panel on computer and information technology were first published in *Aeronautics Technology Possibilities for 2000: Report of a Workshop*, by the Aeronautics and Space Engineering Board of the National Academy of Sciences. "The Potential State of Computer and Information Technology in the Year 2000," a paper by Stephen Lundstrom with Ronald L. Larsen of NASA that includes all the findings in the workshop report, was presented this year at the Hawaii International Conference on System Sciences, held January 2-4.

Industry shake-up felt at Comdex

Torrey Byles, Contributing Editor

Software has begun to overtake hardware as the engine of growth in the computer industry, according to speakers at the fall Comdex in Las Vegas. "Of all computer user organizations in the country today," said Ed Yourdon, founder and chairman of Yourdon, Inc., a computer consulting firm specializing in software engineering, "whether they have a mainframe or just a personal computer, 50 percent of the company's computer expenditure is for hardware, the rest is for software. And the trend is more and more money being spent on software."

"The ground rules are changing," said Apple Chief Executive Officer John Sculley, in reference to IBM's announcement of in-house software such as *Top-View* and a package that links the AT with the system 36. "The big innovations are going to be in software [and not in hardware]," he said. Sculley held that today the computer is going through an evolutionary transition from "hardware machine to software appliance," implying that the computer, with improved software, will no longer be accessible just by the computer experts, but by all who have information handling needs.

Nevertheless, in the microcomputer market where software sales are galloping ever upward—totalling \$2.2 billion this year, and increasing 30 percent annually, according to Future Computing President Portia Isaacson—the approximately 8000 vendors of software are just too many for the market to sustain. The buzzword at the show was "shake-up."

"No pie is so big that you can't cut it up into such small pieces that nobody makes any money," said David Wagman, founder and chairman of Softsel, a software distributor, regarding today's vendor-heavy software market. Much of the competition is a result of vendors concentrating on a limited selection of applications. According to John Couch, president and CEO of Lightyear, a Sunnyvale software technology company, today's software products consist of only three basic types: word processing, database management, and spreadsheet packages. Wagman and Couch insisted that vendors, in order to survive, must develop original software applications, perhaps singling out specific market niches (for example, clerical workers,) and building a solution for them.

Although emphasizing the need for vendors to create innovative software, speakers characterized software as having become a "marketing-driven in-

dustry," where good product distribution is paramount to success. Inexperience in marketing has been responsible for many software house failures, said Wagman. Either the vendor would buy too much advertising for a product that wasn't needed, or would spend it in the wrong areas. "The most effective sales tool for the next few years will be that guy standing on the sales floor." Therefore, spending money to train and support the salesperson is generally a much smarter use of the advertising budget than buying more media, he suggested.

According to Isaacson's surveys, almost half of all business application software for personal computers is sold through computer speciality stores, making the stores the most important mode of distribution. (Other modes are mail order, software stores, direct sales, and value added resellers.) A dispute still remains unresolved between these stores and software vendors. Store dealers are complaining that they are spending too much time learning—and then demonstrating to the customer—complicated packages. Assisting the customer in troubleshooting the package after the purchase also consumes valuable sales time. Speakers noted the growing importance that demo/instructional software plays in the distribution process. William Luden, president of the computer retail chain, ComputerEase, recommended that vendors could help alleviate the dealer's workload by installing kiosks in stores that contained, in addition to product literature and displays, an instructional diskette loaded in a computer and a telephone hot line to the vendor for questions and answers.

ICCP and Singapore reach accord

The Institute for Certification of Computer Professionals has entered into an agreement with the National Computer Board of Singapore that will lead to the establishment of ICCP certification of Singapore computer professionals.

The agreement was signed October 23, 1984. Examinations will be conducted in Singapore that will lead to the awarding of the Certificate in Data Processing and Certificate in Computer Programming, the two major programs now offered by ICCP. The first examination under this agreement is scheduled to be held in Singapore in May, 1985.

In other developments, two major associations representing information

Software development efforts by startups require tight management organization and control, Softsel's Wagman advised, especially in today's contracted venture capital market. Plan according to the business cycle, preserve the ability to contract business, match cost to revenue, and let dead products die, he cautioned. And as the market is full of competitors, don't wait until the product is perfect—you will be passed by.

Significant change in the software industry over the next five years will be the norm, according to the show's speakers. Currently, said analyst Yourdon, IBM derives 59 percent of its revenues from hardware sales and 41 percent from non-hardware, namely, software, sales. But these numbers will invert by 1990 such that, "in a sense, IBM will become a software company."

Yourdon sees a major consolidation of the computer industry comparable to that which occurred in the automobile industry. (In the 1920's, more than 100 independent makers were in the market.) By 1990, he predicted, only three to four makers of mainframes and only two to three makers of mini/micro systems will exist. Giant software companies will have acquired many of the hardware companies that didn't keep up.

Most astonishing is Yourdon's prediction that third world countries, where labor is relatively inexpensive, will take over the role as producers of software in the 1990's, particularly software maintenance products. Yourdon said that the combined salaries of computer programmers in the English speaking third world countries of Singapore and the Philippines are already one sixth those of America.

professionals have been accepted as members of the Institute. The Association for Systems Management and the Office Automation Society International have joined ICCP, bringing to nine the number of major organizations now members of the Institute.

The other societies and associations that are members of the Institute are Association for Computing Machinery, Association for Educational Data Systems, Association of the Institute for Certification of Computer Professionals, Automation One Association, Canadian Information Processing Society, Data Processing Management Association, and Computer Society of the Institute of Electrical and Electronics Engineers.

Microprogramming archive dedicated in Louisiana

The University of Southwestern Louisiana's new International Microprogramming Repository, was dedicated October 29 in Lafayette, Louisiana.

As computer professionals know, there was no uniformity to the design of the control unit of a computer before the advent of microcode. Microprogramming introduced a systematic way of designing a control unit.

One of the guest speakers at the dedication was Maurice Wilkes, the former Cambridge University professor who is now a research scientist for CEC. He first suggested microprogramming in his paper, "The Best Way to Design an Automatic Calculating Machine," presented to the Manchester University Computer Inaugural Conference in 1951.

Bruce Shriver, USL adjunct professor of computer science and editor-in-chief of *IEEE Software* magazine, conceived and established the USL Microprogramming Repository. "So many machines depend on microcode, and such a large number of efforts have been conducted all over the world, we felt it would be a valuable service to bring these many contributions under one roof," he said. Shriver, who is the Alfred Lamson Research Professor at USL, is also a member of the research staff at the IBM Thomas Watson Research Center.

"The repository is analogous to, say, an archive of all the poems of James Joyce, and all of the scholarly writings about those poems. People can come to the repository and know that they have the richest collection of materials available in the study area."

USL has secured many hundred of different items for the International Microprogramming Repository: articles, reference manuals, working papers, sales literature, samples of actual microcode for specific machines, unpublished notes and papers, doctoral dissertations, and even parts of early computers.

Among the items thus far submitted are a 1966 microprogramming manual for the IBM 360 computer; a 1967 article, "Microprogramming Revisited," by Stanford faculty member Mike Flynn (who was also one of the guest speakers at the dedication) and Donald MacLaren; Magnus Persson's "Design of Software Tools for Microprogrammable Microprocessors"; and "Dokumentation zu den IOP Lade-Programmen," by Gerhard Chroust and A. Kruezer. Also included are Maurice Wilkes' "Microprogramming: The Hardware-Software Interface," and C. V. Ramamoorthy's "A Survey of Techniques for Optimizing Microprogramming."

IEEE announces competition

The Institute of Electrical and Electronics Engineers, Inc., has announced the 13th annual competition for congressional fellowships, a congressional internship for members of IEEE.

Electrical and electronics engineers and allied scientists are competitively selected to serve a one-year term on the personal staff of individual senators or representatives or on the professional staff of congressional committees. The program includes an orientation session with other science-engineering fellows sponsored by the American Association for the Advancement of Science.

The purpose of the fellowships is to contribute to more effective use of scientific and technical knowledge in government, to educate the scientific communities regarding the public policy process, and to broaden the perspective of both the scientific and governmental communities regarding the value of such science-government interaction.

Fellows shall be selected based on technical competence, on ability to serve in a public environment, and on evi-

dence of service to the Institute and the profession. Specifically *excluded* as selection criteria shall be age, sex, creed, race, ethnic background, and partisan political affiliations. However, the fellow must be a US citizen at the time of selection and must have been in the IEEE at member grade or higher for at least four years. Additional criteria may be established by the selection committee.

IEEE plans to award two fellowships for the 1985-1986 term. Further information and application forms can be obtained by calling W. Thomas Suttle [(202) 785-0017] at the IEEE Washington, DC, office, or by writing

Secretary,
Congressional Fellows Program
The Institute of Electrical and
Electronics Engineers, Inc.
1111 Nineteenth St., NW, Suite 608
Washington, DC 20036

Applications must be postmarked no later than March 30, 1985, to be eligible for consideration.

TV anchor to moderate Softcon keynote seminar

Ted Koppel, anchor of ABC TV's *Nightline* program, will moderate the keynote panel discussion, "The Future of Software," at Softcon in Atlanta, March 31 through April 3, 1985. Panelists will include Mitch Kapor of Lotus, Esther Dyson of Rosen Research, and John Scully of Apple.

"Koppel will give the keynote discussion a sharp focus and keep it lively," a spokesman for Softcon said. "With a reputation for bringing the best out of his interviewees, Koppel is sure to engender a substantive and entertaining discussion."

Koppel and the panelists will be available to meet with softcon attendees following the keynote discussion.

Softcon's exhibitors will showcase software products for business, professional, office, home, education, entertainment and vertical market applications, including accounting, agriculture, banking, communications, insurance, medical industries, and real estate.

The Softcon Conference Program consists of three separate conferences, each designed for the three audience groups attending Softcon: distributors and merchandisers; corporate and institutional buyers; and software publishers and developers.

SESAW III: A Summary

Martha Branstad, NBS

The third Software Engineering Standards Application Workshop was held in San Francisco, October 2-4, 1984. The workshop, organized around the theme, "Standards in a Competitive World," provided a forum on the need and the implementation of standards, as well as other general issues associated with standards development.

Overviews of standards activities within voluntary organizations, the Federal government, and professional societies were presented. The software development standards produced by the Joint Logistics Command, and software engineering standards being developed within the IEEE were outlined. The remainder of the workshop was composed of

- (1) Papers that presented experiences with the implementation and use of software engineering standards;
- (2) Panels that discussed data collection, software life-cycle issues, and software standards in the nuclear industry;
- (3) Forums in which to discuss activities and issues of various IEEE software engineering standards working groups on metrics, verification and testing, and software quality related issues; and
- (4) Smaller discussion groups, organized around specific topics of general interest.

The attendance of over 190 people from 10 nations attested to the growing interest in standards.