

EXCHANGE

BRIGHAM YOUNG UNIVERSITY SCHOOL OF MANAGEMENT

SPRING 1987

Making the Most of
Information Systems?



DEAN'S REPORT

The School of Management is making significant progress in preparing students for the world of computers and the management of information systems (MIS). We're strengthening the faculty and the curriculum and providing state-of-the-art equipment and learning experiences. To coordinate these efforts, we've established a faculty steering committee led by Owen Cherrington. Committee members review curriculum, encourage research and writing, and provide the stimulus for better MIS teaching. The group's excitement is being transmitted to both faculty and students.

The School's computer facilities improve each year. For example, the lab now has 78 IBM PCs and 30 Apple Macintosh units. The computer classroom contains an additional 41 instructional PCs. Virtually all faculty have computers in their offices, and although it is not a formal requirement, graduate students are encouraged to obtain computers. The School has received excellent support from hardware and software firms. AT&T donated 15 microcomputers, Apple Computer donated equipment, Lotus Corporation has given graphics packages, and Novell is working on a major networking project for the School.

Computer literacy among faculty is established, and members are pursuing exciting, challenging activities in teaching, writing, and publishing. Owen Cherrington and Marshall Romney have developed and are teaching a systems course on the integration and use of microcomputers with mainframes and data bases. They originally developed the course to instruct IBM personnel, but have found application for it in their BYU classroom presentations.

In early 1986, the American Assembly of Collegiate Schools of Business selected BYU as the site for its 1986 seminar on computer-assisted finance teaching. BYU, as the cosponsor, provided the facilities for this highly successful seminar, taught by Brent Wilson. Shortly after its conclusion, the AACSB asked BYU to cosponsor a second seminar, which will feature the computer in marketing education and will be taught by Scott Smith. These AACSB invitations show recognition that we are leaders in management computer education.

The School is adding faculty who have outstanding credentials and experience in the MIS area. Other faculty members have taken professional development leaves to gain insights into the MIS needs of businesses and organizations. This industry work provides first-hand experience to our professors, who then transfer their knowledge into the classroom. Other faculty members are publishing MIS-related articles and books.

Although this emphasis is new, our students recognize the value of obtaining strong MIS skills in preparing themselves for the job market. Currently, one hundred majors are enrolled in the information managements bachelor's degree program, and the second largest accounting concentration is in information systems. All SOM programs now provide MIS instruction in both required and elective courses.

The School is preparing its faculty and students for the future—for the world of the computer and MIS.

Paul H. Thompson

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Grasping the Possibilities

REAL MEETS -ARTIFICIAL- INTELLIGENCE

Gary Carlson

What in the world is “artificial intelligence?” That’s a question being asked more and more in business and general literature.

Food producers have just convinced us that “natural” is best and “artificial ingredients” should be purged from our diets. Now, along come the high-tech folks all excited about *artificial* intelligence.

What exactly is artificial intelligence (AI) and what does it mean for us? Is it just another passing fad? How does AI differ from “real” or “natural” intelligence? Can anything from AI give me greater net profit? Can it help solve the daily problems that take so much time? Can AI help me to plan ahead and

reduce the crisis mode? Can it replace some of my helpers? Let’s take a look at a small part of the AI field and attempt to answer these questions. But before we begin, let’s back up and consider just what “natural” intelligence is.

Natural Intelligence

“Intelligence” usually refers to smart or useful decision-making behavior. When a manager makes a sound business decision, we infer that it was an intelligent decision. The higher the stakes, the more we hope to have intelligent decisions. The more complex the decision, the more we need good intelligence, both in information and brain-

power. The lower the stakes—the more routine the task—the less intelligence needs to come into play.

In low-stakes decisions—the routine or trivial choices we make—people have limited opportunity to use their intelligence. Many industrial jobs have been designed so that people are expected to act as robots—unthinking, just following instructions. We often think of this behavior only in a factory setting, but many office routines produce the same kinds of stifling behavior.

Real intelligence involves people’s ability to solve problems in new, creative ways. Yet there are many jobs in which we do not want creative behavior (or maybe management wants just a lit-

tle, but not too much). The clerk must process claims forms in a routine and consistent manner, but "use his or her head" when an exception comes along. The assembly line worker must not miss a single bolt, but if the hole is not properly drilled, he or she must "take intelligent initiative," and not slow down the assembly line. Managers want consistent and reliable behavior, but they also want people to make good choices when things go wrong.

Computer Tools

So how can organizational leaders help their people make good decisions when faced with the unanticipated exception to the routine? Enter computer technology. Obviously, computers have evolved to a point where they can now help people in business, to varying degrees. The computer can handle routine math calculations. It can also do routine clerical tasks like posting, sorting, and filing. (For some time now we have used computers for clerical tasks in large, repetitive systems like check processing, inventory control, airline reservation systems, etc.)

Who most benefits from these computer operations? It appears that the most common use of computers is for producing control reports—those that help the lower manager monitor events, dollars, people, and other resources. The lower-level manager often takes the report at face value and can act directly on the information.

Middle managers typically use reports to assess the status of one or more departments within an organization.

Executives usually do not receive computer reports directly. More often they get reports from middle managers, so they're served indirectly by the computer.

The point of all this is that, until recently, *the help that people received from computers was inversely related to the opportunity to use their human intelligence*. That is, the level at which the computer is able to be most helpful is also where less opportunity exists to use one's own intelligence. Extensive computerization at clerical levels leaves little room for initiative, and executives (who

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must make broad policy decisions) receive only indirect help from computer information systems.

Spreadsheets and Data Bases

Two recent tools are beginning to change this picture: spreadsheets and data bases. They allow people to keep their brains in gear, even while using a computer. These tools are not used at the lower clerical levels, nor generally at the top levels of management, but in the middle range of office workers, from systems clerks to middle management. But people using spreadsheets and data bases must remain alert to the numbers and information coming from the computer to be certain that the data are correct and meaningful. Recently, a lawsuit was brought by a spreadsheet user against the maker. Apparently the user employed the spreadsheet incorrectly, and a number showed on the printout that was *not* properly included in the total. The total was therefore wrong, but the sheet "looked OK." The user is claiming that the maker of the spreadsheet should not let this happen! There are probably many complications that we are not aware of in any particular case, but the idea is common. The user thinks that the responsibility for accuracy somehow can shift to the maker of the tool. To avoid this trap, we still need to do "back of the envelope" calculations, that is make a quick approximation of what range the numbers ought to be within, and make sure that the answers coming out of the computer are *reasonable*.

Two other tools coming onto the market continue the movement toward helping middle managers. These are *natural language interfaces* and *expert systems*. As with the earlier tools, care must be taken to use these tools appropriately by

keeping the brain in gear. These new tools make it easier than ever to let us think, to use our real intelligence, while not worrying so much about the details of computer language and operations.

Natural Language Interfacing

Natural language interfacing means that a noncomputer person can ask questions of a data base using language that looks close to normal conversational English. The commands must be typed, but the user does not have to know any special computer jargon. An example for microcomputer is the natural language interface called CLOUT by MICRORIM. In this query language, a user might ask: "Please give me all of the salespeople with sales above \$120,000 who work in northern California." The system examines the query for "understanding." If CLOUT does not understand any term, it asks the user what is meant by the term. CLOUT then asks you if you want to add this new term to the computer's vocabulary. This way, the computer adapts to each user and his or her particular vocabulary.

After the query is understood, the system does the search, often through several tables of data. When the answer is displayed, the user can ask more questions about this new subset (in the above example, after the list is displayed, the user can ask: "Now all in Sacramento." Only those salespeople meeting this new criteria are displayed.).

Natural language interface allows a user to start with broad questions and easily narrow down requests to get the information needed.

An example from a retail furniture store data base shows the process. A broad question is entered into the computer: "Show me all customers by last name." CLOUT searches the files and displays all customers sorted by last name.

We then type: "Now all with TVs." CLOUT searches the above customer list and selects only those customers with TVs.

We then type: "Now all over \$400." CLOUT makes a further selection by sale price. Note that the program accepts English statements just as they are

shown above.

Natural language processors allow a great deal of flexibility in how we pose a question. The above sequence of questions can be entered as: "customers"; then "show all"; then "TVs"; then "over 400," and we will get the same answers. Note how brief and cryptic the questions can be stated.

Another example of the great flexibility is shown with a simple query. All of the following give the same result:

List all customers who bought a TV.

Give me all customers with TVs.

Which customers purchased TVs.

TVs were bought by which customers.

Or we can be very cryptic:

Customers TV

Or very wordy:

Please give me a list of all customers who bought a television.

We can also ask a series of questions: Did someone buy a TV? The computer answers: "Yes!" We can then enter "Who?" and get a complete list.

Hopefully, the user is thinking carefully (i.e., using natural intelligence) about what information will be of use. This is a highly interactive process that lets the user concentrate on getting the information wanted, rather than worrying about a complicated computer language. We call such a process "nonprocedural." This means that the user asks *what* is wanted, not *how* to get the answer.

Most business communication at the management level is nonprocedural. For example; the boss says "Increase sales by 30 percent." He is telling the sales manager to get a job done—any way that is reasonable. The *how* is left to the initiative and ingenuity of the sales manager. Clerical tasks, by contrast, are often procedural. We tell the worker how to do a task and hope that the results will be what we want. Since most management communication is nonprocedural, managers are finding that natural language interfaces feel comfortable.

But, there is a very real danger! Natural languages have a lot of ambiguity and redundancy. Natural language computer interfaces retain the ambiguities, but *not* the redundancy, so it's easy to ask a question in such a way that we get

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a wrong answer. Even more damaging, there's no indication that the answer is wrong or incomplete.

There are three types of problems:

1. We ask a question and get *no* answer. This is not really too bad, since the lack of any response can alert us to a possible problem. For example, we enter "How many customers bought a TV?" The computer responds with "5." We then enter "who?" The computer, in this particular case, responds with nothing. We know that something is wrong, so we try again. We enter: "Did somebody buy a TV?" The computer responds with: "Yes!" We enter "who?" The computer then gives a correct list. Subtle differences in the way we ask a question can give different answers.

2. The computer gives only *part* of an answer. This is a very serious problem. For example, we enter "List sales transactions where the customer ID equals 200." The computer lists only one line of data. We suspect that there are more customers who meet the criteria. (That is, we suspect this *if* our real intelligence is still working.) We try again: "List all sales transactions." The computer gives a correct list. We then enter: "Now list where customer ID equals 200." The computer then lists *all* of the correct transactions. Why the difference? We are not sure yet. We are just starting to explore the problems of such queries.

3. Now for the very worst condition: the computer gives the *wrong* answer. For example, we enter "Who bought a TV?" The computer responds with a list of all TVs that are in the inventory, with no customer names showing. A sleepy user could erroneously conclude that there are no customers in the file who have bought a TV. Part of the problem, in this particular system, is that the word

"who" is a special, reserved word. By contrast, if we ask "Which customers bought a TV?" we get the correct answer.

We are currently conducting research aimed at understanding and solving these problems. We hope to soon provide guidelines on avoiding such pitfalls in this emerging field of natural language query.

As with most good things in life, natural language interfaces are a two-edged sword. They are easy to use, but they can give wrong answers. When using them, we *must* visualize what a reasonable answer might be. Do use back-of-the-envelope figuring to make sure answers are within a reasonable range and that they make sense.

Expert Systems

Expert systems allow us to capture a human expert's knowledge and put it into the computer for others to use. These systems are also called "knowledge-based systems." Many special tools are used to develop expert systems, and while no single technique has emerged as *the* way to develop them, so-called "knowledge engineers" are doing a lot of exploration. Some tools can be used by noncomputer people, but programming experience seems essential to get much done beyond the most basic levels. This means that if you want to start exploring possible expert systems applications, you probably *do* need to have a computer programmer help you work through the process.

Conditions under which an expert system might best be considered are:

1. Where needed decisions are moderately complex—not too simple, and not too complicated.

2. Where decisions are not made on a wholesale basis. (In other words, there are many special circumstances that impact a best solution for a specific situation.)

3. Where human experts *do* exist—that is, there are people who really do know the answers. There may be only a few such experts, but they are available. The ability to capture a person's expertise while it is available (before a person retires or moves to a competitor) is one

of the strongest advantages of expert systems.

4. Where the outcome of correct decisions has a moderate economic value—not too low, and not too high. Low-value decisions can be made at lower cost using people (real intelligence). High-value decisions are made by people, since we can not yet totally trust these new tools. As we gain experience and confidence, the ability to deal confidently with software-generated higher-value decisions will be enhanced.

5. Where the decision process can be safely explored; i.e., there are no taboos, no legal restrictions, no political impediments to a careful analysis of the decision process. (No one in power will be seriously threatened by trying to “automate” the decision process.) But—*user beware!* Just as we saw with natural language queries, we must keep our real intelligence working. Expert systems can appear to be working—and giving correct answers—when, in fact, the answers are wrong.

Conclusion

Just as spreadsheets and data bases have given middle managers new tools, natural language interfaces and expert

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systems—two new AI tools—can also help. But users must be careful when using AI. *Do* be sure to keep natural intelligence in good working order. Always make the human intelligence tests of reasonableness.

There are no computer programs that can yet test for a sensible *and reasonable* answer. A few people are starting to work on that, but nothing of importance has emerged. To be safe, assume that the computer has inadvertently tricked you. Doubt the output. Then with review, you can get better and more reliable information in less time.

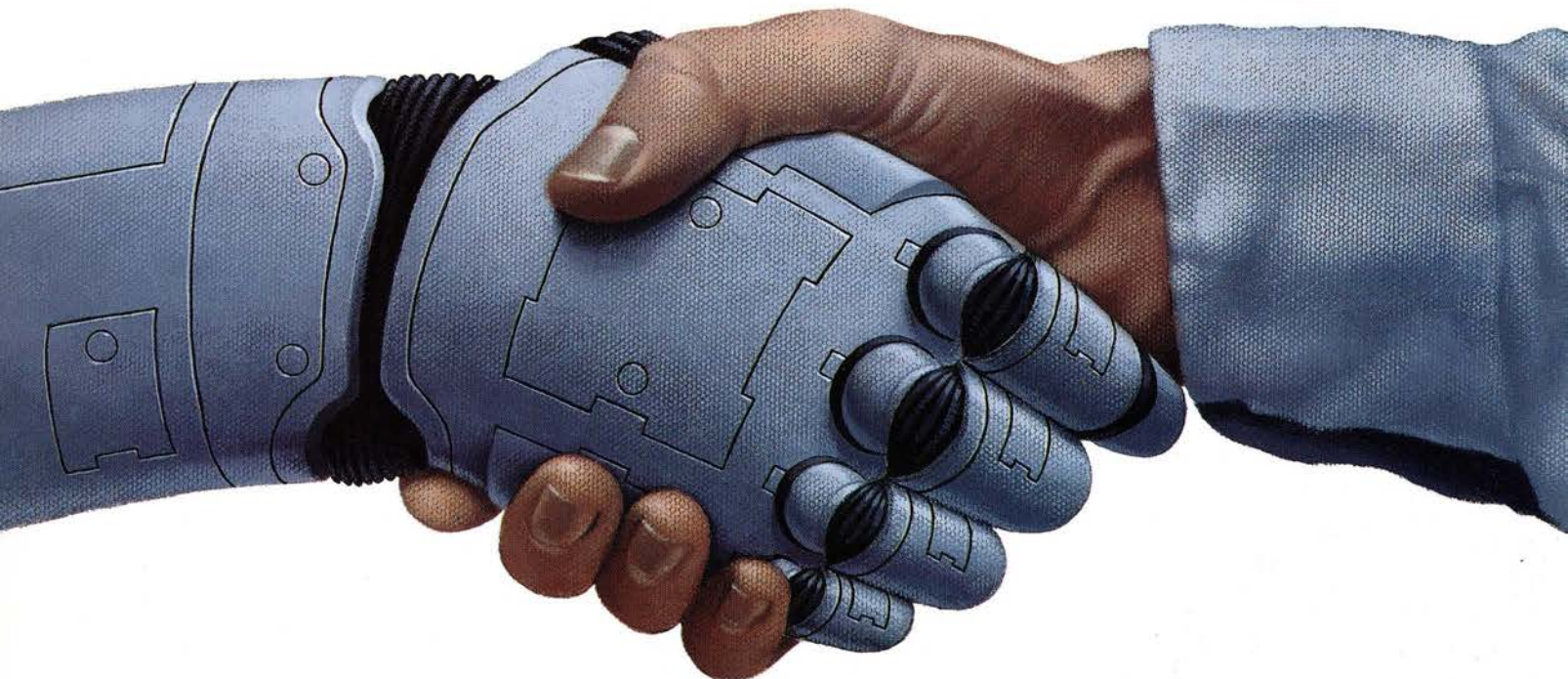
To get the most out of these new tools, plan to work closely with information management specialists and computer scientists. The research scientists need “real people” to help understand the problems that are of most concern to

management. Managers, however, can be of little help until they become familiar with the new tools—only then can they suggest meaningful improvements. Managers and technicians need to be able to talk the same language in these new areas.

As managers continue to explore different AI topics, they can expand computer usage and still use “real” intelligence. Going a step further, such research could lead to effective computer use at higher and higher levels of management—finally bringing the power of the computer into the executive suite. ☐

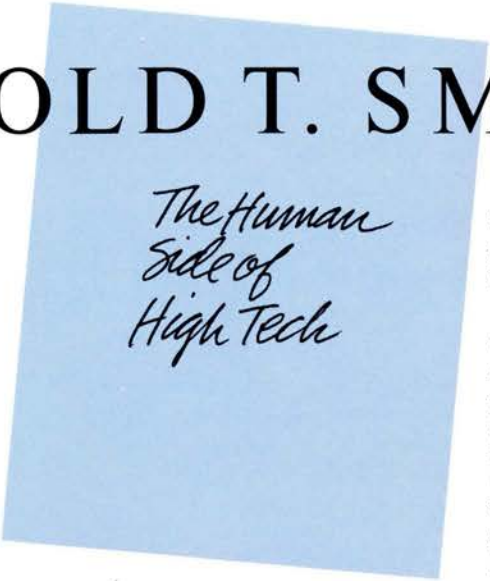


Gary Carlson, Ph.D., is a professor in the Department of Information Management at Brigham Young University. He recently returned to BYU after several years in industry. He is interested in combining practical management approaches with new computer techniques like expert systems, computer learning, and computer-aided inductive logic. He has a continuing interest in tuning computers for more efficient operations.



PROFILE

HAROLD T. SMITH



*The Human
Side of
High Tech*

When a BYU management professor recently returned from a consulting trip to Saudi Arabia, he brought back with him a colorful poster a firm there uses to help its managers be more effective. A title across the top reads "20 Critical Management Competencies," and a note of credit just under it says: "Adapted from a study by Dr. Harold T. Smith at Brigham Young University."

Those few words speak volumes about the worldwide recognition for the work of Dr. Smith, professor of information management and director of the Information Management Program at BYU. The study was completed almost a decade ago, garnering publicity throughout the United States and in several other countries, and Dr. Smith continues to get inquiries about it.

This year, Dr. Smith's sphere of influence is expanding even further as he takes the helm of the 9200-member international Administrative Management Society, the largest and most respected organization for office managers.

The driving force behind Dr. Smith's tenure as president of AMS—the purpose guiding his entire career, in fact—is clear and straightforward, as is the professor himself.

"My overall mission in my profession is to try to help people become better managers. Everything I've done has led along that path," he says.

William Baker, chairman of the Information Management Department, has written two textbooks with Dr. Smith and has team taught classes with him on occasion, instructing students in such principles of management as long-range planning, leadership, delegation, decision-making, and communication. He says his colleague is the epitome of a professional who practices what he preaches.

"One of his greatest strengths is the ability to apply the concepts taught in the classroom to a real-world situation...." says Dr. Baker. "I see in everything he does the proper application of those principles."

Almost immediately after Dr. Smith took the office as AMS president, his skills became apparent. He quickly devised a five-year plan and set forth four major goals that he calls "critical success factors."

"There's a difference in the communication coming from AMS international headquarters now than from a month before he took office," says Dr. Baker. "He is a very perceptive leader. He has a knack for identifying specific problems and for coming up with solutions."

And if that endorsement isn't enough, Dr. Baker also says without reservation that his colleague is a consistently high producer.

"He's a great model for others to follow."

Two of Dr. Smith's best-known studies are solid evidence for Dr. Baker's assessment. For the critical skills study, Dr. Smith culled the results of surveys for the most salient principles, then cap-sulized them into a list, making them simple, accessible and therefore usable. And he did it without slipping into the superficial easy fix. The first item on the list, one of four "super critical" factors, is to listen actively. That includes, his

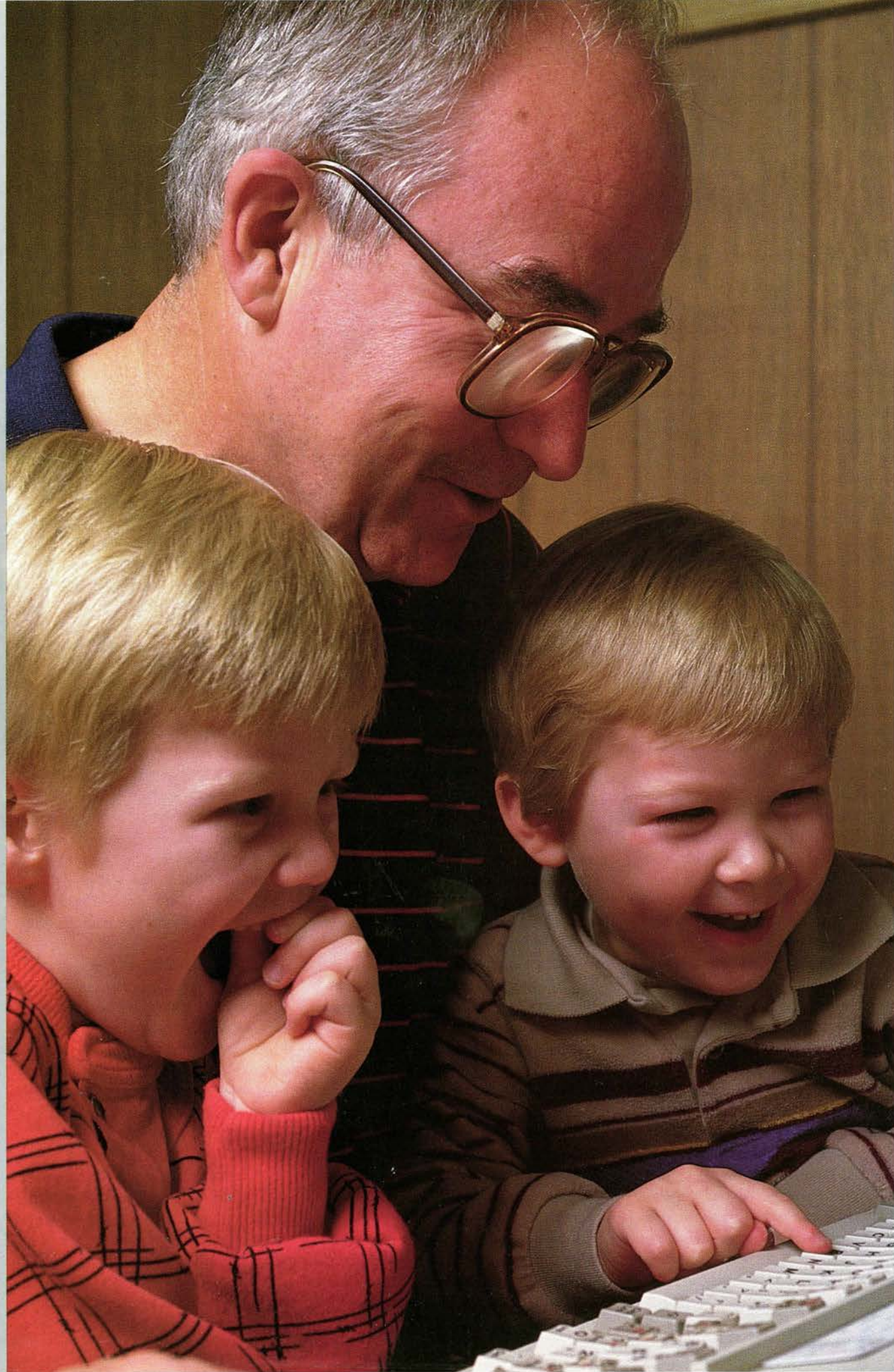
study noted, showing care and concern, observing body language, noticing feeling tone, and reflecting understanding.

The other project is just as straightforward and practical. For it, he produces a monograph, "Human Resources—Issues and Trends," as the first of a four-part study launched by AMS in 1982 on "Managing the Office—1990 and Beyond." In the report, Dr. Smith gets his readers' attention immediately by transporting them to an office of the future, complete with voice-recognition computers and sparsely populated corridors. Many employees, the time-traveling reader discovers, work at home and communicate with the office via computer.

The rest of the study identifies in elegantly simple prose the problems managers will face as offices become automated, how those managers should prepare and what solutions are possible. Always the antithesis of the myopic professor hunched over books in an ivory tower, he sees the big picture as well as the nitty gritty—from the loss of identity and dehumanization that could occur in automated offices to the need for posture studies, correct chairs, and proper lighting to serve people who will spend most of their working lives at a computer terminal.

Such people-oriented research might seem unlikely coming from a man who specializes in management of information through computers and whose two highly successful texts bear the titles *Automated Office Systems Management* and *The Administrative Manager*. But Smith considers technology only a tool—albeit a valuable one—that is, after all, used by human beings.

"I don't restrict myself to computers and systems and things of that nature. It's everything involved with what managers are concerned about—time management, setting goals, communication. And of course the computer and systems provide a tool that helps managers to do



a better job given each of those individual areas.”

Dr. Smith practices what he preaches in the family setting as well, where he says managing a brood of nine children alongside his wife, Victoria, is not so different from managing a business.

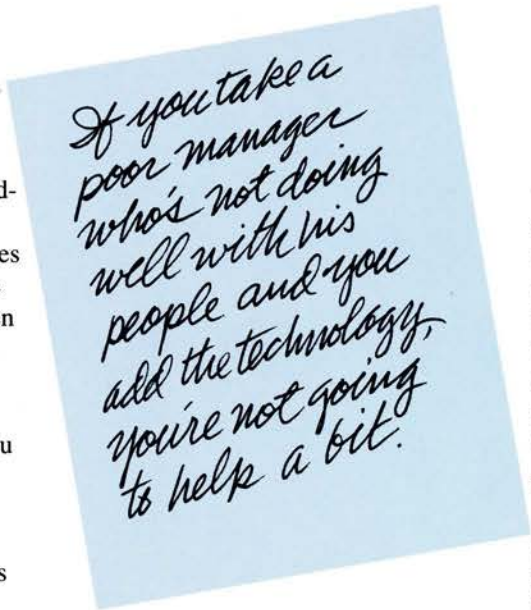
“There’s a lot of carryover.... For example, with people in any group you have to be able to communicate; you have to be able to get them motivated and to want to move on their own. Another of the critical competencies is listening to people.”

He enjoys his family tremendously, he says, and is making sure his grandchildren learn at an early age to feel comfortable with computers. He has purchased software for his home computer that even a two-year-old grandchild “can just bang away at” as it lights up and makes noise.

Dr. Smith would never consider, of course, valuing his computer hardware or software above the worth of his grandchildren, but he has found that some managers let technology take precedence over employees. He therefore agrees with current conventional wisdom that human concerns must emerge as paramount as technology becomes pervasive. If companies don’t orient themselves in the caring, people-oriented direction, he says, technology’s two-edged sword could inflict serious wounds.

“We have all kinds of technology available to do most anything you want to do, but you can waste a lot of time with it. The idea is to get people to the point where they’re really better off and more effective because of the use of the technology.

“If you take one manager who’s a good, effective manager with people and bring in the technology, he’s going to improve his operations. If you take a poor manager who’s not doing well with his people and you add the technology, you’re not going to help a bit.”



If you take a poor manager who's not doing well with his people and you add the technology, you're not going to help a bit.

Smith cautions in particular against managers who are so totally taken with the power of computers that they immerse themselves in high technology and demand the same of others. Such people must guard against their machine orientation, lest they “just get buried in technology and lose out completely.”

Smith also predicts that the problem of technophobia, mostly among the nation’s older workers, will not go away until the work force is completely replaced with those who have grown up with computers. That means managers have to know how to motivate even those who resist technology, since such men and women are often among the most experienced and valuable employees.

“Basically the solution is to show them results, show them how they can benefit. When they see somebody else using (a technology) and out-producing them, maybe getting promoted and making more money, just doing better because of it—it’s a powerful motivator.”

Smith began his career as a management analyst for the Utah Army Depot in Ogden after completing his master’s degree in business education at Colorado State in Greeley. In Ogden, he and his family joined the LDS Church.

Within four years he had moved on to BYU, where he taught business courses full-time while completing his Ed.D. In

the ensuing years at BYU, he has developed the information management major and program, has been a visiting scholar at Western Michigan University, has been named distinguished professor in the School of Management, and has consulted for such companies as General Mills, Kennecott Copper, and the U.S. Civil Service Commission, helping them plan for automated office systems.

Since 1964, Dr. Smith has been one of AMS’s most active members, serving in such positions as president of the Salt Lake City chapter, international director-at-large and vice chairperson for the Research Committee, international vice-president for management education, and first vice president. This year he is slated to receive AMS’s top honor, the Ambassador Award.

In his role as AMS president, Dr. Smith has an unusual opportunity to influence his profession. The organization produces a newsletter and a monthly magazine, offers seminars, conducts surveys, sponsors research, and produces publications of use to its members.

It sponsors a major annual conference that draws nationally known speakers and participants from all over the world—this year’s is in Chicago. Aside from overseeing those efforts—with the help of 25 full-time staff members at AMS headquarters in Willow Grove, Pa.—Dr. Smith will be traveling extensively during his tenure as president to speak and visit AMS chapters nationwide. In addition, his role requires him to meet many top corporate leaders, which he considers a benefit to the college—particularly its placement program.

These many responsibilities are also privileges, he says, and they make all the work worthwhile.

“So many opportunities never would have opened otherwise, so I feel I owe a lot to AMS. This year is partly paying back for a lot of those things.” ■



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IS INFORMATION MANAGEMENT A BIG BOON TO SMALL BUSINESS?

William H. Baker, C.A.M.

The computer age has helped create an intense interest in information as a vital management resource. Large organizations have invested billions of dollars in information management budgets to remain competitive in their respective industries and to comply with legal information requirements. Systems personnel in these organizations have developed sophisticated techniques to exploit the capabilities of information processing systems. Further, approximately one-third of the major firms in the U.S. have a "Chief Information Officer" whose primary objective is to manage the information resource of the organization.* As a result, large organizations have made significant strides in managing information more effectively.

Small organizations, on the other hand, have not been in a position to invest large amounts of money in automated information systems. Further, vendors of information systems have typically not focused major efforts on the small-business market because profit potential is not as great. Today's micro-

*"Straddling the Spheres," supplement to *The Wall Street Journal*, September 16, 1985: 47c.

computers, however, are changing this situation. With the powerful processors and low price tags of these systems, small businesses can now capture many of the benefits of automation formerly available only to larger companies.

To better understand the current status of information management in small businesses, I recently studied forty locally controlled, for-profit small businesses. Twenty of these companies were professional service firms, and twenty were manufacturing firms. Each firm employed less than 100 people. The companies were randomly selected from the 1984 issue of *Utah Directory of Business and Industry*.

The manufacturing companies surveyed produced steel products, clothing, carpentry and woodworking, furniture, bookbinding, medical devices, conveying systems, outdoor lighting, sports goggles, and paper boxes. Professional service organizations handled accounting, legal, advertising, aerial photography, training, recruiting, safety engineering, civil engineering, blueprinting, electrical systems testing, and research and development. To gather data from each firm, I conducted on-site interviews with the chief executive officer or his/her designate.

Where Do CEOs Get Computer Information?

The average CEO had attended school before computer education was a common part of the curriculum. Thus, a

need exists for these managers to receive additional education regarding automation and its use in their organizations.

The most frequent sources of automation information cited by CEOs were vendors/sales representatives, in-house experts, and trade periodicals.

A closer look revealed that manufacturing CEOs receive their information primarily from outside the organization, whereas the CEOs in professional service firms obtain their computer knowledge somewhat equally from both inside and outside sources. It appears that trade periodicals play an important role in both types of organizations.

How Are Information Services Managed in Small Firms?

The next element of study focused on the way information services are managed in these small businesses. Some further differences between manufacturing and service organizations emerged. The former were more likely to have centralized responsibility where only one person has responsibility for all information processes. Ninety percent of the manufacturing firms have such centralized responsibility, whereas only 55 percent of the professional service firms do.

Perhaps one explanation for this is that manufacturing firms are much more traditional in their organizational pattern, with the standard "textbook" organizational hierarchy being very common. Professional service firms, on

the other hand, seem to follow no standard pattern of organization, and committees are used much more in these firms than in manufacturing.

In spite of the centralized approach followed by many of these firms, none use terminology including the word "information" in the position title. Rather, more traditional terms like comptroller, office manager, or V.P. finance are used. In fact, when most were asked "Who is responsible for managing information processing in your organization?" many would respond with "Well, I guess that would be . . ." It seems that the concept of a "Chief Information Officer" has not yet caught on in most small businesses and that the assignment to govern information systems is not yet formalized.

The CEOs in the professional service firms are more involved in giving final approval to automation decisions than are their manufacturing counterparts. While nearly all professional service CEOs get involved in this approval process on a regular basis (85 percent), only slightly more than half of the manufacturing CEOs are regularly involved. These data suggest a need for CEOs and other top-level officers to be "computer literate" in order to make wise decisions regarding automated information systems.

How Many Workers Deal with "Information"?

The average number of employees in the two types of firms was 70.5 (manufacturing) and 33.3 (professional service). Of interest is the marked difference in percentage of "knowledge" or "information" workers between the two. An information worker is defined as an employee whose main work deals with the use or processing of information; e.g., managers, accountants, attorneys, engineers, or secretaries.

As would be expected, the professional service firms work largely with information, both as their main raw material (input) and as their major product (output). Manufacturing firms, on the other hand, work mostly with a tangible product, with information processing serving a support role.

CEO Information Sources*

Information Source	Manufacturing	Professional Services
Vendors/sales reps/consultants	55	25
Trade periodicals	35	45
Outside personal acquaintance	25	35
From owning a PC	25	15
Other businesses	25	10
Experience with in-house system	15	20
College class	15	10
In-house "experts"	10	55
Conventions/seminars	10	20
National trade associations	5	0

*Expressed in percent.

IS INFORMATION MANAGEMENT A BIG BOON TO SMALL BUSINESS?

Degree of Information Processing Automation

Information Processing Task	Manufacturing Companies	Professional Service Companies
	% Automated	% Automated
Financial statements	95	84
General ledger	90	80
Accounts receivable	90	65
Payroll	85	75
Accounts payable	80	47
Taxes	65	50
Mass mailings	60	8
Sales analysis	50	42
Personnel records	45	15
Order entry/processing	44	66
Job costing	44	14
Library/document mgt.	43	23
Inventory management	42	66
Word processing	41	95
Work in process	39	61
General records	33	25
Cash management	32	44
Budget management	31	53
Purchasing	28	0
Planning/forecasting	25	44
Shipping and receiving	25	25
Project management	18	40
Graphics	13	50
Quality control	12	0
Average percentage	48	45

To What Degree Do Companies Use Outside Agencies?

The information processes within the sample companies were also analyzed to determine which ones are being performed by an outside agency. Processes such as taxes, financial statements, and accounts payable are processed by outside agencies for half or more of the manufacturing firms. Only taxes are processed by outside agencies for more than half of the professional service firms. In general, manufacturing firms use outside information services much more than do their professional service counterparts. But overall, neither type of industry uses outside agencies to a very great degree.

How Automated Are These Small Businesses?

Another area of interest was the status

of automation among small firms. Again, some differences were found between manufacturing and service organizations. The accompanying table shows 24 typical information processing tasks and what percentage of organizations had at least partially automated the task.

The manufacturing firms are slightly ahead of the professional service firms in the degree to which they have automated their information processes. The table also shows that accounting processes are the most automated tasks in both manufacturing and professional service firms. In professional service firms, word processing is also highly automated.

How Many Computer Terminals?

Computer penetration can be determined by comparing the average number of computer terminals with the number

of information workers in these organizations. The manufacturing firms and professional service firms both showed a penetration percentage of just under 40. In other words, both types of companies have about three users per terminal.

What Factors Influence Automation Implementation?

Study participants were asked to indicate the degree to which they felt that selected factors tended to hinder the adoption of automation and the degree to which other factors positively influence the adoption of automation.

There is relatively common agreement between the two industries about the factors that most significantly hinder the implementation of automation in businesses. The top one-third of these factors are:

1. Feeling that technology is changing too rapidly.
2. Lack of confidence in claims made by computer sales representatives.
3. Lack of time to do the necessary analysis to determine what or how to automate.
4. Lack of confidence in computer vendors to provide ongoing service and support after implementation.
5. Lack of knowledge about new technology.

Data about the relative impact of factors that tend to persuade small businesses to implement automated information systems also showed common responses from both manufacturing and service companies.

The leading factors that both groups of study participants agreed would persuade them to adopt automation are the promises of—

1. increased office productivity,
2. more accurate information, and
3. greater information processing capability.

How Satisfied Are Small Business Users?

Finally, I asked company leaders how satisfied they are with automation's ability to improve their information processing. I used seven-point scales (with seven representing a highly satisfied

Degree of Satisfaction with Present Processes				
Information Process	Rank	Mfg.	Rank	Prof.Svc.
Taxes	1	6.20	4/5	5.50
Word processing	2	6.16	17/18	4.94
Payroll	3	6.15	3	5.60
Order entry/processing	4	6.00	6	5.41
Graphics	5	5.92	1	6.29
Financial statements	6	5.89	10	5.25
Shipping and Receiving	7	5.86	16	5.10
Library/document mgt.	8	5.69	4/5	5.50
Cash management	9	5.67	12	5.22
Mass mailings	10	5.62	19	4.88
Quality control	11	5.55	13	5.18
Purchasing	12	5.50	8	5.29
Accounts payable	13	5.47	10	5.25
General ledger	14	5.40	2	5.67
Project management	15	5.33	7	5.38
General records	16	5.15	15	5.12
Planning/forecasting	17	5.13	20/21	4.87
Personnel records	18	5.10	22	4.85
Accounts receivable	19	5.05	10	5.25
Budget management	20	5.00	20/21	4.87
Work in process	21	4.89	23	4.82
Inventory management	22	4.80	14	5.17
Job costing	23	4.57	17/18	4.94
Sales analysis	24	4.33	24	4.80
Average		5.43		5.21

position) to measure degree of satisfaction. When reviewing the list of 24 information processing tasks, none fell below a four on the scales.

The processes that were seen most favorably (in the top one-third) by both manufacturing and service organizations were taxes, payroll, order entry/processing, graphics, and library/document management. Those processes consistently falling in the bottom one-third were sales analysis, planning/forecasting, personnel records, budget management, work in process, and job costing. These latter processes suggest prime opportunities for more appropriate support by automated systems.

Conclusion

Small businesses are making progress at automating information processes within their organizations, but much more can be done to improve the way these organizations manage the whole information processing function. General recommendations include more

computer training for the CEO and other top-ranking officers, more attention given to implementing of compatible and integrated systems, and formal appointment of a top-ranking person as "Chief Information Officer," whose responsibilities include developing appropriate information systems personnel to help analyze and meet the organization's information management needs. ■



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senior analyst at the home office of Kemper Group in Chicago and as an information systems consultant to many other organizations. He is the coauthor of four textbooks, including The Administrative Manager and Automated Office Systems Management.

BRIEFLY



Professorships Announced

Dean Paul H. Thompson announced in early December that three more professorships have been endowed and will provide funding for the 1987-1988 school year.

The first of these new endowments is the Joel C. Peterson Professorship in Business Administration. Joel and Diana Peterson endowed the professorship as part of their efforts to assist the School of Management to achieve academic excellence for its students and faculty. The Petersons recognize the vital role a strong faculty plays in providing challenging educational opportunities for students of business administration. This endowment is their way of supporting the School's efforts to strengthen the faculty. The Petersons, who are from Dallas, Texas, are alumni of BYU and serve on the School's National Advisory Council. He is currently the co-managing partner of Trammell Crow Company. The Petersons are active participants in their community.

The J. Earl Garrett and Elaine B. Garrett Professorship is part of a commitment made by Earl Garrett when he left BYU as an accounting graduate in 1929. At that time, he made a promise to himself that he would "pay back" BYU for the education he received. Since that time he has given of his time and expertise to assist the School in achieving its goal to provide quality education for its students. Earl is a charter member of the National Advi-

sory Council, and Elaine serves as a member of the NAC Spouses Committee. The Garretts are residents of Glendale, California. He is the president of Nu-Way Industries, Inc., and served for many years in various executive positions with Mayfair Markets and Arden-Mayfair. Both of the Garretts are active in their community and church.

In the November 1984 annual meeting of the National Advisory Council, council members voted to support a major fund-raising drive that ultimately would have a goal of \$10,000,000. As part of that drive, the council members agreed that they should lead the way by funding an endowment for the National Advisory Council Professorship in Management. At the 1986 meeting, Hank Marcheschi, NAC fund-raising chairman, announced that the goal of funding the professorship was nearly realized and that by the first of December funding would be at a level to allow the announcement of the professorship. This professorship will be a lasting tribute to the men and women who give of their time and means to assist the School. Through their service they are assisting the School to become a stronger and more vital educational institution.

Faculty Fellowships Announced

BYU alumni and friends at Goldman, Sachs & Co., under the leadership of Ralph Severson, a 1971 BYU MBA, have established the Goldman Sachs

Faculty Fellowship. This award will provide \$5,000 per year to assist a faculty member to perform more effectively. The funds will be used to provide research assistants, computer time, professional travel, salary supplement or funds for other activities consistent with the goals of the fellowship. The funding was developed through personal donations that were matched dollar-for-dollar by Goldman, Sachs & Co.

The Merrill and Edythe Lason Dame Faculty Fellowship was also established in 1986. Reed Dame, President of Woodgrain Mouldings, Inc., announced the funding of this fellowship to honor the founders of Woodgrain Mouldings. The Dame Fellowship will provide funds to assist the recipient to develop expertise in teaching and research and other achievements consistent with the fellowship's goals.

Professors Awarded

School of Management professors Gary F. McKinnon, Scott M. Smith, and Milton E. Smith were awarded the Outstanding Article of 1986 in the *Journal of Marketing Education (JME)* for their article entitled "The Diffusion of Personal Computers Among Business School Faculty: A Longitudinal Study of Attitudes, Expectations and Uses." The selection process was carried out by a subcommittee of the Board of Directors of Western Marketing Educators' Association (WMEA) and reviewers of the *JME*.

The award will be presented in Monterey, California, as part of WMEA's annual conference meetings this spring.

Donald E. Pickett

Donald E. Pickett, the founder and former CEO and chairman of the board of Neo-Life Company of America, Inc., became the School's first Executive in Residence in a new program estab-

lished by Dean Thompson. He visited campus in November 1986.

Neo-Life is known as "America's Health and Fitness Company." It was founded in 1958. Mr. Pickett is also founder and chairman of the board of Natural Formulas, Inc., a leading private label manufacturer of food supplement formulas for the health and food industry.

The Executive in Residence program brings outstanding executives to campus to visit with and make presentations to faculty and students. Its objective is to build a partnership between the School and members of the business community. Faculty are encouraged to visit with the Executives in Residence for help in identifying appropriate research on current business topics.

Scholarship and Student Assistance Endowments Established

In December the University received a major gift from the estate of Ruth M. DeBernardi. Part of that gift, \$100,000, was earmarked to endow a scholarship fund for the School of Management. Funds from the endowment will provide scholarships beginning Fall Semester 1987.

The estate of Ella Mae Herman, a long-time resident of southern California, has provided an endowment for a special fund that will assist students financially while they are enrolled in the School of Management. Income from the endowment will fund scholarships and assistantships.

New School of Management Alumni Board Organized

An SOM Alumni Board has been organized to help enhance the School's alumni relations. Fifteen charter members met in September, and Lowell Benson (BS '62 and MBA '64) was chosen to be the first president of the board.

The Board aims to help involve more alumni with the School, to develop more School of Management support, and to assist with alumni activities. The board will also help raise funds, enhance employment opportunities, seek development opportunities for the faculty, and assist with executive development programs.

The board meets twice annually and will eventually have 35 to 40 members, including the two current student council coordinators. Members will be selected (taking into consideration geographic location, degree, profession, and class year) so that the board will represent the overall alumni population. The normal board term is two years, and new officers will be elected at the first meeting each year.

School of Management Student Council Organized

For some time there has been a need for a central SOM student organization to provide better communication and coordination of activities sponsored by various groups and clubs within the School. Therefore, at the beginning of the 1986-87 school year, the first School of Management Student Council was organized.

The council is composed of presidents or appointed representatives from approximately 12 School of Management organizations. The dean has appointed Britt Berrett and Scott Walker as coordinators for this school year. They represent the School of Management to the University-wide Student/Alumni Association.

The council meets monthly to share information, coordinate events, and to help support SOM activities. It is also an arm of the Student/Alumni Association, which sponsors a number of excellent activities each year. Another council purpose is to build student commitment to the School of Management with a desire to maintain continuing ties after graduation.



Doug Weaver (right) presented the class gift of more than \$8,000 to Dean Paul Thompson at the Reunion Banquet.

Seven-class School of Management Reunion

The weather was warm and clear, the campus was all dressed up for Homecoming, and the fall colors were beautiful. It was a perfect reunion setting for the MBA Classes of '66, '71, '76, and '81 plus the 20-, 25-, and 30-year undergraduate classes on Homecoming Weekend, October 24-25, 1986.

Some alumni came a day early to participate in the classroom or to meet with students in various

activities.

Friday seminars on a variety of subjects were led by Stephen Covey, Dean Paul H. Thompson, and others. Lots of good food enhanced the opportunity to renew old friendships. Other activities included a report from the dean, a guided tour of the Tanner Building, and campus tours.

The evening banquet featured a Class Reunion gift presentation of over \$8,000 to the School, followed by a rousing speech from master motivator Douglas Snarr.

Saturday brought still more food at a reunion pre-Homecoming game tailgate party. Alumni then thoroughly enjoyed watching BYU beat UTEP.

Thanks go to Hugo Boren (MBA '71), who chaired the entire reunion, and to Bob Sharp (MBA '71), master of ceremonies.

Plans are underway for the 1987 School of Management Reunion. It will include everyone who received a degree in years ending with a 2 or a 7.



Douglas Snarr (left), seen here with Reunion Chairman Hugo Boren, capped the banquet with "a rousing speech."

A New Way To Manage

On November 12–13, the School of Management with the assistance of the BYU Division of Continuing Education sponsored a conference on managing an organization using the concept of continuous process improvement. The rise of Japanese industry since World War II has been due in great degree to this management approach. The conference introduced participants to the management concepts taught by Dr. W. Edwards Demming, Dr. Joseph Juran, and Dr. Kaoru Ishikawa.

Impetus for the conference came from Chet Harmer, controller of Hewlett Packard's Direct Marketing Division in Sunnyvale, California. Chet serves as the president of the BYU Management Society in San Jose. Hewlett Packard has begun to implement many of these principles and has realized tremendous benefits.

Conference speakers were individuals involved in the actual operation of process improvement principles. The keynote address was given by Dr. Myron Tribus. Until his recent retirement, Dr. Tribus served as the director of the Center for Advanced Engineering Study at MIT. He is well known for his writings on quality management and is one of the founders of the American Quality and Productivity Institute. He introduced participants to the challenges of foreign competition and how the concept of managing using constant process improvement principles addresses this challenge.

Following Dr. Tribus, Chet Harmer discussed the steps that his Direct Marketing Division of Hewlett Packard uses to implement statistical process controls. This division is a distribution center with no manufacturing responsibilities; thus, all of Chet's illustrations were in administrative areas. Benefits in terms of profits and increased customer satisfaction were identified. The session also covered

the formation of a multicompany Santa Clara Valley group devoted to improving quality in business processes.

Dr. Trudy J. Sopp, manager of San Diego's Organization Effectiveness Program, described the nine steps she uses to improve productivity in a public sector setting. Difficulties encountered were discussed in addition to program benefits.

Mary Ann Gould and Maureen Glassman of the Philadelphia Area Council for Excellence (PACE) focused on how and why the Greater Philadelphia Chamber of Commerce organized the PACE Quality Roundtable as an approach to helping companies implement a total quality program. Top local managers meet in monthly roundtable discussions to interact and learn new management techniques. Some organizations involved include Mellon East Bank, Sun Refining & Marketing, the Internal Revenue Service, and Campbells Soup.

Edward J. Kane, director of Quality-Marketing Service and Support Systems, IBM, spoke on his company's business process quality focus. He has been involved in IBM's pioneering efforts in managing through quality improvement concepts.

Two School of Management MBA students presented a report on their internship with Hewlett Packard, where they worked on quality improvement projects. They discussed the benefits to both students and the sponsoring organization and encouraged involvement by conference participants.

The second day of the conference was devoted to small group workshops directed by Chet Harmer, Dr. Trudy Sopp, and PACE representatives Mary Ann Gould and Maureen Glassman. These workshops involved more detailed, hands-on discussions of concepts presented previously. The workshops were repeated in the afternoon, allowing attendance at two of the discussions.

Conference enrollment

totalled 85. Organizations represented at the conference include Ford Motor Company, Fred Meyer, Proctor and Gamble, the LDS Church, the Sacramento County Office of Education, Hewlett Packard, Amdahl, Payless Cashways, and Measurix.

Comments confirmed the conference's success and laid support for future gatherings. Inquiries or suggestions regarding future conferences should be directed to Dr. Kevin Stocks, BYU School of Management, 535 TNRB, Provo, Utah 84602, or Chet Harmer, Controller, Direct Marketing Division, Hewlett Packard Company, 1320 Kifer Road, Sunnyvale, California, 94086.

Seminar Explores Teaching with Computers

Increasing use of microcomputers in finance has created a growing demand by students and business executives for including microcomputer studies in the finance curriculum.

In response to that need, the BYU School of Management hosted a seminar on introducing microcomputer applications in the finance curriculum last June. The seminar was sponsored by the American Assembly of Collegiate Schools of Business (AACSB), the national, accredited organization for business schools. This was the first such faculty development seminar that the AACSB had sponsored. The response from the academic community was favorable with fifty faculty members from schools in the U.S., Canada, Mexico, Puerto Rico, and Saudi Arabia attending.

Brent Wilson, from our School of Management, was faculty leader for the program. Other session faculty were Diana Harrington from the University of Virginia and Michael Schlosser from the Centre d'Enseignement Supérieur des Affaires (CESA) in France.

The seminar was designed to assist faculty members who were

not familiar with microcomputers in learning how to teach finance using this new technology. It focused on how to teach, as well as what should be taught, using microcomputers.

Participants were expected to learn:

1. How to use a microcomputer, specifically the IBM-PC.
2. How to use spreadsheet programs, primarily emphasizing Lotus 1–2–3.
3. How to use microcomputers in the finance curriculum, primarily focusing on corporate finance courses.

To simulate the learning environment of an actual finance course, participants received extensive "hands-on" experience working individually with microcomputers in the School of Management computer lab. The attending faculty learned the concepts and applications of financial modeling by actually developing spreadsheet models.

Knowing how to develop a financial model is not the same as knowing how to use the concepts in teaching finance. So in addition to learning how to use spreadsheets, the seminar emphasized developing an approach to teaching with microcomputers. Participants were exposed to different methods of instruction, including cases and lectures. For each of these methods, curriculum changes necessitated by the use of microcomputers were discussed.

Participants responded very favorably to the seminar. In addition to program content, the attendees were especially impressed with the Tanner Building and the School of Management facilities. The response was so favorable that the School of Management will host another AACSB-sponsored program this summer. Scott Smith, another BYU School of Management faculty member, will be faculty leader for a seminar on using microcomputers for teaching marketing. ■



Finding What You Filed

Retrieving and Purging Your MS-DOS Files

William H. Baker, C.A.M.



An additional problem caused by file disorganization is the time required to purge useless files from disks. This often results in avoidance of the unpleasant and time-consuming task; it usually falls on the list of "things I'll do next year." Using more diskettes or acquiring hard disks with greater storage is the typical solution to the bulging files problem (the old "go buy a new filing cabinet" syndrome).

An Easy Solution

Fortunately there is an easy way to solve the slow-search problem as well as the seemingly impossible purging problem. The procedure explained hereafter is for word processing files, but the same concept can be used with other types of files as well.

Date

When you boot up the system and load DOS into RAM memory, you are prompted to enter the current date and time. Many computer users simply press the enter key to bypass these requests. But by doing this they automatically assign the same date to all files and thus lose one important method of file identification. The time generally is of limited value, but the date is a very important element. Hence, make sure you enter the current date when DOS requests it.

Name

The next critical step is to carefully select the name of each document you save. Three guidelines should be followed in assigning each text file a name. First, common sense indicates that you should assign the name that will most likely come to mind when later looking for the file. For example, if you write a memo to your fellow worker Marty Jones, you would logically think of "Marty Jones" when looking for a copy of that memo.

Second, for documents that are logically tied to the name of a person or the name of a company, incorporate it in the file name. For names of persons, a recommended method is to use the first six characters (if there are that many) of the last name, followed by a hyphen, followed by the first initial. Thus, the file name for a letter to Arthur P. Robinson would be ROBINS-A. The files contain-

ing a memo to Janet Hall would be named HALL-J. For company names, use a similar approach—name the file according to the first eight characters in the company name. Letters to Ajax Insurance Company could be named AJAXINSU or simply AJAX. And letters to Wilkinson Widgets, Inc. could be named WILKINSO. In cases where exact matches occur in either company or personal names, some variation of the name must be developed to differentiate between the two. The use of two initials instead of one is a method that will solve most such problems with personal names. Some other variation will be required for duplicate company names.

Third, for documents not tied to a particular person or organization, a name that best describes the nature of the document should be used. This is the most difficult name to select, because usually no single name will be thought of in all cases—one project could be given a variety of logical descriptors. The main guideline is to use a name you think will *most likely* come to mind when you want to find the file and that will be easily recognized when scanning for it.

This process is significantly enhanced if you use a one- or two-character category prefix followed by a corresponding seven- or six-character name. The prefix reflects different categories of the work you regularly perform, such as budget (B), research and development (RD), different products (W—for Widgets), and so forth. Thus, the name selected for a progress report on the axle bearings of a new widget might be WAXLBEAR. In a subsequent file search, you would know that the file name would begin with W, since it pertains to your Widget line, and from a list of all the W files you could pick out the correct file—AXLBEAR, an abbreviation for axle bearings.

Extension

The three-character extension is a vital part of the document identification. Each character plays a unique and vital role that can make or break a subsequent file search or purge routine. If the word processing package you use automatically assigns an extension to all WP files (e.g., TXT), you have lost a powerful retrieval and purging tool.

Use the first character of the extension

to identify the document *type*. The following list has proven useful for educators, professionals, and managers, but you can modify it to meet your needs.

- A Agenda (or Article)
- B Book
- C Correspondence (letters and memos)
- D Dossier
- F Form
- G Graph (or Game)
- L List
- M Miscellaneous (a vital catch-all category)
- N Note (a note to yourself for later reference)
- O Outline
- P Policy statement
- Q Questionnaire (or Quiz)
- R Report
- S Speech
- T Table
- V Visual (for overhead projection)
- X EXam

It is a good idea to attach this list to the side of your monitor for easy access when saving a WP file.

The second character is a *serial* identifier, reflecting the "numbering" of documents that have matching file names. "A" indicates the first document in the series, "B" reflects the second, "C" the third, and so forth. In most cases this code will be the letter A. But when the names and extensions of two documents match in every way, the next unused letter in the alphabet is used in this spot—B, then C, then D, and so on.

The third character is used as the *purging* code. For most PC users it is recommended that PC files be purged quarterly. Thus, the following codes are used:

- D Delete this file immediately. During the creation of a document, it is wise to save the file periodically. However, as soon as the document is finished and printed, delete it.
- 3 Purge at the end of month 3 (March)
- 6 Purge at the end of month 6 (June)
- 9 Purge at the end of month 9 (September)
- Y Purge at the end of the current year (December).
- R Review this file at the end of

every year and purge when appropriate. This code reflects a file that has an undeterminable purge time.

- P Permanent file. Do not purge.

Quarterly purge routines are easily accommodated with the foregoing codes.

Does It Really Work?

Using this procedure in a day-to-day routine is easy and effective. To perform the March 31 (month 3) purge, for example, you load DOS and enter the following command: DEL *.*??3 (* is a wild card and represents multiple characters; ? is a single-character wild card). This deletes all files with extensions ending in the figure 3. Likewise, at the end of each year you enter DEL *.*??Y, but you must also go through all R files and review them for possible purging.

The retrieval process also works very effectively. To find and retrieve a memo to Ron Jones, you use the following search code: JONES-R.C* This will retrieve and list all correspondence to Ron Jones. In many cases, such a search will turn up only one document, the exact one you're looking for. However, the search may turn up several listings, such as JONES-R.CAR, JONES-R.CBR, and JONES-R.CAP. To select the proper memo, you examine the date of each (if your word processor includes the date on the screen display) and select the desired file.

To retrieve a "note" pertaining to your budget, you would enter B*.N* This would display all notes pertaining to your budget. If there is only one, your search is over. If several appear, you examine the dates to find the desired note or simply examine each note until you find the right one.

Obviously, this method is not the only file management tool available to PC users. Subdirectories can be set up on hard disks to help categorize documents, and different diskettes can be used for similar purposes. Further, advanced word processors can search all files for a particular word or character string (although such a process can be somewhat slow and tedious). But this method does provide one effective way to logically organize MS-DOS text files for easy retrieval, easy purging, and efficient use of personal computing power. ■

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