Artificial Intelligence in Support of Small Business Information Needs

BY WILLIAM LARRY GORDON, CSP, AND JEFFREY R. KEY

WILLIAM LARRY GORDON, CSP

Larry Gordon is an Associate Professor in the Department of Mathematical Sciences in the College of Arts and Sciences of the University of Alaska, Anchorage, where he authored the Computer Science Curriculum and Program consisting of two major options, Business and Scientific. Professor Gordon has held various positions in industry including Senior Analyst with Control Data Corporation and Operations Analyst with Lockheed Aircraft Corporation.
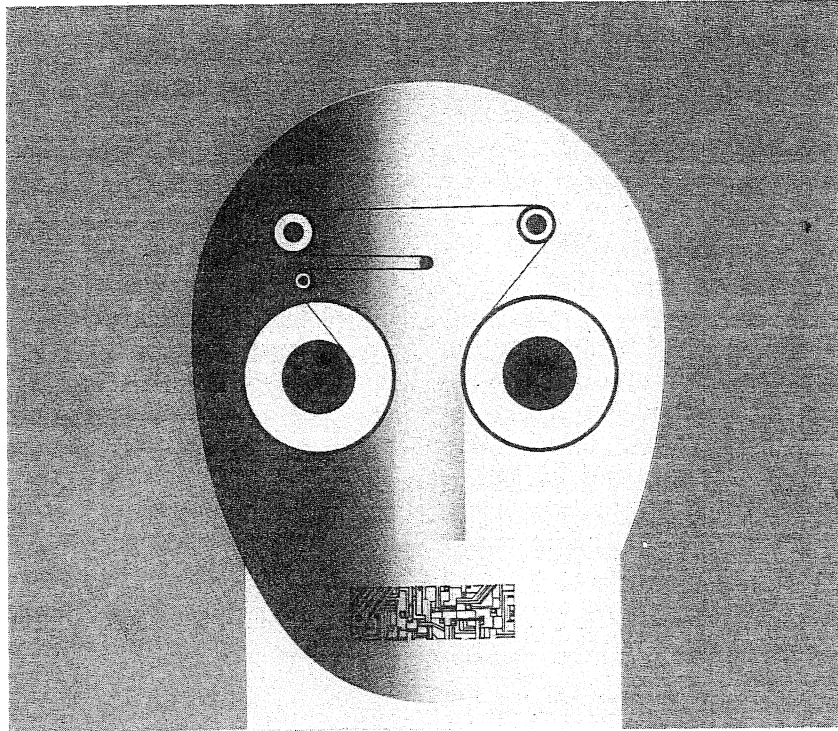
JEFFREY R. KEY

Jeffrey Key is an Instructor in the Department of Mathematical Sciences in the College of Arts and Sciences of the University of Alaska, Anchorage. Mr. Key is currently completing his doctorate from the University of Colorado, Boulder. His research interests include artificial intelligence applications in remote sensing, statistics, and geographic problem-solving.
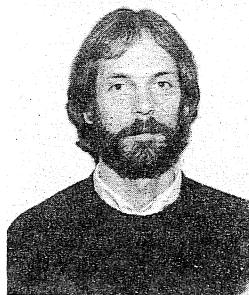
■ Computerization of small businesses has occurred at a phenomenal rate. According to statistics released by the U.S. Bureau of Census, nearly 3.7 million of the 4.16 million digital computers shipped in 1984 were priced at less than $2,500.[1] Sales of all desk-top computers in the United States are expected to grow from a level of approximately $1 billion in 1980 to a level exceeding $40 billion in 1986.[2]

Besides the factors of availability and low cost, a major factor contributing to the increased usage of computers is the awareness of the small businessperson that small business survival depends as much on management ability as it does on the quality and desirability of the goods or services offered. The Small Business Administration (SBA) estimates that nine out of ten businesses fail due to the lack of management ability, which the SBA broadly defines as skills in accounting problem-solving, marketing problem-solving, and other problem-solving areas.[9] These data are supported by recent studies by Khan and Rocha[4] using Iowa data and by Wichmann[13] using Alaska and Wyoming Small Business Institute (SBI) case data that revealed that marketing and accounting problem-solving skills were the key problem areas.

These findings are particularly disturbing given the level of effort by the SBA in devel-

oping and presenting educational programs for small business entrepreneurs in order to increase their level of management ability in these critical problem-solving areas. Such programs would be expected to at least increase the level of awareness of problem-solving weaknesses and to result in an increased usage of outside consultants or of computerized decision support systems.

Low Use of Consultants

Relative to the use of consultants, Pelham[8] expressed his concern that small businesses do not seek adequate levels of assistance. Relative to the use of computerized decision support systems, computer use studies indicate that this potentially effective source of assistance is being underutilized. One recent survey of micro users indicated that only 68% utilized their micros daily and that micro use was more common at the lower levels of the organization with word processing being the most commonly used application.[6]

The low utilization of outside consultants is explainable by the small businessperson's aversion to the "unreasonably high charges" of consulting services. While plant and equipment expenditures are viewed as necessary investments, people-related expenditures, including

training, are typically considered to be, at best, semi-discretionary costs. Given that this attitude is not likely to change, what are the problems with, and the opportunities for, managerial assistance through the acquisition of computerized expert systems utilizing AI concepts? This article will define AI and the concept of an expert system, will explore the information needs of the small business, and will examine the availability of AI-based software, such as expert systems, to assist in satisfying these needs.

Artificial Intelligence and Expert Systems

Artificial Intelligence is concerned with the development of computer hardware and software that is capable of carrying out the tasks that normally would require the use of humans employing their intelligence. Research in AI involves an examination of the ways that knowledge can be represented and used and includes the investigation of the types of problems where logic is supplemented by rules-of-thumb based on experience and intuition. Unlike today's digital computers, where number processing speed and efficiency is defined in millions of floating point calculations per second ("megaflops"), the proposed AI-based "Fifth Generation" computer systems will have symbol processing speed and efficiency that is measured in mil-

lions of inferences or deductions (or thoughts?) per second ("megathots!").

Current areas of AI research include natural language processing, image recognition, knowledge representation, and robotics. Another major area of study within AI is the development and application of expert (or knowledge-based) systems for performing highly specialized tasks normally considered to require the ability of human experts. These expert systems are capable of reasoning and recommending solutions to specialized problem areas given the human expertise provided to them. Most expert systems have certain characteristics that, as a group, distinguish them from the capabilities of classical Management Information Systems (MIS) or Decision Support Systems (DSS). Turner suggests the following features:

1. Expert systems contain the facts, "rules of thumb" (or heuristics), and other knowledge that an expert would use in solving a problem.

2. Expert systems explain, upon demand, the reasons for their conclusions.

3. Expert systems try to imitate the decision-making processes of humans.

Of the major areas of AI, natural language processing and expert systems are of immediate use to the small businessperson. Natural language processing provides support to word processing and data base applications, and expert systems provide support to improving management ability.

Small Business Information Needs

All information processing activities can be categorized as one of the following:
- Word processing
- Data collecting, processing, summarizing, and retaining
- Information interpretation for problem-solving and decision-making.

The importance of the first category within the small business is well known. Word processing activities are consistently ranked number one in terms of importance and is the first activity to be implemented by the small business when it purchases its first computer. A re-

cent survey of PC users[7] revealed that word processing and spreadsheets were the most dominant PC applications, with integrated packages, graphics, general ledger/accounts payable, electronic mail, and calendar applications being important but less frequently used. Published sales-statistics on the top thirty PC software programs[10] indicates that word processing and desk accessory programs are the unit sales leaders, accounting for approximately 40% of the total units sold.

TABLE 1
Top 10, 20, and 30 PC Programs Represented within Major Product Categories
(Total Unit Sales as of June 30, 1985)

Product Category	Percent of Programs in		
	Top 10	Top 20	Top 30
Word Processing	20%	25%	20%
Data Management	10	10	20
Spreadsheets	10	10	7
Integrated Systems	10	5	3
Project Management	10	10	7
Graphics	—	5	10
Desk Accessories	20	20	20
Communications	10	5	7
Operating Systems	10	10	7
TOTAL	100%	100%	101%
Word Processing	20%	25%	20%
Decision Support	40	40	47
Other	40	35	33
TOTAL	100%	100%	100%

Table 1 provides a summary by product category of the percentage of each category that is represented by top selling products belonging to the top ten, the top twenty, and the top thirty PC programs relative to their total unit sales. The nine product types presented have been further summarized as "word processing," "decision support software" and "other" software. These general categories provide a better understanding of the demand by PC users for applications software that has the potential to assist management in its decision-making. In terms of AI-based applications potential, decision support software corresponds to potential expert systems applications and the word processing category to natural language applications.

The data indicate widespread acquisition of software that could support problem-solving activities and increase management ability. The fallacy lies in inferring that software ownership means software use. It does not! Many surveys confirm this statement, including a recent survey of 1000 small non-accounting businesses who are members of the Anchorage, Alaska, Chamber of Commerce. This study revealed that actual use of computer software is considerably below desired use, implying that available software is not owned or is underutilized! (Table 2.)

TABLE 2
Anchorage Chamber of Commerce
Respondents Computer Applications

Function	Current Usage (%)	Desired Usage (%)
Word Processing	24	75
Data Management	17	69
Graphics	3	31
Inventory Control	23	56
Accounting	61	82
Simulation	3	28
Other	6	36

This characteristic of small business computer usage is partially explainable by a general organizational fear of computers (cyberphobia) and partially by an unwillingness on the part of the small business entrepreneur to invest time, effort, and money into acquiring a minimally sufficient education in each of the major problem-solving areas and in the use of the software so that utilization of the computers' capabilities can be obtained. It is unlikely that the typical owner-managers can nor will make this effort. The combination of management problem-solving and computer skills required to effectively use most of the currently available applications software to its fullest capabilities is, in general, beyond their reach. The result will continue to be underutilized computer resources unless the user friendly software can become user friendlier and can embody problem-solving skills.

An expert systems marketing objective is to do just that! With these new systems, many of the major problems of small businesses identified in Pelham's 1984 study[8] of small businesses in Northeast Iowa could be alleviated and possibly reduced to the status of minor problems. This study indicated the major external problems of small businesses as being interest rates, inflation, and taxes, and the internal major problems as declining sales, cash flow, and marketing.

AI for Small Business Management Needs

Egil Juliussen, Chairman of the Board of Future Computing, believes that by the early 1990s most software will use AI.[3] The current PC software advertisements would seem to indicate that this event has already occurred.[11] AI appears to be the latest gimmick to sell software. An existing product is modified to incorporate some modest AI related capability and a new sticker is added: "New and Improved — With AI Added!"

The truth is that very few AI-based applictions are currently available or are currently affordable by small businesses. Most of the products employ natural language processing concepts in word processing or data base applications or are expert systems designed for use by licensed professionals such as CPA's and lawyers. AI development tools such as programming languages are not discussed here. These products, if acquired by the small businessperson, would generally suffer from the same disuse that has occurred with the "user friendly" development products currently owned.

Word Processing — AI-based word processing aids detect and attempt to correct spelling errors in real time. These programs offer "guesses" on the correct spelling of the word. Some software packages also include a thesaurus. The degree to which these programs incorporate AI techniques depends largely on the method used in searching the dictionary or thesaurus: from purely algorithmic to almost entirely heuristic, where rules of thumb play a major role. Prices range from $60 to $150.

Data Management — Improvement in data base management sytems as a result of AI research will occur in three areas: natural language interfaces, more complex data structures, and "intelligent" searching/reasoning mecha-

nisms. Traditional data base software available to small businesses has been enhanced in the first area only, where natural-language "front ends" have been added that allow English or English-like queries. Typical prices range from $250 to $800.

Data base users can also expect to see the utilization of more complex, hierarchical structures called "frames" in the near future. Frames permit a greater degree of abstraction in declaring objects, and also create a more meaningful connection between these objects. In addition, the search process will soon incorporate a set of general reasoning mechanisms which are able to draw conclusions from incomplete data as well as performing the traditional syntactic searching. Improvement in these three areas — natural language interfaces, data base structures, and general reasoning mechanisms — will ease the transition from data management to knowledge management.

Expert Systems and Expert System Shells — This category of software includes expert systems for business applicatons, expert system shells targeted for business use, and general-purpose expert system shells. To date, expert systems have been written for use as negotiation aids, tax advisors, financial planning consultants, and employee-management problem solvers. Expert system shells targeted for business use are designed for decision modeling, data base analysis and management, and report generation. General-purpose shells vary in complexity and capability, and typically require a considerable effort to produce a working expert system. Prices for expert systems and expert system shells range from $100 to $5000.

Summary

Small business success and survival is related to management ability. If problem-solving skills are deficient in any of the critical areas of management decision-making, then the small business owner-manager must improve those skills through the use of appropriate educational programs, consultants, AI or non-AI based computer software, or some combination of these. In the area of expert systems, tremendous potential exists for enhancing manage-

ment ability. With the current level of interest and investment in exploiting the potential of AI systems, it is not unreasonable to predict that small business failure in the future will be primarily due to the "lack of a better mousetrap" and not due to management problem-solving deficiencies in such major areas as accounting and marketing. The rate at which this progress occurs will partly depend upon industry's continued committment to AI technology which is slow and costly to develop; upon the availability of AI-trained experts — which is estimated to be fewer than 2000 people worldwide.[5] And of non-AI trained specialists in areas such as software engineering management, knowledge engineering, AI training, marketing, market support, technical writing, and government liaison; and upon the availability of experts in specific industries including banking, insurance, engineering, travel, and finance. This effort will be made because neither the U.S. computer industry nor the U.S. government will allow the Japanese nor any other government to take a lead in this critical area of information technology.   ●jsm

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