EXPERT SYSTEMS: A CHALLENGE TO MARKETING EDUCATORS

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ABSTRACT

The coming of computerized expert systems means that much of the knowledge which once "belonged" to the marketing professor can be encoded in hundreds of if-then rules. Expert systems pose a significant challenge for how we might teach our classes in the short run and how the role of the professor may change in the long run.

INTRODUCTION

As a society, we are just beginning to sense that the microcomputer will likely affect us as much as the introduction of the automobile has over the last half century. The microcomputer will affect higher education very deeply, but not in the ways most people anticipate. The use of the computer to drill on skills or practice tests, for example, will grow but the effects will not be very significant. The more significant impacts will ultimately be in the ways students, faculty, administration, and library communicate with each other and, more importantly, how we as educators structure, access, package, and deliver expertise in our respective fields.

What Is an Expert System?

The Fifth Generation, by Edward A. Feigenbaum and Pamela McCorduck (Addison-Wesley 1983), tells how the Japanese are attempting to become the future knowledge brokers of the world with a new generation of computer technology and a branch of artificial intelligence known as expert systems. An expert system is essentially a set of computerized if-then rules which capture expertise or experience in an applicable form.

An example of an expert system was described in Infoworld (October 1983, Vol. 5, No. 40, pp. 18-99). General Electric had a master mechanic for diesel electric locomotives. With his retirement, the company would lose 40 years of experience. A computer system was developed that captured a good deal of his expertise and made it available via an interactive computer program to other, less experienced mechanics.

The system starts off with a menu of possible symptoms. It then systematically and efficiently proceeds to pinpoint the diagnosis with a series of followup questions like: "Is the fuel filter clean?," or "Are you able to set fuel pressure to 40 pounds per square inch?". Where appropriate, drawings can be called up on the screen. Eventually, they will add "movies" of actual component replacement steps which will be called up by the computer system from an attached videodisc player. Expert systems have also been developed in areas of medical diagnosis and the prescription of antibiotics.

Types of Expert Systems in Marketing

We have bits and pieces of expert systems in the field of marketing. Many of these can and do run on mini-computers, so they are definitely feasible. We don't have to wait for the Japanese fifth generation of new hardware and software. Three types of expert systems in marketing can be identified: 1) information retrieval systems, 2) analytical and simulation models, and 3) heuristic if-then action recommending rules.

Examples of the first type, information retrieval systems, include electronic bibliographic search systems, and more specialized data bases like census information. The average marketing professor probably "knows" a number of good references in a particular specialty area and may be familiar with some recent census information and demographic trends, but the electronic data bases "know" more.

A second type of expert system is a computerized analytical or simulation model. Models, of course, often embody a great deal of expertise. Variables of importance are identified, and the relationships between them (often based on marketing research) are explicitly specified. They embody concepts in operational form. Models may sometimes be incomplete or not very good (just like human experts).

Computer models have been developed in every area of the marketing mix from pricing to sales force management. They are not popular with some marketing faculty because the expertise on which they are based is usually both complex and poorly explained, because some computer skills are needed to operate them, and because they have not been designed with the "mass market" in mind (i.e., they are usually not very user-friendly). As a result, most faculty find it difficult to teach either the operation or the logic (i.e., expertise) of these models.

Easy-to-use models can be developed, however. The real significance of lowcost computers is that it allows us to package knowledge in new and more useful ways, often as various kinds of models. For example, the expertise needed to compute a required sample size for a survey can be packaged in a textbook or in a computer program which asks the user a series of questions (like desired confidence level) and then computes the required sample size. The program represents a more useful form of knowledge (more operational, less ambiguous, less prone to errors, usable by persons with less training, etc.).

A third type of marketing expert system is an electronic advisor in the form of an if-then decision rule recommendation generator or question answerer. These kinds of systems normally have some kind of dialogue going on between the user and the computer that leads to a computer-generated answer or recommendation. For example, in the sample size model mentioned earlier part of the manmachine dialogue is as follows:

COMPUTER: "Can you estimate the standard deviation?" (Yes/No)

USER: "No."

COMPUTER: "In that case, we'll have to use the formula for proportions with p set at .5".

The Challenge of Expert Systems

The challenge of expert systems to the individual marketing professor might be worded as follows:

> IF YOU HAVE NOT ORGANIZED YOUR CLASS MATERIAL IN SUCH A WAY THAT IT COULD BE IMPLEMENTED AS A COMPUTERIZED EXPERT SYSTEM(S), PERHAPS YOU DON'T REALLY QUALIFY AS AN EXPERT IN YOUR ROLE AS A TEACHER.

This challenge may be threatening more because most of us probably don't meet it very well, than because we don't believe it. It's going to be more convenient to attack the yardstick than to try to measure up.

There's a "Catch-22" to the above proposition which may be stated as follows:

> IF YOU HAVE ORGANIZED YOUR CLASS MATERIAL IN SUCH A WAY THAT IT COULD BE IMPLEMENTED AS A COMPUTERIZED EXPERT SYSTEM(S), THEN YOU CAN BE REPLACED (AT LEAST TO A CONSIDERABLE DEGREE) BY A COMPUTERIZED EXPERT SYSTEM, AND SOONER OR LATER PROBABLY WILL BE.

Maybe "marketing myopia" is alive and well in the university and maybe we fail to see that a particular product (like a teacher) is only a temporary solution to a more fundamental need (learning). If we are courageous, perhaps it's time to think about new careers as knowledge engineers for expert systems, just as buggy whip makers had to think about new careers.

Whether the coming of expert systems is good depends on whether or not you want the public higher education system to become more efficient and to be able to teach more students more effectively with fewer, but higher-paid, faculty.

It also depends on whether you can see yourself spending more time building computerized decision tools and systems that teach students and less of your time teaching students directly. If this discussion seems improbable, perhaps we should recall that a few short years ago, electronic tellers, industrial robots, and chess-playing microcomputers also seemed improbable. It may be that the next generation of "principles of marketing" textbooks will incorporate more of the "if-then" form of the computerized expert systems.

Expert Systems and the Way You Teach Next Term

It is not clear what our response to expert systems ought to be, but it seems pretty obvious that an electronic expert is a potential competitor to a human expert. An expert system is also a potential partner with a human expert. In the short run, our response might be to allow the existence of expert systems to add something of their logical rigor to our organization and presentation of knowledge in the classroom. In the long run, many of us may want to participate in the building of expert systems in the field of marketing.

Most of us do not have backgrounds in computer science or knowledge engineering, but we can begin to respond to the challenge of expert systems immediately in the way we teach our classes. Each of the types of expert systems in marketing (retrieval, modeling, if-then decision rules) carries with it a potential response as a teacher. Some possible actions in each category are as follows:

Retrieval Systems

1. Identify the kinds of information (relevant to the class) that exist.
2. Identify any computerized data bases of such information that exist.
3. Teach efficient strategies and methods for finding and retrieving data from manual and electronic systems.
4. Develop your own specialized data bases that students can access (example: your own selected and annotated bibliography on a micro or mainframe that students can access).

Models

1. Have, as a departmental goal, the development of an in-house inventory of models and sufficient supporting documentation to make it possible for any instructor to both run the model and to explain the logic of the model (the concepts and principles as well as computations that it employs).

Decision Rules for Applying Knowledge

1. For every concept taught, begin to develop if-then rules for the circumstances under which the concept is highly, moderately, or not relevant.
2. For ever concept taught, begin to develop if-then rules for its application to problems or decisions.

Such decision rule development is consistent with the "situational theories" that have been developed in business.

Some Modest Examples

Next term, in a graduate forecasting and modeling class, students will develop a computerized annotated bibliography on forecasting and modeling as one course assignment. A commercial data base package may be used or, if there is interest, a student term project may be to write a program to do the job. We'll use the IBM PC's which are part of our Microcomputing Center in the School of Business. The data will be kept on floppy diskettes.

I have developed a computerized pricing case and model that runs on the IBM-PC which ties together computing channel markups, a derived demand curve, and production cost-volume relationships. It is user-friendly, and the case is presented on-screen. This will be made available to instructors teaching principles of marketing. It will be "stocked" in floppy diskette form both in the department (with instructor notes) and in the Microcomputing Center for use by students. An advertising simulation model has also been developed. It is used by students as an aid to a case problem which requires recommending an advertising budget.

The efforts of the graduate modeling course will be directed toward developing additional cases and accom-

panying models and analytical [illegible] tools on microcomputers that will provide some of the material for a new case course under development: "Computer-Based Marketing Management."

The last area of effort is to try to develop improved application guidelines for the theories, concepts, and research findings that we discuss in the classroom. This means trying to answer the "so what" question with respect to any material covered. The consumer behavior area is in need of organized sets of if-then rules to help make sense of the vast array of concepts, theories, and studies. For example, Bourne did a classic study on reference groups, the conclusions of which could be stated as the following if-then rules:

IF YOU ARE MAKING DECISIONS ON ADVERTISING CONTENT, THEN REFERENCE GROUPS MAY BE RELEVANT TO THE TYPE OF CONTENT CHOSEN.

IF YOUR PRODUCT IS NOT HIGHLY VISIBLE, THEN REFERENCE GROUPS PROBABLY DO NOT PLAY A VERY IMPORTANT ROLE IN THE PURCHASE DECISION.

IF YOUR PRODUCT IS HIGHLY VISIBLE, THEN REFERENCE GROUPS PROBABLY PLAY AN IMPORTANT ROLE IN THE PURCHASE DECISION.

IF REFERENCE GROUPS PLAY AN IMPORTANT ROLE IN THE PURCHASE DECISION, THEN ADVERTISING SHOULD EMPHASIZE THE SOCIAL SETTING OF THE PRODUCT.

IF REFERENCE GROUPS DO NOT PLAY AN IMPORTANT ROLE IN THE PURCHASE DECISION, THEN ADVERTISING SHOULD STRESS THE FUNCTIONAL FEATURES OF THE PRODUCT.

As marketing experts and teachers, we can develop our abilities to organize our knowledge in this actionable form. Development of fragments of expert systems can provide challenging graduate term projects and can actually be implemented on microcomputers by those with programming skills.

Social Problems of Expert Systems

In the past, it has been primarily blue-collar workers that have been the targets of automation. From now on, professionals and white-collar workers will no longer be exempt. While the social problems of dislocation may become severe, the productivity gains can be very good for society as a whole. More work will be accomplished with fewer people. As we improve our ability to produce goods and services, the debate on how to allocate wealth among the population will become more intense.

Legal liability of expert systems will probably surface rapidly, perhaps for the first time when an electronic "bum steer" is acted upon with dire consequences to the client.

The dignity and worth of a human being will be called into question by expert systems. When the capability of an expert system greatly exceeds that of any single human being, how will we feel? I can report from first-hand experience that it is not very good for one's ego to be beaten decisively by a microcomputer chess program, and that was just a game!

CONCLUSION

While computers can function as tireless accounting machines or calculators, they can also function in a very different way as knowledge processors. Many people do not fully realize the extent to which computer systems can organize and manipulate the kinds of concepts, facts, and expertise which now "belongs" to the marketing professor! I hope the challenge of expert systems makes us all better teachers in the short run, and better knowledge engineers in the long run.

REFERENCES

Kinnear, Paul (1984), "Computers That Think Like Experts," High Technology, (January), 30-37.

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